Desk Review on Exposure of Humans to Wildlife and the Risk of Spread of Zoonotic Diseases with Pandemic Potential in Lao PDR

Final Report

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Acronyms and Abbreviations

ACIAR	Australian Centre for International Agricultural Research
ACRES	Animal Concerns Research and Education Society
ADB	Asian Development Bank
AK-47	*Avtomat Kalachnikova*, model 1947, a Russian assault rifle
Aka	also known as
AVSF	Vétérinaires et Agronomes sans Frontières
BCC	Behavior, change and communication
BIORAP	Rapid and Participatory Biodiversity Assessment
BPKP	Bolisat Pattana Khet Pudoi (Mountainous Area Development Company
CAFRI	Centre for Agriculture and Forestry Research Information
CCL	Comité de Coopération avec le Laos
CBD	Convention on Biodiversity
CERoPath	Community Ecology of Rodents and their Pathogens in southeast Asia
CIRAD	Centre de Coopération Internationale en Recherche Agronomique pour le Développement
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPAWM	Centre for Protected Areas and Watershed Management[1]
CPT	Carnivore Preservation Trust
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFO	District Agricultural and Forestry Office
DFRC	Division of Forest Resource Conservation
DLF	Department of Livestock and Fisheries
DoF	Department of Forestry
EID	Emerging infectious Diseases
e.g.	*exempli gratia*, for instance
EPT	Emerging Pandemic Threat
E&S	Environment and Social
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDD	Food and Drug Department
FHI 360	Family Health International
FMCP	Forest Management and Conservation Program
FOMACOP	Forest Management and Conservation Program
GDP	Gross Domestic Product
GEF	Global Environment Facility
GMS	Greater Mekong Sub-region
GoL	Government of the Lao PDR
GVFI	Global Virus Forecasting Inc.
HH	Household
H5N1	A strain of the Influenza A virus

[1] Formerly a component of the Department of Forestry. The Centre has been dissolved and its responsibilities attributed to several institutions, among others the Forest Resources Conservation Section and the National Agriculture and Forestry Research Institute (NAFRI) (FMCP, 2000)

HTNV	Hantaan hantavirus
IDENTIFY	one of the five components of the USAID-EPT program
IEWMP	Integrated Ecosystem and Wildlife Management Project
IFMT	Institut de la Francophonie pour la Médecine Tropicale
ILRI	International Livestock Research Institute
INGO	International Non-Governmental Organization
IRD	Institut pour la recherche et le Développement
IUCN	The World Conservation Union
LAK	Lao Kip
LCMV	Lymphocytic Choriomeningitis Virus
LSFCP	Lao-Swedish Forestry Conservation Project
LXML	Lan Xang Minerals Limited (registered name of the company operating the Sepon Gold and Copper Mine)
MAF	Ministry of Agriculture and Forestry
MARD	Ministry of Agriculture and Rural Development in Vietnam
m.a.s.l.	Meters above sea level
MCU	Mobile Conservation Education Unit
MMG	Minerals and Metal Group (owner to 90% of the LXML mining company)
MoC	Ministry of Commerce
MoH	Ministry of Health
MoNRE	Ministry of Natural Resources and Environment
MRC	Mekong River Commission
MSG	Mono Sodium Glutamate
Mt.	Metric ton (1,000 kg)
MWBP	Mekong River Basin Wetland Biodiversity Conservation and Sustainable Use Program (UNDP-IUCN-MRC joint program)
n.a.	not assessed
NAFRI	National Agriculture and Forestry Research Institute
NAHC	National Animal Health Centre
NBCA	National Biodiversity Conservation Area (aka NPA)[2]
NCLE	National Centre for Laboratory and Epidemiology
NEIDCO	National Emerging Infectious Diseases Coordination Office
NEM	New Economic Mechanism
NGPES	National Growth and Poverty Eradication Strategy
NLMA	National Land Management Authority
NMF	Non-malarial fever
NN-NPA	Nakai-Nam Theun National Protected Area
NOFPM	National Office of Forest Protection and Management
NPA	National Protected Area (aka NBCA)
NTFP	Non-Timber Forest Product
NTPC	Nam Theun 2 Power Company
NUOL	National University of Laos
NURIFaR	Northern Uplands Rice Based Farming Systems Research Project
PA	Protected Area
PAFO	Provincial Agricultural and Forestry Office

[2] WWF, 2004, p. 86.

PDR	People's Democratic Republic
PPA	Provincial Protected Area
PREDICT	one of the five components of the USAID-EPT program
PREPARE	one of the five components of the USAID-EPT program
PREVENT	one of the five components of the USAID-EPT program
PRF	Poverty Reduction Fund
RESPOND	one of the five components of the USAID-EPT program
SARS	Severe Acute Respiratory Syndrome
SDPA	Sepon Development Project Area
SEOV	Seoul hantavirus
Spp.	species
STEA	Science, Technology and Environment Agency
TABI	The Agro-Biodiversity Initiative in the Lao PDR
THB	Thai Baht, Thailand's currency
THPC	Theun Hinboun Power Company Ltd.
UNESCO	United Nations Educational, Scientific and Cultural Organization
US(A)	United States (of America)
USAID	United States Agency for International Development
UK	United Kingdom
USD	United States Dollar, the USA's currency
USSR	Union of Soviet Socialist Republics
UXO	Unexploded Ordnance
VCMU	Village Conservation Monitoring Unit
VSF/VWB	Vétérinaires sans Frontières/Veterinarians Without Borders
WASH	Wash/Avoid/Safety/Health
WB	World Bank
WCS	Wildlife Conservation Society
WFP	World Food Program
WHO	World Health Organization
WMPA	Watershed Management Protected Area (near NN-NPA)
WREA	Water and Environment Resources Agency
WWF	World Wide Fund for Nature (=World Wildlife Fund)

Meaning of Cited Lao Words

Ahlao[3]	A population of the western Vietic speaking branch of eastern Mon-Khmer (austro-asiatic group) living in Khamkeut district, Bolikhamxay province
Ahoe	A population of the western Vietic speaking branch of eastern Mon-Khmer (austro-asiatic group) living in Nakai district, Khammouane province and Khamkeut district, Bolikhamxay province
Atel	A population of the south-western Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group) living in Tha Muang village in Nakai district, Khammouane province
Ban	Village
Bo	A population of the Viet-Muong of the Mon-Khmer (austro-asiatic group) living mainly in Hinboun district, Khammouane province
Bolisat Pattana Khet Pudoi	Mountainous Area Development Company
Brou	A population of the western Katuic speaking branch of the Mon-Khmer ethno-linguistic group (austro-asiatic group) living mainly in Sepon district, Savannakhet province and in Khammouane province[4]
Gao	A paste obtained by boiling bones of animals, until they are reduced to gelatine. The paste is used in traditional medicine
Hai	Plot of land cleared by slash and burn practice for upland rice cultivation
Het phor	Edible mushrooms, *astraeus hygrometricus*
Hon	Brush-tailed porcupine *(atherurus macrourus)*
Khana baan	Village committee
Katang	A population of the of the Mon-Khmer (austro-asiatic group) living mainly in Sekong, Saravan and Champassak provinces
Katu	A population of the Katuic speaking branch of the eastern Mon-Khmer (austro-asiatic group) living mainly in Sekong, Saravan and Champassak provinces
Kha-nyou	Laotian rock rat, *Laonastes aenigmamus*
Khmu	A population of the Khmuic speaking branch of the northern Mon-Khmer (austro-asiatic group)
Khui (Kui)	A population of the Mon-Khmer (austro-asiatic group)
Kisii	Damar resin, *shorea*/*parashorea spp.*, used in Vietnam to make incense sticks, to waterproof boats, etc.
Kri	A population of the southern Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group) living in Bourapha district, Khammouane province
Laab	Popular Lao dish consisting of minced meat (of fish), often uncooked or partially cooked. It can be prepared with virtually any meat. It may contain blood and other body fluids (e.g., stomach or rumen content).
Lao lao	Local alcohol, distilled from fermented rice

[3] References for all Vietic groups follow Chamberlain (1997, p.I3-4), and others from http://www.ethnologue.com/show_country.asp?name=LA [accessed 23 February 2012].
[4] Alton and Sylavong, 1997, p. II-6.

Lao Loum	"Lao of the Plains," of the Tai-Kadai ethno linguistic group[5]
Lao Sung	"Lao of the Highlands," of the H'mong-Mien/Meo-Yao
Lao Theung	"Lao of the Uplands," of the Mon-Khmer/Austro-asiatic group
Liha	A population of the north-western Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group) living mainly in Khamkeut district, Bolikhamxay province
Mai dam	Literally "black wood," aka as *"mai ketsana," "po huang,"* a resinous, scented hardwood formed within the heart of Aquilaria spp. damaged by insects or bullet wounds and infected with different *fungi*. It is used in incense making and perfumery and is highly praised in China, Japan and Arabic countries[6]
Makang (Mangkong)	A population of the south-western Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group), living in Khamkeut district, Bolikhamxay province
Mak chong	Malva nut, the fruit (nut) of the malva tree (*sterculia lychnophra* and *scaphium macropodum*)
Mak kho	fruit from the Taraw palm (aka swamp anaham or Ceylon oak) *livistona saribus*[7]
Mak saeng	Vomica nuts, *strychnos/nux vomica*
Mak taw	A kind of palm fruit/nut, *arenga westerhoutii*[8]eaten by civets
M'labri	A population of the Khmuic speaking branch of the northern Mon-Khmer (austro-asiatic group), living in Xayaburi province (aka *Phi Tong Luang*)
Mlengbrou	A population of the southern Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group), living in Nakai and Gnomalath districts, Khammouane province
Naew hoom	Elders' council
Nam	River/stream
Nam man yang	Yang oil, *dipterocarpus* spp., using for torch making, boat sealing, varnishes, medicine, perfume, handicraft
Nuu khii	*Rats of the bamboo (flowering)*
Phi Tong Luang	see M'labri
Phou	Mountain
Phóng	A population of the southern Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group) living in Nakai district, Khammouane province
Phrai (Prai)	A population of the Khmuic speaking branch of the northern Mon-Khmer (austro-asiatic group) living mainly in Xayaburi province
Sek	aka *Tai-Sek*, a population of the Tai-Kadai living mainly in Nakai (Khammouane province) and Khamkeut district (Bolikhamxay province)
Sin haeng	*Dry meat*
Tai dam	«Black» Tai of the Tai-Kadai group

[5] According to Chazee, 1999, p.6, classification officially abandoned but still widely used (Schlemmer, 2001, p. 10)
[6] Foppes et al., 1997, p. 7.
[7] Alton and Sylavong (1997, p.A5-9) see also http://www.tabi.la/lao-ntfpwiki/index.php/Mak_kho_/_Livistona_saribus_(Lour.)_Merr._ex_Chev.
[8] Boonratana, 1998, p. 45, http://www.tabi.la/lao-ntfpwiki/index.php/Mak_tao_/_Arenga_westerhoutii

Tai deng	"Red" Tai of the Tai-Kadai group
Talaat Sao	Morning market, one of the most popular markets in Vientiane for traditional medicinal products sold by *Hmong* women
Ta Oy	A population of the Mon-Khmer (austro-asiatic group) living in Ta Oy district in Saravan province
Tet	Vietnamese New Year, falling in January or February
Themarou	A population of the south-western Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group) living in Ban Vang Chang in Nakai district, Khammouane province
Toum	A population of the north-western Vietic speaking branch of the eastern Mon-Khmer (austro-asiatic group) living in Khamkeut district, Bolikhamxay province
Toun	Bamboo rat spp.
Xe	Large river

Key Terminology and Definitions Used in This Report

Wildlife is defined by the Wildlife and Aquatic Law (GoL, 2007) as "*all species of wild animals that generate in the nature or are taken for captivity such as: elephants, tigers, bears, deers, monkeys, snakes and birds.*" In the present text, the terms wildlife and wild animals are used alternatively.

The primate order comprises among others monkeys (*cercopithecidae*), gibbons (*hylobatidae,* aka lesser apes) and lorises (*loridae*). According to Duckworth, Salter and Khounboline (1999, p. 176-182), the following families and number of species are found in Lao PDR:

- ***Cercopithecidae*** (Old-world monkeys): nine species are found in Lao PDR, from 81 worldwide. They comprise macaque spp. and langur spp. (ibid, p. 176-179).
- ***Hylobatidae*** (Gibbons): four to five species are found in Lao PDR, from 11 worldwide (ibid, p. 179-182).
- ***Loridae*** (Lorises): at least three species are found in Lao PDR, from six worldwide (ibid, p. 173).

Small carnivores (*carnivora* order) of interest to the present review comprise the following families: *viverridae,* selected *mustelidae* and *herpestidae*.

- ***Viverridae*** (civets, palm civets, otter civets, linsangs and binturongs): between nine and 11 viverrid species are found in Lao PDR, from 34 worldwide (Duckworth, Salter and Khounboline, 1999, p.189). Although viverrids belong to the carnivora order, some species are omnivorous or frugivorous.
- ***Herpestidae*** (mongooses): two species are found in Lao PDR, from 37 worldwide (ibid, p.192).
- ***Mustelidae*** (weasels, martins, hog badgers, ferret badgers and otters): ten to 13 species were found in Lao PDR, from 65 worldwide (ibid, p. 185-189).

Rodents (*rodentia* order) are mammals characterized by two continuously growing incisors in the upper and lower jaw, which must be kept short by gnawing. According to Duckworth, Salter and Khounboline (1999, p.213-240), common rodents in Lao PDR include:

- ***Muridae*** (rats and mice): murinae sub-family between 28 and 31 species (ibid, p. 237-239).
- ***Rhyzomyinae*** (bamboo rats): three species are found in Lao PDR (ibid, p.239).
- ***Arvicolinae*** (voles): between zero and two species are potentially found in Lao PDR (ibid, p.239).
- ***Soricidae*** (shrews): five, potentially seven species are found in Lao PDR, from 272 species worldwide (ibid, p.222).
- ***Sciuridae*** (non-flying squirrels): nine to 12 species are found in Lao PDR, out of 230 worldwide (ibid, p.213).

- ***Pteromyidae*** (flying squirrels): six to eight species are found in Lao PDR, among 43 worldwide (ibid, p.217).
- ***Hystricidae*** (porcupines): two species are found in Lao PDR, among 11 worldwide (ibid, p.219).

As of 2007, Lao PDR counted 53 described rodents and several other species, known but not yet specified (Aplin et al., 2007, p. 291).

Scandentia (tree shrew) is an order of mammals comprising one family (*tupaiidae*) and two sub-families (*Ptilocercinae and Tupaiinae*)[9]. It was long debated if they belong to insectivores or primates. In Lao PDR, the most common animal belonging to the *scandentia* order is the tree shrew. Two species were found, out of 11 species worldwide (Duckworth, Salter and Khounboline, 1999, p. 173).

Chiropters (*chiroptera* order) are flying mammals commonly called bats. According to Duckworth, Salter and Khounboline (1999, p.225-235), common bat species in Lao PDR belong to the following families:

- ***Pteropodidae*** (Old-world fruit bats): eight to 11 species
- ***Emballonuridae*** (Sheath-tailed bats): three to four species
- ***Megadermatidae*** (False-vampires): two species
- ***Rhinolophidae*** (Horseshoe bats): 15 to 19 species
- ***Hipposideridae*** (Round leaf bats, trident bats): nine to17 species
- ***Vespertilionidae*** (Evening bats): 37 to 53 species
- ***Molossidae*** (Free-tailed bats): two species

National Biodiversity Conservation Areas (NBCAs) versus National Protected Areas (NPAs): The denomination of protected areas was changed from National Biodiversity Conservation Areas to National Protected Areas in 2001. NPAs comprise three main tiers: national, provincial and district, as well as local (village) (Hedemark, 2003, p.12). According to Phiapalath and Saisavanh (2010, p.10), NBCAs is the legal and technical name in use in Lao PDR and NPA is the informal name adopted by the conservation community. The International Centre for Environmental Management (ICEM), however, considers National Protected Areas as the new official denomination (ICEM, p.44). In the present report, the terms National Biodiversity Conservation Areas (NBCAs) may still be used, especially in citations made prior to 2001. Both denominations and their acronyms shall, however, be considered as equivalent. The Khammouane Limestone NBCA (NPA) is the old name of the present Phou Hin Poun NPA.

[9] Or alternatively 2 families Ptilocercidae and Tupaiidae

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Executive Summary

This report presents results of a desk review carried out over 93 days between September 2011 and March 2012 in Vientiane Capital by a team of two independent consultants, foreign and Lao, mandated by FHI 360, a non-governmental organization (NGO) in the U.S. The review took place under the USAID-funded PREVENT project on emerging pandemic threats (EPT). The aim of the review was to identify human exposure to wildlife, more specifically to primates, small carnivores (viverrids), rodents, and chiropters (bats), and to assess the risks borne by such exposure in terms of emerging zoonoses with pandemic potential.

The review is based on secondary data obtained from 196 documents in English and 16 documents in Lao language, mostly from gray literature, collected from nine libraries, several offices and the internet. The review is also based on information gleaned during 41 interviews (22 in English and 19 in Lao) carried out with selected stakeholders working in the fields of nature conservation, agriculture, human and animal health, human nutrition, hydropower, tourism, press, and communication. The present report consists of data and pieces of information gleaned from the aforementioned sources.

The review showed that, while wildlife exposure to humans has been extensively investigated, mainly by wildlife and nature conservation agencies, the opposite -- human exposure to wildlife -- has been hardly documented to date.

The review identified four main fields exposing humans to wildlife through both direct and indirect contacts: (1) subsistence hunting and consumption, (2) domestic commercial trade and consumption, (3) international trade, and (4) habitat sharing between humans and animals and the resulting exposure (e.g., conflicts). Although the demarcation line between these areas is often blurred, the distinction is necessary, as each field of exposure often encompasses different species.

Human exposure to wildlife consists of any activity bringing humans in direct or indirect contact with wild animal species such as: hunting with a wide array of active or passive methods (shooting, snaring, trapping, catching by hand); handling live and dead animals throughout the market chain (bleeding, eviscerating, skinning, deboning, cooking, smoking, drying, freezing); consuming; sharing habitat; playing; exhibiting; extracting by-products; storing; and transporting.

The review highlighted a clear gender demarcation with regard to wildlife hunting, handling, and trading, with men/older boys in charge of active hunting with modern and traditional weapons, and women/girls in charge of “softer” methods, such as trapping and harvesting. Depending on species, wildlife can be used as food items; ingredients of traditional medicine; trophies and curios; sources of by-products (e.g., bat guano); pets; and live “products” destined for the laboratory industry. Wildlife plays a crucial role in the livelihood of most rural communities,

both as a food and as a cash earner to cover subsistence needs, irrespective of the communities' ethnic background.

Several surveys and studies have highlighted and demonstrated the crucial nutritional and economic importance of non-timber forest products (NTFPs) in general, and wildlife in particular, in subsistence-oriented communities nationwide. For many communities, especially the ones not relying on aquatic resources as their main source of protein, wildlife still represents an important source of protein, iron, fat, and other indispensable nutrients. Basically all wildlife species are susceptible to being eaten, depending on individual and community tastes, preferences, rituals, and taboos. Most species belonging to the four animal orders of focus are commonly eaten on a subsistence basis. While little information was found on handling of live and dead animals, some information was gleaned on preparation and consumption habits. All kinds of preparation modes are encountered: skinning, eviscerating, mashing, crushing, smoking, drying, grilling, boiling, fermenting, rotting, and eating raw. All of these manipulations bear substantial risks of disease contamination.

As with all other exposure points, trade of wildlife represents a substantial source of exposure to disease transmission. Although wildlife trade is illegal, it is widespread. Domestic and cross-border trade has continuously gained momentum in the last 20 years and has increasingly gone underground (Nooren and Claridge, 2001, p. 15; Hansel, Vannalath and Johnson, 2004, p. 9). The problem of cross-border incursionists from Vietnam (and China), widely reported since 1986, has not been solved so far and foreign traders and poachers continue to buy and hunt, respectively, wildlife on Lao territory. Women have become increasingly involved in wildlife trade, possibly because law enforcement is weaker for women than for men (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 42).

A few authors established the link between trade of wildlife and potential outbreaks of zoonotic diseases in Lao PDR. Pathways for the transmission of zoonotic diseases are identified as being: through direct contact (aerosols, oral contacts or contact with fomites), vector-borne, or environmental. Each of the aforementioned activities related to wildlife, which are part of the daily life of most people in Lao PDR, therefore poses a risk in terms of zoonotic disease transmission. Of particular concern are the widespread habits of:

- Digging rodents (rats, bamboo rats, and porcupines) out of their burrows/nests and catching them by hand and the high exposure of harvesters (mainly children and women) to bites.
- Eating raw meat and blood, as well as fast-grilled, un-gutted whole animals -- mainly bats, rats and squirrels.

Widespread exposure to rodents (rats and mice) in villages -- chronically or during so-called "bamboo flowering rodent outbreaks" -- is a major risk factor for the transmission of rodent-borne zoonoses.

The review identified the following specific issues of concern for each of the four orders of focus:

Primates (macaque spp., gibbon spp., langur spp., loris spp.): Large-scale private farming of macaques and other primate species for international export is of major concern, as sanitary conditions at farms are not properly monitored and general farming conditions are poorly known.

Viverrids (civet spp., binturong): Local, urban domestic consumption, as well as international export of viverrids is still widespread and of particular concern, knowing the role as intermediary hosts these animals have played in the regional severe acute respiratory syndrome (SARS) outbreak in 2003 (Lau et al., 2005).

Rodents (rat spp., mice spp., bamboo rat spp., non-flying and flying squirrel spp., and porcupine spp.): Infestations with murine rodents are reportedly increasing and conflicts with humans in agricultural activities are numerous. Moreover, murine rodents share the most extensive habitats with humans both in rural and urban areas. Non-murine rodents (squirrels, porcupines) still form a non-negligible proportion of small mammals consumed and traded as food item or as pets (squirrels).

Scandentia (tree shrew spp.): These small mammals that look like rodents but belong to a specific order are commonly hunted, consumed, and occasionally traded as a food item at district and provincial markets.

Chiropters (bats, flying foxes): Bats are heavily hunted, consumed and traded locally (Vongbounthane, 1998b, p. 9) and thus pose a potentially great risk in terms of disease emergence, considering that out of the approximately 60 viruses that bats can carry, two thirds are known to have a zoonotic potential (e.g., Lyssa virus, *paramyxoviridae*) or are assumed to have such a potential (e.g., *coronaviridae*, *filoviridae)* (Gonzales, Bourgarel and Leroy, 2010). Nevertheless, with the exception of an outbreak of highly pathogenic avian influenza that caused two human fatalities in 2007, no outbreak of viral zoonotic disease with pandemic potential has been recorded in Lao PDR to date.

In light of these results, it is therefore recommended that potential emerging infectious disease (EID) outbreaks be pre-empted by using existing diseases -- such as rabies, food-borne diseases, or anthrax -- as entry points for an awareness campaign that targets specific groups of stakeholders. It is also proposed that birds be included in future surveys, as they form a large part of wildlife consumed and traded for nutritional, recreational and religious purposes.

Preliminary Remarks

- While reading the report, dates in citations should be kept in mind. As most reports consulted date back to the 1990s, information they contain should be placed in its historical context. Readers should therefore remember that findings presented in this report may differ from the present-day situation.
- Citations, personal communications, and excerpts from reports do not necessarily reflect the views of the author of this report, nor of the funding agency.
- Whenever possible, the author of this report has attempted to transcribe Lao words found in reports into their English and Latin versions. In some cases, however, this was not possible.
- Most conventions have been taken over from other sources, cited in connection with each convention.

The report is organized as follows:

Chapter 1 provides background information for the review, and outlines its objectives. Chapter 2 details the framework and methodological approach used to access data and information. Chapter 3 presents results of the review. Results are presented from a value chain perspective, starting from upstream activities (harvesting) to downstream activities (trade, commercial consumption). Under each sub-heading, a relatively short paragraph summarizes the main findings. Chapter 4 briefly discusses the outcome of the review and draws the main conclusions. Chapter 5 presents the way forward.

1 Introduction

1.1 Background for the Desk Review

In June 2011, FHI 360,[10] an American NGO, was entrusted with the "Global Avian Influenza and Zoonotic Behavior Change and Communication Support Activity," also called the PREVENT project, under the Emerging Pandemic Threats (EPT) Program funded by the United States Agency for International Development (USAID). The EPT program consists of five components: PREDICT, RESPOND, IDENTIFY, PREVENT and PREPARE, and is aimed at "*pre-empting or combating at their source newly emerging diseases of animal origin that could threaten human health.*"

The PREVENT project focuses on using behavior change and communication (BCC) research, strategies, and interventions to prepare for, prevent, respond to, and control avian and pandemic influenzas and emerging pandemic threats. Over the course of the five-year program, the PREVENT project will work globally in 'hotspot' countries. The PREVENT project aims at preventing the emergence and spread of zoonotic diseases, building on USAID's H5N1 avian influenza efforts. PREVENT's ultimate objective is to develop interventions that reduce transmission of EPT viruses from animals to humans. The main emphasis in Year 2 is on problem definition and characterization, to inform the design and implementation of interventions. In Lao PDR, PREVENT is implemented by FHI 360 in collaboration with the National Emerging Infection Disease Coordination Office (NEIDCO). To inform future interventions, FHI 360 recruited a foreign and a national consultant to perform a desk review of literature on human exposure to wildlife in Lao PDR.

1.2 Objectives and Goal of the Desk Review

The two main objectives of the desk review are:

1. To identify human practices and behaviors that cause exposure to wildlife, specifically primates, selected small carnivores (viverrids and mustelids), murine and non-murine rodents, as well as chiropters, and to assess risks posed by such exposure in terms of emerging viral zoonoses in Lao PDR.
2. To assess past and current research on viral emerging zoonoses known to be carried by the aforementioned wildlife species and to identify the main stakeholders involved in research and project implementation in Lao PDR.

[10] Awarded by USAID to the Academy for Educational Development (AED), a Washington-based NGO whose assets were acquired by FHI 360 in July 2011.

The outcome of this review is a report, providing an up-to-date summary of current knowledge on consumption of wildlife meat, wildlife trade, and human-wildlife exposure, which shall inform PREVENT's activities in Lao PDR.

2 Methodology

2.1 Research Questions

According to Hasebe and Le Thi Quynh Mai (2007, p. 51), "*zoonotic pathogens are currently considered to be the major sources (73%) of emerging and re-emerging diseases.*" However, very few studies on zoonotic viruses have been carried out in the Southeast Asian region so far (Blasdell et al., 2009, p. 94). To inform PREVENT's activities in Lao PDR, the following research questions formed the basis of the review:

1. What is known about past outbreaks related to possible infections from zoonoses in Lao PDR?
    - Reports about outbreaks of zoonotic disease that spilled over to humans

2. What is known about rate of contact between humans and wild animals – specifically primate, carnivore (viverrids), rodent and bat species?
    - Human-wildlife contact studies (direct and indirect)
        - Human-wildlife contact studies – both with live and dead animals
    - Consumption of wild animal products
        - Consumer preferences for wild animal food and products (consumer demand and stated preferences for wild animal meat, restaurant studies, nutritional studies of wild animal consumption, seasonal consumption patterns)
        - Traditional medicine
        - Efforts to introduce alternative sources of protein
        - Wild animal husbandry; domestication of wild animals
        - Customs, traditions, attitudes, and beliefs that promote consumption or other use of wild animal products
    - Other occupational contact with wild animals and wild animal feces

3. What is known about the key determinants (contributors) to increased/decreased contact between wildlife/humans in Lao PDR? What interventions have been documented to minimize the negative impact of such variables?
    - Wildlife trade
        - Trade of wild animals (within Lao PDR and cross-border)
        - Sale of wild animals and wild animal products in markets for food, pets, etc. (within Lao PDR and cross-border)
        - Demand and/or price studies
        - Livelihood studies including subsistence hunting for local consumption or income and/or commercial hunting
        - Interventions/programs to reduce wildlife trade or livelihood based on wildlife trade
    - Human impact on land use: contact and conflict
        - Extractive industries (timber industry, mining, hydropower)
        - Interventions/programs that aim to minimize the impact of the above industries

        - Urbanization; habitat fragmentation; road construction; human migration; agriculture development; biodiversity loss
    - Policy
        - Relevant national plans (programs to be included below)
        - Regulations about hunting, capturing, selling and/or buying specific types of wild animals

4. What specific sub-populations or settings are especially at risk for zoonotic disease transmission?

5. What perceptions/classifications exist for wild animals?
    - Relevant perception or classification of wild animals such as, but not limited to, traditional and medicinal classifications.

2.2 Timing and Team Members of the Review

The desk review was conducted between September 2011 and February 2012 by the following persons:

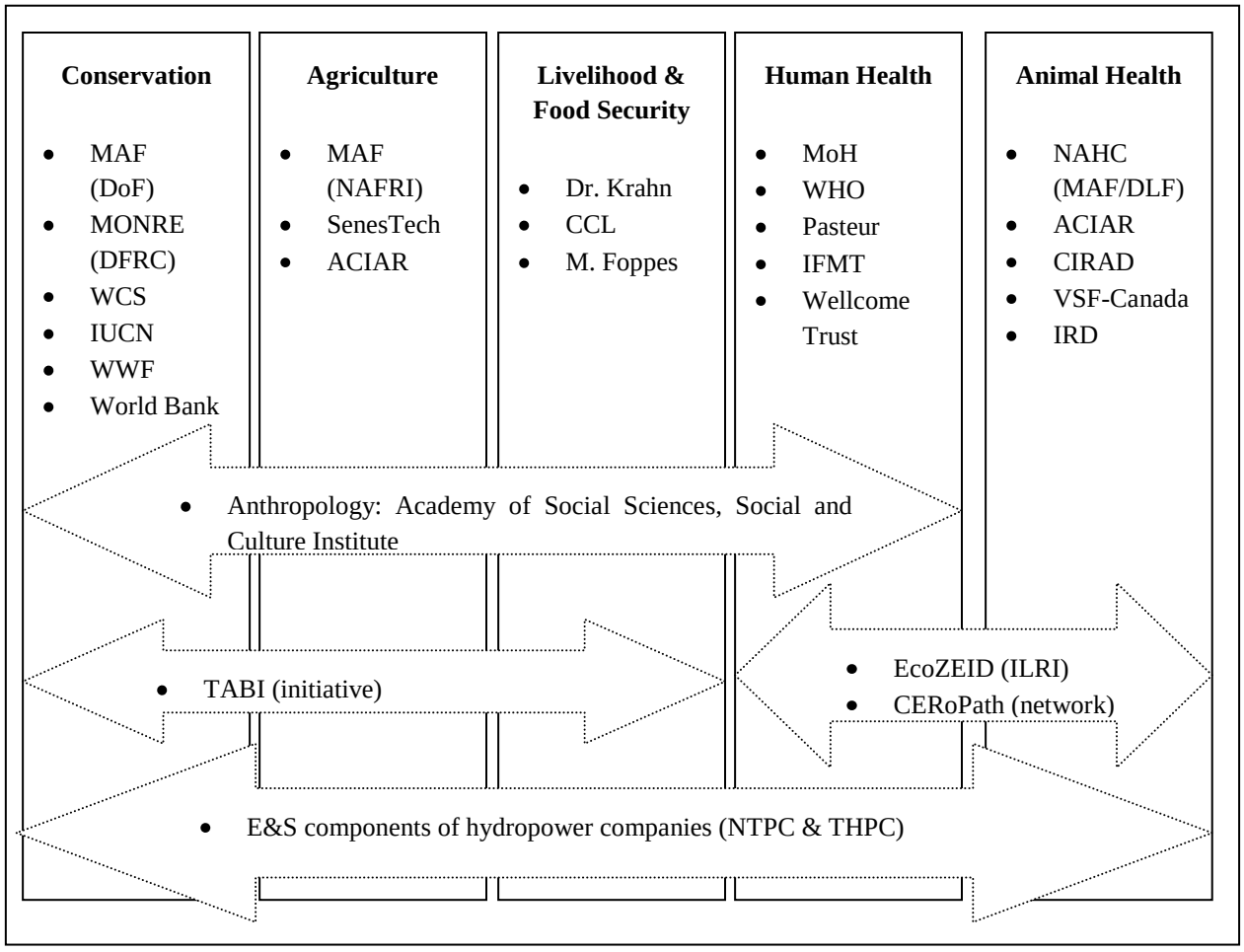
Table 1 -- Desk Review Team Members

Name and Professional Background	Position	Mandate	Days
Ms. Nancy Bourgeois Lüthi B.Sc. Animal Sciences, M.Sc. Agribusiness for Development	Team leader Independent consultant	➢ Identify foreign stakeholders ➢ Search for English reports ➢ Organize meetings with foreign stakeholders ➢ Analyze relevant information and data from 196 reports ➢ Write overall report ➢ Provide technical backstopping to Lao consultant and regional teams	48
Ms. Duangchith Viravongsa M.Sc. Gender Studies and Development	Independent consultant	➢ Identify Lao stakeholders ➢ Organize meetings with Lao stakeholders ➢ Search for Lao reports ➢ Write an annotated bibliography and summary report of findings from 15 Lao reports	38
Dr Khounkham Xaymounvong Medical doctor	Trainer-specialist consultant at FHI 360	➢ Read, summarize and translate 13 Lao reports written by students from the National University of Laos (NUOL)	7

2.3 Methods to Access Data and Information

This review is a synthesis of oral information, secondary data, as well as primary data obtained from various stakeholders. Potential stakeholders were contacted by email, by phone, or by postal mail and were met and interviewed, as far the imparted time and budget frame would allow. Respondents were from government institutions, as well as international government or nongovernment institutions and organizations. Figure 1 summarizes, in a schematized way, areas investigated and stakeholders contacted.

Figure 1 -- Panel of Stakeholders Consulted During the Desk Review



Complete lists of stakeholders contacted and consulted by the foreign and the Lao consultants, independently or jointly, is available in Annexes 1, 2 and 3.

Emphasis was put on obtaining unpublished data and information not accessible through the internet.

- Oral data and information disclosed during interviews carried out with relevant stakeholders.
  - A list of potential stakeholders was drafted based on the fields of research identified through the research questions. The snowball sampling methodology, by which a selected respondent elicits subsequent respondents, was used to identify additional stakeholders.

- Secondary data and information
  - Secondary data and information were gathered from documents collected from nine libraries and offices identified during meetings with stakeholders. Documents have been searched from the internet, as well with a pre-established list of keywords, accessible in Annex 4. A total of 196 documents in English language, as well as 33 documents in Lao language were read, their relevant information extracted, analyzed, and to some extent (16 reports) incorporated into the present report. Table 2 shows where secondary data was accessed.

Table 2 -- Libraries Visited During the Desk Review

	Librarian	Classification system	Physical access to documents
CCL	Yes	No	Direct access Restricted with timing (1 week) and number of documents (3 at a time)
NAFRI	Yes	Computerized system	No direct access Restricted on site (far from the center) Photocopying done on site
DoF	Yes	Computerized system (not in English) Basic classification	Restricted with timing (1 week) and number of documents (10 at a time)
NUOL[11]	*n.a.*	*n.a*	*n.a.*
Faculty of Agriculture	Yes	Computerized system, not effective	Restricted on site (far from the center) Photocopying done on site
WWF	No	No computerized system, no physical classification	Restricted on site No photocopying
WCS	Yes	Computerized system Physical classification	Restricted on site, photocopies allowed on command
IUCN	Yes	Computerized system Physical classification	Restricted on site, photocopies allowed against deposit of ID card
Academy of Social Sciences	*n.a.*	*n.a.*	*n.a.*

[11] The three highlighted libraries were visited by the Lao consultant only

- Primary data
  - Primary data recently collected within the PREDICT component of the EPT program was shared by the PREDICT project leader in Lao PDR. Selected crude data has been included in the present review.

- Referencing
  - Referencing follows the Harvard system described by Anglia Ruskin University (2010).

2.4 Limitations to the Methodology

The desk review was constrained by a series of issues:

- Delayed recruitment of the Lao consultant. As a result, it was not always easy for consultants to schedule their activities in an optimal way. Following this timing issue, a third consultant, Ms. Xaymounvong, had to be mandated to translate and summarize Lao documents found after the completion of Ms. Viravongsa's contract.

- Wide-ranging scope of the review and limited time to delve deeper into the numerous fields covered by the study, including natural resources and wildlife conservation, livelihoods, nutrition, animal health, human health, tourism and extractive industries.

- Time-consuming process to obtain meetings with stakeholders, to obtain documents, or to access libraries at the government level due to protocol issues.

- Time-consuming search for documents at libraries and resource centers. Few institutions keep a library and even fewer have a librarian and a functioning computerized filing system. Most documents had to be searched visually and manually extracted from shelves and boxes.

- For timing and organizational reasons, documents found at libraries could in most cases not be photocopied and could not be accessed again for verifications. The present report therefore contains some gaps (e.g., missing page numbers) which could not be filled during the final data and information verification process.

- For timing reasons, not all pre-identified stakeholders could be contacted and met, and a selection had to be made based on the relevance of their main activities for the present review.

- The present report reflects results obtained from a review of literature carried out in all relevant offices and libraries found in Vientiane province only. However, for time and budget

reasons, the review did not include visits to cities or provinces other than Vientiane Municipality. As a result, it is expected that a non-negligible amount of data and documents, both in Lao and English, have been overlooked.

Due to the aforementioned constraints, numerous unpublished, as well as published, documents could not be included in the present review. Hence, this report will not be considered a systematic review. Rather, it shall be considered an attempt to draw a broad picture of wildlife and human interaction from an open angle and unconventional perspective.

3 Results

3.1 The Lao PDR, Background Information

Population

In 2010, the population of Lao PDR was 6.2 million (World Bank, 2011, p. 21), with an estimated annual growth rate of 1.7%.[12] In the early 2000s it was estimated that 80% of the population was living in rural areas (ICEM, 2003, p. 19) and in 2007/2008, 71% were engaged in agriculture (World Bank, 2010, p. 5).

The country counts over 200 linguistic groups belonging to 49 distinct ethnic populations recognized by the government (World Bank, 2010, p. 5). In the past, Lao PDR's ethnic diversity was commonly aggregated under three main groups (adapted from MoC and IUCN, 2000, p.14 and Vongkhamheng, 2002, p. 30):

- ***Lao Loum*** (Lao from the lowlands): Comprising mainly *Lao* and *Tai* populations, living in lowland areas and dominantly involved in wet rice cultivation, with additional activities such as animal husbandry and fishing. Their population was estimated to make up 68% of the total population in 2002.
- ***Lao Theung*** (Lao from the mid-range-highlands): Comprising mainly *Mon-Khmer* populations, living in highland areas and growing upland (dry) rice and relying strongly on other agro-forestry activities (fishing, hunting, collecting forest products). They were estimated to make up 22% of the total population in 2002.
- ***Lao Sung*** (Lao from the uplands): Comprising mostly *H'mong* and *Yao* populations traditionally living on subsistence agriculture based on slash-and-burn practices and occupying areas higher than the *Lao Theung* (above 1,000 m.a.s.l.). They were estimated to make up 10% of the total population in 2002.

This "classification" is not based on any anthropological basis and has been officially abandoned. It is, however, still widely used in reports.

According to MoC and IUCN (2000, p.26), in Lao PDR the population pressure is exerted in three main ways on natural resources:

- Expanding demand for land areas for agriculture
- Expanding demand for raw materials such as fuel and building material
- Expanding demand for income generation

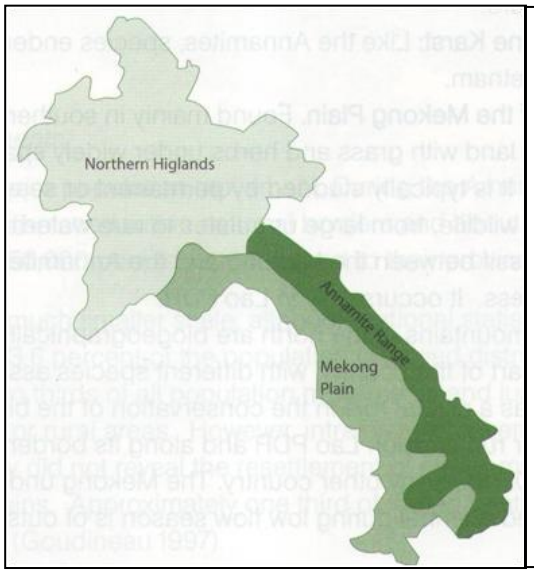
[12] http://www.state.gov/r/pa/ei/bgn/2770.htm

Geographic and Physio-geographic Background

Lao PDR is a country with an area of 236 800 km^2 belonging to the Indomalayan region and Indochinese sub-region in Southeast Asia (Guillén, Francis and Salivong, 1997, p. 7). For these authors (ibid), "*the Indomalayan region is one of the richest areas for biological diversity on earth and can be considered a natural laboratory for humans to study the evolutionary history of life, including humans themselves."*

More precisely, Lao PDR is situated in the mainland of the Greater Mekong Sub-region (GMS) and is bordered by five countries: China to the North, Myanmar to the North-West, Thailand to the West, Cambodia to the South, and Vietnam to the East. The country, which comprises 16 provinces and the capital city, can be divided into three main distinct physio-geographic regions,[13] as illustrated by the following figure.

Figure 2 -- Physio-geographic Regions of Lao PDR



- The Northern Highlands ranging from 500 to 1,500 m.a.s.l. with degraded habitat
- The Annamite Mountain range, ranging between 200 and 2,500 m.a.s.l. It runs along the Vietnam border in the East and is covered with evergreen forest
- The Mekong Plains, at an altitude below 200 m.a.s.l., west of the Annamite range. Habitat types are deciduous and semi-deciduous

Sources: Map: ICEM (2003, p.17) and Text: Timmins and Ruggeri (1996).

Climate and Seasons

The climate in Lao PDR is influenced by the south-west monsoon, characterized by heavy precipitation in the wet season, between April/May and September/October (ICEM, 2003, p. 16). Robichaud (2005, p. 12) defined the main seasons of Lao PDR as follows:

[13] Nieman and Kamp (n.d) define four main regions: upper Mekong, upper Annamite, central plains, and lower Mekong basin

Table 3 -- The Three Main Seasons in Lao PDR

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cool dry												
Hot dry												
Warm rainy												

Natural Resources

Duckworth (1995, p. 1) divides Lao PDR's habitat into three classes: (1) wetland, (2) forest, and (3) limestone karst, each hosting specific species.

The forest cover in Lao PDR was estimated at 70% (16 million ha) in 1940, 48% (11 million ha) in 1981 (IUCN, 2001, p. 25), 43% in 1993 (Duckworth, 1997, p. 3) and 41%[14] in 2002 (http://www.theredddesk.org/countries/laos/statistics). Despite a constant shrinking in forest area over the last 70 years, the Government of Lao PDR (GoL) targets a forest cover of 60% by the year 2020 (IUCN, 2001, p. 25).

In northern regions, the practice of swidden agriculture resulted in fragmented forest intermingled with patches of hill crops. In central and southern Lao PDR, local populations exhibit different agricultural systems, with a higher reliance on wet rice cultivation. The lower reliance on hill rice cultivation resulted in larger intact forest tracts (Duckworth, 1997, p. 3).

Systematic planning for the establishment of National Biodiversity Conservation Areas (NBCAs) was initiated in 1988 (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 1) and in October 1993, the GoL established 18 NBCAs by decree No. 164 of the Prime Minister's Office (PMD 164). The aim of setting up NBCAs was "*to protect a significant representative cover of each major natural habitat type in each of the three bio-geographic subunits encompassing Lao PDR*" (Berkmüller, Evans, Timmins and Vongphet, 1995, cited in Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 1). According to Robinson, Jenkins, Francis and Fulford (2003, p. 31), the establishment of NBCAs "*provided an impetus for extensive biodiversity survey work in the country, to evaluate the existing selection of NBCA and to help set priorities for future management activity.*"

Three pieces of legislation underpin the establishment of NBCA (ICEM, 2003, p. 45):

1. Prime Minister's Decree 164
2. Forestry Law
3. NBCA Regulations 2001

[14] Using the government reference of over 20% tree canopy cover

The Forestry Law defines the status of forests in Lao PDR as follows: (1) conservation forests, (2) protection forests, (3) production forests, (4) regeneration forests, and (5) degraded forests. Conservation forests can be designated at the national level (NPA), provincial level (PPA), district level, or village level (ICEM, 2003, p. 47).

The Forestry Law states zonation within NPAs as follows: (1) absolutely prohibited zones (=totally protected zones), (2) management zones (=controlled use zone), and (3) linking zones (=corridors).

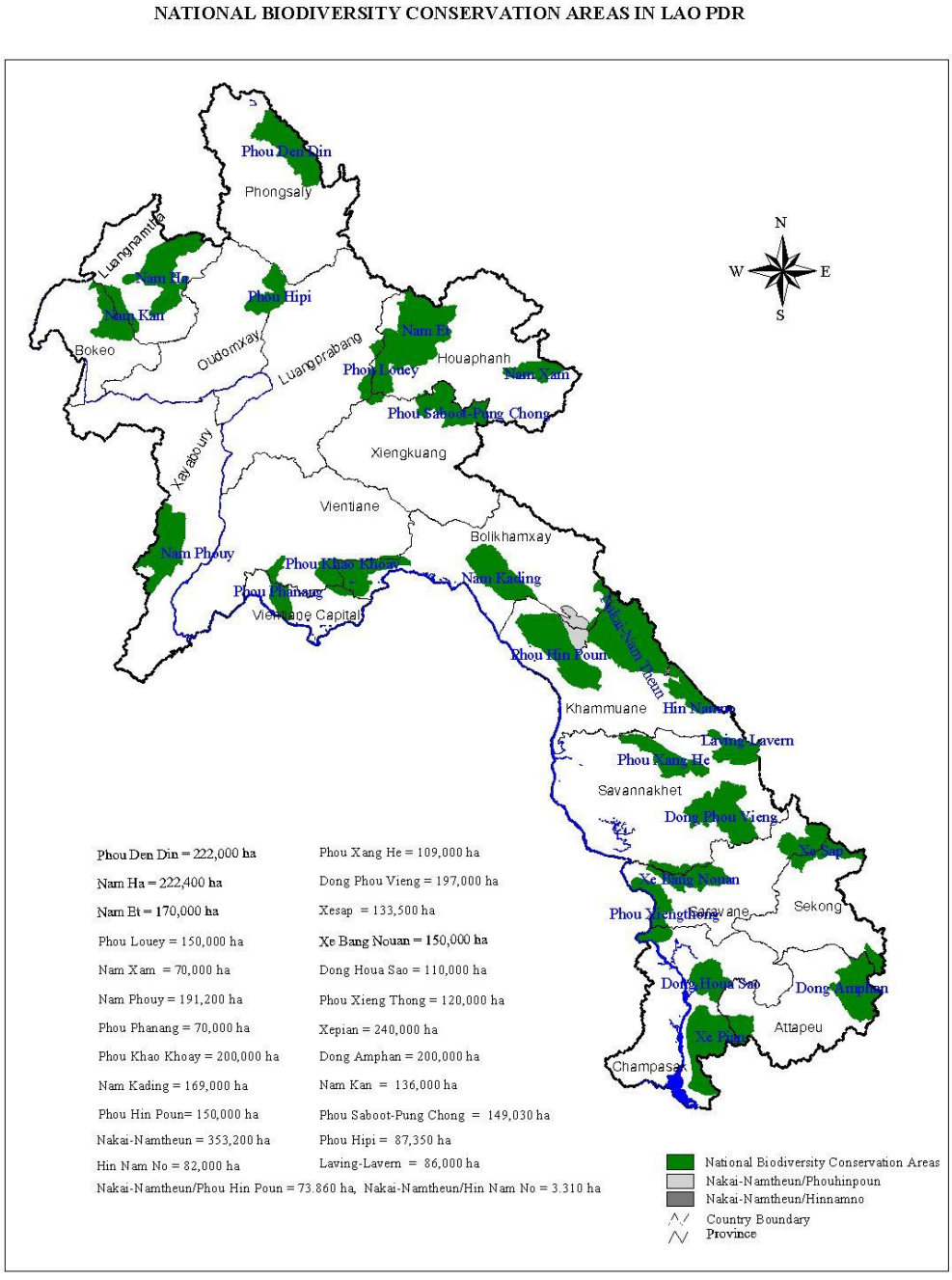
The denomination of protected areas was changed from NBCA to National Protected Areas (NPAs) in 2001. NPAs comprise three main tiers: national, provincial, and district, as well as local (village) (Hedemark, 2003, p. 12).

While another 11 areas had been recommended for protection in 1993 already (Robinson et al., 2003, p. 31), two areas were added in 2001, bringing the number of NPAs to 20 (Vongkhamheng, 2002, p. 25-26). They covered 30,000 km^2, 13% of the total land area of the country. It was estimated that 10% of villages were located within 5 km of an NPA and that "*these protected areas provide a wide range of goods and services upon which local communities are often heavily reliant*" (IUCN, 2001, p. 31).

As of 2005, the country counted 20 NPAs and two corridors, 57 provincial conservation areas, 23 provincial protection forests, 144 district conservation areas, and 52 district protection forests, bringing 5,340,195 ha (22.55% of the land) under some degree of protection (World Bank, 2006, p. 21).

In 2012, Lao PDR counts 24 NPAs and two corridors, covering 3,844,850 ha (38,448.51 km^2), or 15% of the territory (*see following figure*). According to ICEM (2003, p. 14), the government aims at a total coverage of NPAs of 21% in the future.

Figure 3 -- National Protected Area System in Lao PDR



Source: Division of Forest Resource Conservation (DFRC), courtesy of Ms. Renae Stenhouse, the World Bank, 2012.

Despite an extensive cover under NPAs, Hirsch, Phanvilay and Tubtim (1994, p. 32) observed that, "*contrary to common assumption, based on Lao PDR's relatively low population density, there is a substantial pressure on natural resources.*" Boonratana, Sengsavanh and Chounlamounty (2000, p. 22) noted that biodiversity is dwindling at an alarming rate.

Research on Wildlife in Lao PDR

According to Guillén, Francis and Salivong (1997, p. 7), "*the Indomalayan region is one of the richest areas for biological diversity on earth, and can be considered as a natural laboratory for humans to study the evolutionary history of life, including humans themselves.*" The latest status report on wildlife in Lao PDR, compiled in 1999, reviewed 1,140 species (Duckworth, Salter and Khounboline, 1999, p. 32). Faunal surveys and accounts were conducted episodically between 1919 and 1949 (Duckworth, 1995, p. 1) and "*between 1950 and 1989 Laos was closed to research,*" as was reminded by Timmins and Ruggeri (1996). Duckworth (1995, p. 1) put this seclusion on the account of "*a succession of political upheavals and, in the 1970s, restrictions on foreign visitors.*" As a consequence, "*until recently Laos has been one of the biologically least-known countries in the world*" (Timmins and Duckworth, 1999, p. 470). Since the end of the 1980s, extensive faunal surveys were conducted in the country, but remained confined mainly to the southern and central part of the country (Duckworth, 1995, p. 1). In 1997, the same researcher noted that "*information is still very limited on wildlife in Laos north of the 18˚40'N"* (Duckworth, 1997, p. 1).

According to Duckworth (2008, p. 7), "modern" (i.e., post-1980s) information sources pertained to conservation issues for the identification of an NPA system:

- 1988-1991: habitat assessment and village interviews[15] within the forest resources conservation project
- 1991: direct field surveys of large mammals and other biota with the Lao-Swedish Forestry Cooperation Program (LSFCP)
- 1994: direct field surveys supported by several international NGOs in collaboration with the Department of Forestry (DoF)
- independently conducted environmental assessments of hydropower projects

In 1989, the Lao government, with support from the LSFCP and IUCN, launched the first investigations on natural resources and habitats since colonial times. Extensive field research was carried out since the inception of the protected area system in 1988. Villagers were interviewed about wildlife as food providers, pests, and predators (Salter, 1993a, p. 1-2).

[15] By IUCN within the Lao-Swedish Forestry Cooperation Program

The first surveys to assess human pressure on wildlife were incepted in 1992 (Timmins and Ruggeri, 1996).

Between 1992 and 1998, extensive baseline wildlife surveys were conducted on birds, mammals and habitats in existing or future NPAs (Timmins and Duckworth, 1999, p. 471). Such surveys focused on wildlife conservation issues. Areas around villages and degraded forest were least studied because their habitat was not under pressure anymore and wildlife was extirpated already (Duckworth, 1997, p. 1). The last comprehensive wildlife surveys were carried out in 1999, and by 2008, only one NPA (Phou Phanang) had not been surveyed (Duckworth, 2008, p. 7).

Simultaneously, research also revolved around taxonomy, such as the study on diurnal squirrels carried out by Moore and Tate (1985), the status and conservation of species such as primates (Timmins and Ruggeri, 1996; Timmins and Duckworth, 1999), chiropters (Francis and Salivong, 1998a, 1998b, 1998c and 1998d), and viverrids (Duckworth, 1994, p. 1). Duckworth (n.d., p. 1) noticed that until 1992, almost no reliable information had been collected on small carnivores in the country. Duckworth, Timmins and Cozza (1993, p. 12) mention that small mammals such as rodents, shrews, and bats are difficult to identify under field conditions and therefore more emphasis is put on more easily identifiable species (primates and squirrels, among others). Indeed, surveys on bats had been initiated only recently, namely since 1995 (Francis, Khounboline and Aspey, 1996; Guillén, Francis and Salivong, 1997; Francis, Guillén and Vongkhamheng, 1997; Francis and Salivong, 1998a, 1998b, 1998c and 1998d; Francis, Kock and Habersetzer, 1999; Guillén-Servent and Francis, 2006). Chiropters remained among the least-researched mammalian species in what was still called Indochina (Davidson et al., 1997, p. 20). Guillén, Francis and Salivong (1997, p. 7) confirmed that "*knowledge of the Lao bat fauna remains very poor*." Besides bats, insectivore and murine rodents were the least-studied wildlife species by the end of the 1990s (Duckworth, Salter and Khounboline, 1999, p. 32). Francis, Guillén and Vongkhamheng (1997, p. 11) recommended that longer-term studies with focus on small mammals, such as rats and squirrels, should be undertaken in selected NPAs. Rodents were mainly studied in conjunction with rodent outbreaks and their impact on livelihood (Khamphoukeo et al., 2006).

Substantial trade studies were carried out in the 1990s (Martin, 1992; Srikosamatara, Siripholdej and Suteethorn, 1992; Baird, 1993, 1995a and 1995b; Compton and Le Hai Quang, 1998) and early 2000s (Nooren and Claridge, 2001; World Bank, 2005). Trade was then episodically monitored (Bennett and Rao, 2002; TRAFFIC, 2008), more specifically in Vientiane Capital (Hansel, Vannalath and Johnson, 2004; Stenhouse, Vannavong and Hansel, 2006; Stenhouse and Johnson, 2006).

Summary Chapter 3.1: The Lao PDR, Background Information

Lao PDR is a land-linked country of the Indomalayan region and Indochinese sub-region in southeast Asia, with an area of 236,800 km^2. It shares borders with Thailand, Myanmar, China, Vietnam, and Cambodia. The country can be divided into three main physio-geographic areas: the northern highlands, the Annamite mountain range and the Mekong plains. The climate is influenced by the southeast Asian monsoon, with three seasons: dry-cool (4.5 months), dry-hot (2.5 months), and wet (5 months). The country's population is estimated at 6.2 million people and the population growth rate at 1.7%. The forest cover is estimated at 41% and the country comprises 24 National Protected Areas, two corridors, and several provincial and district protection forests. Lao PDR harbors an extremely rich faunal and floral diversity. Research on wildlife in Lao PDR has so far focused on inventorying species and on conservation issues, with an angle focusing on human impact on wildlife rather than the impact of wildlife on humans.

3.2 Wildlife-Human Interactions and the Link with Emerging Zoonoses

Wildlife-human interactions can be scrutinized from two different angles, or from a "twin viewpoint," by looking at: (1) the impact of human on wildlife (i.e., anthropogenic impact), and (2) the impact of wildlife on humans.

While immediate impacts may differ depending on which angle they are looked at, ultimately they are inter-connected and zoonoses may derive from this interaction. Indeed, as assumed by Blasdell et al. (2009, p. 94), "*with changing climates and land use and rapidly increasing globalisation, it is likely that the situation regarding [...] zoonotic viruses will change, resulting in an increase in human infections.*"

Human Impact on Wildlife

In 1996, Claridge and Phanthavong (1996, p. 2) identified four forces exerted by humans on wildlife:

1. Need for protein in the dry season.
2. Harvesting wildlife for sale to generate cash income.
3. Need to pursue sport hunting by communities with sufficient income and time.
4. Habitat destruction by human activities.

Chazée (1990, p. 17) had previously defined warfare, deforestation, slash and burn, hunting, trapping, and encroaching on wildlife habitat as human actions resulting in a modification of the behavior of some wildlife species.

Timmins and Duckworth (1999, p. 482) summarized the three main threats, all human driven, to Douc langurs: (1) subsistence hunting, (2) international trade, and (3) habitat loss. The Ministry of Agriculture and Forestry (MAF) reminds that, "*any human activity which leads to degradation and destruction of habitat also heightens the threat of hunting as an opportunity arising from closer contact between people and gibbons*" (MAF, 2011, p. 14). Physical pressure exerted by humans on wildlife will be discussed in the Chapters 3.5 to 3.16.

The destructive impact of human activities on wildlife goes beyond physical harm (e.g., hunting) and concerns diseases as well. Hasebe and Le Thi Quynh Mai (2007, p. 51) namely remind that, "*zoonoses are diseases and infections which are naturally transmitted from other animals, both wild and domestic, to humans or from humans to animals.*" However, very few information sources could be found on this specific issue in the Lao context. Hansen and Jeppesen (2004, p. 41) found that villagers in Dong Phou Vieng NPA (Savannakhet province) used the forest to quickly isolate healthy chickens during poultry disease outbreaks in the village, a reflex which may trigger outbreaks in jungle fowl populations (and possibly other bird species such as pheasant). Boonratana (1997, p. 20) came across a herd of 12 domestic buffaloes brought by villagers from Ban Muang Thong to a mineral lick in the Nam Phoui NPA (Xayaburi province) "*to prevent them from being infected by parasites that were affecting some buffaloes at Muang Thong.*" Boonratana (1997, p. 34) recommended that all domestic animals kept by army personnel in the Controlled Use Zone and around the Nam Phoui NPA shall be inoculated against major diseases in order to prevent contamination to wild stock.

Boonratana (1998, p. 46) was told by villagers in Ban Na Sampan that several wild pigs were found dead in the forest in January 1997, an event suspected to be caused by an epidemic.

Wildlife Impact on Humans

Wildlife can have a direct physical impact on humans or their activities, such as attacks on domestic animals or humans, as well as raids in crops. These interactions and their impacts are discussed in Chapter 3.14.

Besides such direct impacts, wildlife, including rodents, among others, are a well-known reservoir of harmful pathogens (Begon, 2003, p. 13) which poses a danger to humans. Cumming (2011) broadly defines wildlife-human interface as "…*humans, livestock and wild animals (who) come into contact in ways that can result in the transmission of diseases between them.*" Clifford, Wolking and Muse (2011) define disease transmission as "*a successful transfer or shift of disease pathogens from one sick individual to another, making the other individual sick.*" The same authors summarize the disease-transmission pathways as being direct contacts (e.g., through aerosols, oral contacts) and indirect contacts (e.g., through fomites, vectors, or the environment). Detailed examples of transmission modes can be accessed in Annex 5.

Bochaton (n.d.) states that modifications within the epidemiological environment induce global changes, which, in turn, affect host-pathogen interactions. In other terms, major changes in habitat and diversity lead to new contacts between human (and their domestic animals) and wildlife. This chain of events poses new risks, among others, in terms of zoonotic diseases. A zoonosis is understood as an animal disease which may be transmitted to man under natural conditions (e.g., brucellosis, rabies) (Dorland, n.d.). Bochaton (n.d.) reminds that most emerging or re-emerging infectious diseases are zoonotic diseases. The Food and Agriculture Organisation of the United Nations (FAO) notes that 60% of emerging infectious diseases in humans are zoonotic and since 1940, 70% of these zoonotic diseases have wildlife as their origin (FAO, 2011, p. xi). However, Bochaton (n.d.) observed that, so far, studies on the transmission of infectious diseases concentrated on the use of new molecular tools and epidemiological modelling, but rarely on wildlife-human interface -- that is to say on the relationship between human communities and wild reservoirs. This observation corroborates observations made by Begon (2003, p. 13), according to whom the role of pathogens in population and community ecology has received more attention only recently.

Until recently, few authors highlighted the risk posed by human exposure to wildlife in terms of zoonoses in Lao PDR. Alton and Sylavong (1997, p. V-3) recommended to investigate the reasons behind increased rodent outbreaks in central Lao PDR and highlighted the danger posed by these species in terms of zoonotic diseases (e.g., scrub typhus and plague). Stenhouse (2006, A6, p. 3) highlighted disease spreading as one of the four effects of wildlife trade, besides damaging rural livelihoods, reducing wildlife populations, and weakening environmental functions.

Between 2005 and 2007, staff from the Integrated Ecosystem and Wildlife Management Project (IEWMP) carried out an awareness campaign in Bolikhan, Viengthong, and Pakkading districts surrounding the Nam Kading NPA (Bolikhamxay province). One question asked from villagers, students, and soldiers pertained to the link between diseases (unspecified) and wildlife trade (Hallam and Sisavath, 2007).

According to Hongvanhthong (2011, personal communication), there has been no viral zoonosis outbreak with wildlife as the reservoir in the human population in Lao PDR to date -- or at least it has not been reported and recorded. This statement has been confirmed by several researchers interviewed in the course of the review (Brey, 2011, personal communication; Sengkeopraseuth, 2011, personal communication; Newton, 2011, personal communication; Phommasack, 2011, personal communication). To date, research on human diseases in Lao PDR has revolved around "classical" (non-emerging) diseases, such as research pertaining to infective causes of hepatitis and jaundice syndromes, for instance (Syhavong et al., 2008). According to the Ministry of Health (MoH), Lao PDR exhibits a "*high frequency of food- and vector-borne diseases (such as infection with parasites, malaria or diarrheal diseases)*" (MoH, 2008, p. 8).

Localized epidemics of unknown origin are known to have occurred in Lao PDR (ADB, 2001, p. 112), as illustrated by the following accounts:

- In 1971, an epidemic of unknown origin (suspected to be smallpox or typhoid) devastated the old village of Ban Kou Ne in the Nakai-Nam Theun (NN)-NPA (Alton and Sylavong, 1997, p. AIV-2).
- Ban Phon Keo in Khamkeut district (Bolikhamxay province) was renamed from the old Ban Phon Nyot after an epidemic of unknown origin killed 18 people in 1986 (Alton and Sylavong, 1997, p. B 2-2).
- In Ban Tri, in Sepon district (Savannakhet province), villagers reported that "*there are serious epidemics every year with many deaths. The people flee into the forest to escape, abandoning the bodies*" (ADB, 2001, p. 112). The Asian Development Bank (ADB) participatory poverty assessment team came across such an epidemic, in which 98 villages had been affected and over 100 people had died.

Besides such outbreaks (suspected to be cholera), malaria, dengue, and leprosy were frequent as well (ADB, 2001, p. 112). Human disease outbreaks characterized by non-malarial fever (NMF) are known to occur in Lao PDR, but their occurrence, frequency, and pathogenic origin often remain a "*black-box*" (Brey, 2011, personal communication). According to the National Centre for Laboratory and Epidemiology, 17 diseases[16] are currently under a national surveillance system (Sengkeopraseuth, 2011, personal communication).

To date, research on zoonoses in Lao PDR has focused mainly on bacterial diseases such as leptospirosis (Kawaguchi et al., 2008) and murine typhus (Newton, 2011, personal communication), food-borne parasitic diseases, such as trichinellosis (Barennes et al., 2008), as well as specific viral zoonosis, such as hepatitis E (HEV). Although the main reservoir for such zoonoses might be wildlife (e.g., hepatitis E in rodents in Nepal (Blasdell et al., 2009, p. 94)), they are not necessarily transmitted by wild animals, but can be transmitted by farmed species such as pigs.

Until now, hardly any research has been carried out on infectious diseases transmitted by wildlife to humans in Lao PDR and very few authors have mentioned this issue. Krahn (2005, p. 120) postulated that the contact with feces form civets, muntjac, deer and macaques may be the cause of bacterial and parasitic diseases among *Katu* communities in Sekong province. According to Vansilalom (2011, personal communication), in 2010 a food-borne bacterial disease (salmonellosis) outbreak was reported from Bolikhamxay province to the Food and Drug Department (FDD) of the MoH. The incident was related to wildlife consumption.

[16] Acute flaccid paralysis, fever and rash, tetanus (neonatal and of all ages), diphtheria, pertussis, dengue (without or with signs), severe dengue, acute watery diarrhea, acute bloody diarrhea, food poisoning, typhoid fever, anthrax, acute jaundice syndrome, meningitis, acute encephalitis syndrome, plague, and severe acute respiratory infections (including H5N1).

Other recent food-borne disease outbreaks pertaining to wildlife and reported to the FDD, concerned poisoning by formalin used to preserve wildlife meat, as well as paralysis after consumption of monitor lizards (Vansilalom, 2011, personal communication).

Research on zoonoses specifically transmitted by wildlife has started recently in Lao PDR. In 2006, under its Vientiane Capital City Illegal Wildlife Trade Control Project, WCS carried out training on handling, storage, and disposal of wildlife confiscated at Vientiane markets. The project was envisaged to test animals for zoonotic diseases. Contacts were made with the NAHC and the Tropical Medicine Research at Mahosot International Hospital in Lao PDR and agencies outside the country. The aim was to "*establish the link between wild meat from markets and the presence of zoonoses, and also that wet markets provide a contact point between domestic animals and wild animals, which can facilitate disease spread.*" The Project intended to test ungulates for hepatitis E, lizards for parasites, and birds for highly pathogenic avian influenza (HPAI) and other viruses. The outcome of this research was supposed to serve as a decision basis for government officials to close down wildlife markets. By October 2006, samples had been taken but laboratory testing had not been done by the time the report was written (Stenhouse and Johnson, 2006, p. 3-4).

So far, research on zoonotic pathogens transmitted by wildlife has focused mainly on bacterial (bartonellosis, leptospirosis) and protozoan (babesiosis and toxoplasmosis) rodent diseases in Thailand, Cambodia, and the Lao PDR (Jiyipong, 2009; Ivanova, 2009) within the frame of the CERoPath research network. To date, hantavirus is among the first and few zoonotic viruses with pandemic potential to have been researched in wild animal populations, mainly rodents, in Lao PDR (Blasdell et al., 2009). In 2007, a research project was incepted by the Lao-Oxford-Mahosot Hospital-Wellcome Trust Research Unit with the aim to identify the diversity of microorganisms among hunted wildlife. The field research is carried out in Savannakhet province and blood spots from prey (squirrels/rodents) are collected and sent for investigation to a Global Virus Forecasting Inc. (GVFI) laboratory in Cameroon to examine prey vertebrates for existing or new zoonotic viruses with pandemic potential in Lao PDR (Newton, 2011, personal communication) (see the matrix of programs in Annex B). Broad investigations on viral pathogens hosted by wildlife have recently started within the PREDICT component of the EPT Program (see the matrix of programs in Annex B).

According to Sengkeopraseuth (2011, personal communication), highly pathogenic avian influenza was the only zoonosis with pandemic potential to have affected Lao PDR recently, with two deadly human cases in 2007. Hantavirus is another virus with pandemic potential to have been detected in humans in Lao PDR, as stated by Rollin et al. (1996, cited in Blasdell et al., 2009, p. 96). Sengkeopraseuth (2011, personal communication), however, reports that hantavirus has not caused any outbreak in humans in Lao PDR to date.

Primates as Carriers

Research on viral disease transmission between primates and human has focused on the African context so far. However, some researchers have recently turned their research focus towards the southeast Asian context, where close interactions between primates and humans (temples, menageries, homes, street, markets, and hunting) are known to exist (University of Washington, 2008). During the review, no information on zoonoses relating to primates could be found in the Lao PDR context. Transmission of chigger mites, malaria, and fecal parasites from macaques to humans was documented in Thailand (Malaivijitnond, Gumert and Hamada, 2003, p. 40).

Carnivores as Carriers

According to Schreiber et al. (1989, cited in Johnson, Vongkhamheng, and Saithongdam, 2009, p. 6), "*Laos lies in the second most important core area globally for small carnivore taxa-mustelids and viverrids- of conservation concern.*" *Mustelidae* and *viverridae* are known to be susceptible to common diseases affecting *canidae* (e.g., distemper) and *felidae* (IUCN, n.d., p. 26). Viverrids are known to have played the crucial role of amplification hosts in the SARS outbreak, which struck southeast Asia in 2003 (Lau et al., 2005).

Similarly to primates, no information about viverrids being carriers of zoonotic disease could be found for the Lao PDR context. The only mention of civets in connection with sanitary aspects is the following account of a visit by a veterinarian working for a WCS field program in Lao PDR who was mandated in 1996 to provide care to two recently caught carnivores, a Golden Asian Cat and an Owston's palm civet. The adult male Owston's palm civet, kept alive at Lak Xao wet market, was destined for food. On January 1996, the veterinarian collected a partly engorged female specimen of ticks (*Ixodes ovatus Neumann 1989*). It was the first time that ticks were collected from this carnivore species and the first time that this tick species was identified in Lao PDR. This tick is known to affect humans as well (Robbins et al., 1997, p. 60-62).

Bats as Carriers

According to Bat Conservation International (1996, p. 1), "*contrary to popular misconceptions, bats [...] seldom transmit disease to other animals or humans. All mammals can contract rabies, however, less than one-half of one percent of bats"* do. Almost two decades after this statement was issued, the crucial role of bats as a reservoir of important EIDs has been demonstrated. Gonzales, Bourgarel and Leroy (2010) remind that bats are known to be an important reservoir of diseases with various degrees of infectious and zoonotic potential. They carry a broad spectrum of endoparasites, some with an infectious potential (e.g., trypanosomia), but rarely infect human beings. Similarly, bats are known to host an array of bacteria, which also affect humans (e.g., *salmonella*, *leptospira*, *shigella*, etc.). Direct transmission of bacteria from bats to

humans has, however, not been documented so far. To date, among pathogens hosted by bats, viruses are known to have the greatest zoonotic potential.

Among the approximately 60 viruses that bats can carry, two-thirds are known to have a zoonotic potential (e.g., Lyssa virus, *paramyxoviridae),* or are assumed to have such a potential (e.g., *coronaviridae*, *filoviridae)* (Gonzales, Bourgarel and Leroy, 2010). According to the FAO (2011, p. xii), "*bat-derived zoonotic pathogens such as Nipah and Hendra viruses, SARS-like coronaviruses, the Ebola and Marburg viruses, as well as various rabies-causing Lyssa viruses, have gained notoriety as leading emerging diseases transmitted directly from bats to people, or via intermediate livestock and companion animal hosts, or fomites."*

Rodents as Carriers

According to Milocco (2009), southeast Asia is highly affected by environmental changes and rodents are considered to be an important reservoir of zoonotic diseases. Rodents are involved in the transmission of more than 60 human diseases, which are potentially fatal (CSIRO, n.d.). Aplin et al. (2007, p. 302) remind that "*rodent-borne diseases of major concern in agrarian and urban communities of southeast Asia are leptospirosis, plague, hanta and arena viruses, lymphocytic chorio-meningitis virus (LMCV), typhus and lungworm.*" Between 1995 and 2000, at least 25 new hantaviruses and arena viruses were identified (CSIRO, n.d.).

However, according to Blasdell et al. (2009, p. 94), "*although numerous zoonotic diseases have been identified in southeast Asia in recent years, few have been viral with rodents as their primary hosts.*" So far, among several known zoonotic viruses harbored by rodents as primary hosts, only lymphocytic choriomeningitis virus (LCMV)[17] and various hantavirus species were evidenced in rodents in southeast Asia (Blasdell et al., 2009, p. 95). According to the same authors, no human LCMV clinical cases were encountered in southeast Asia so far. Regarding Hantavirus spp., Hantaan (HTNV), as well as Seoul (SEOV) viruses, were associated with hemorrhagic fever with renal syndrome in humans in the region. HTNV dwells mainly in rodents in rural areas, while SEOV seems to be mainly harbored by domestic rats in urban premises. Blasdell et al. (2009, p. 96) further report that China exhibits approximately half of the human HTNV cases reported worldwide, while China and Korea make up for the bulk of reported SEOV human infections. Cases of hantavirus infection in humans were reported from other countries in the region: Lao PDR, Vietnam, Myanmar, and Indonesia (Blasdell et al., 2009, p. 96). Several hantaviruses were isolated in various rodent species (bandicoot rats, *rattus* spp.), as were *scandentia* spp., in some countries of the region, including Thailand, China, Cambodia, Singapore, Malaysia, and the Philippines (Blasdell et al., 2009, p. 96). According to the same authors, hantaviruses are excreted through rodents' saliva, urine, and feces (ibid, p. 97), and

[17] One of at least 12 Arenavirus spp. affecting humans.

contamination can be either direct or through aerosols spread by the excreta (Kallio et al., 2006, cited in Blasdell et al., 2009, p. 97).

Summary Chapter 3.2: Wildlife-human Interactions and the Link with Emerging Zoonoses

Until now, research on wildlife and human interaction concerned mainly conservation issues. Research focused mainly on the impact of human activities on wildlife (e.g., risk to extirpate wildlife species) rather than on the impact of wildlife on humans (risk of diseases). In terms of public health, research has so far focused on "classical" human diseases with a high prevalence (e.g., malaria, dengue, jaundice syndromes) in the country. Research on zoonosis has been targeted around "classical" zoonoses, mainly bacterial and parasitical ones, such as leptospirosis or trichinellosis, and to some extent viral ones (hepatitis E).

It is only recently, since SARS and HPAI outbreaks affected the region, that the need for research on emerging viral zoonoses with pandemic potential has become more pressing. One study provided evidence that hantavirus is present in humans in Lao PDR. Results of this research are based on serology; no clinical signs of hantavirus were diagnosed in the human population in Lao PDR so far. The literature research, as well as discussions with relevant stakeholders, did not provide any evidence of zoonoses outbreaks in the human population in the country caused by viral pathogens with primates, viverrids, rodents, and bats as primary hosts.

3.3 Institutional Framework of Wildlife Management

Government Bodies Involved in Environmental Policy, Planning and Management

In Lao PDR, various government agencies are more or less closely involved in management of natural resources in general and wildlife in particular. A non-exhaustive list of the main government stakeholders involved in issues pertaining to wildlife-human interactions can be accessed in Annex 6.

Legislation on Wildlife

In the Lao PDR, wildlife is State property and is in theory protected by extensive legislation (Duckworth, Salter and Khounboline, 1999, p. 25). Nooren and Claridge (2001, p. 217) defined at least five levels of legislation pertaining to wildlife: (1) national, (2) province, (3) district, (4) village, and (5) military.

The Lao legislative system (simplified) is depicted in Annex 7. Legislation on wildlife management is relatively recent and has been issued by various bodies in the course of time. A historical account of wildlife legislation is summarized in Annex 8. At present, wildlife is

managed by the Wildlife and Aquatic Law (No. 7/NA), dated 24 December 2007 and issued by the National Assembly. It consists of 74 articles (Annex 9).

Article 10 defines the categories of wildlife and aquatic life as follows:

1. Category I: Prohibition category. Wildlife and aquatic species falling in this category are considered rare and near extinct.
2. Category II: Management category. Wildlife and aquatic species falling in this category are considered to become extinct if management is neglected for preservation in future.
3. Category III: Common or general category. Wildlife and aquatic species falling in this category are ones that do not fall in categories I or II.

The Law does not encompass the detailed content of the three categories. A list of wildlife comprised under each category was issued by a Prime Minister's order in 2008 and was published in Lao language and in hard copy (Vongphet, personal communication, 4 April 2012). In the last status report on wildlife in the Lao PDR published in 1999, 319 out of 1,140 species were of national or global conservation significance: 67% of the large mammals, 53% of the chiropters, 6% of the insectivores, 14% of the murine rodents, 22% of the birds, 25% of the reptiles and 2% of the amphibians (Duckworth, Salter and Khounboline, 1999, p. 32).

More generally, the body of legislation on wildlife also comprises (Hedemark, 2009, p. 2):

1. Laws (forestry and wildlife)
2. Prime Minister's Orders
3. Ministry of Agriculture and Forestry regulations
4. Provincial regulations
5. International agreements

According to WWF (2004, p. 87), legislation on responsibilities pertaining to wildlife comprises two further important pieces of legislation:

1. "Forestry law 164"
2. PM Decree No. 01 on decentralization

Thanks to decentralization, provincial agriculture and forestry offices (PAFO) can issue their own regulations pertaining to wildlife management. PAFOs are allowed to upgrade species from the conservation list, but not degrade them (Baird, 1993, p. 4). Hansen and Jeppesen (2004, p. 47) distinguish between the Forestry Law (MAF 1996) describing customary rights on Non-Timber Forest Products (NTFP) collection and the Prime Minister Decree No. 164 (issued by the

GoL in 1993), which regulates the use of NTFPs in NPAs. According to the same authors, NTFP management is also indirectly governed by the:

- Land Law (dated 1997)
- Agricultural Law (dated 1997)
- Environmental Law (dated 1998)

It was, however, observed that implementation is actually governed by customary laws and managed by district forestry offices and district governors (Hansen and Jeppesen, 2004, p. 47). A more complete list of additional important legal documents can be found in Annex 10.

Theoretical Implementation of Legislation

In the Lao PDR, state administration comprises four main levels: central, provincial, district, and village. At the central level, the overall management of wildlife (general policy and coordination) falls under the Ministry of Agriculture and Forestry, more specifically under two of its departments: the Department of Livestock and Fisheries (DLF) and the Department of Forestry (DoF) through its Division of Forest Resources Conservation (Nash, 1997, p. 4-5). In 2011, the Ministry of Natural Resources and Environment (MoNRE) was created by merging the Water and Environment Resources Agency (WREA) with parts of the National Land Management Authority (NLMA) and the Geology Department, as well as the Protection and Conservation Divisions of the Department of Forestry. The Protection and Conservation Forest Divisions are now housed under a new department, the Department of Forest Resource Management under MoNRE.[18]

Control of wildlife trade used to fall under the Forest Police Force of the DoF, which worked closely with the Ministry of Justice. The Forest Police Force is, however, not entrusted with border trade control. Trade control falls under the National Office of Forest Protection and Management (NOFPM) of the DoF and the Customs Office of the Ministry of Finance. The NOFPM is responsible for domestic checkpoints as well as international border gate checkpoints (Baird, 1993, p. 4). Nowadays, law enforcement on wildlife management falls under the Department of Forest Inspection.

Cross-sector coordination and responsibility for international engagements, for instance the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), used to be ensured by the Science, Technology and Environment Agency (STEA) under the Prime Minister's office. The latter "*acts a general policy executor with the support of various ministries and departments which provide recommendations on broad national issues and*

[18] http://www.theredddesk.org/countries/laos/info/resources/organisations/ministry_of_natural_resource_and_environment_lao_pdr

formulate policies on specific issues within their jurisdiction" (Wangwacharakul, Claridge and Mather, 1996, p. 11). In November 2011, the STEA was moved to the newly created MoNRE (Sundara, 2011, personal communication).

Agencies responsible for the enforcement of the legislative measures are PAFOs at the provincial level, district agricultural and forestry offices (DAFO) at the district level, and villages at the local level (Duckworth, Salter and Khounboline, 1999, p. 26; Nash, 1997, p. 4; IUCN, 1997, p. 8; Hansen and Jeppesen, 2004, p. 48). Hansen and Jeppesen (2004, p. 49) describe in detail how the legislation is passed to villagers in "*a top down approach, where national forestry related regulations (including regulations on NFTP) decided in the Department of Forestry and the Ministry of Agriculture (MAF) are handed over to PAFOs, which decide which regulations are relevant to implement in their province. The relevant regulations are then handed over to DAFOs, which are responsible for explaining [to] local villagers the purpose of the regulations. This is normally done by handing over a written note about regulations to the village chief. The village chief is responsible for the implementation at [the] local level, which is normally done by reading the note in a village meeting.*" The formal management structure at the village level is composed of the village committee (*khana baan*), which elects the village chief and the elders' council (*naew hoom*), which counsels the village committee. The village committee implements both formal decisions passed from the district, as well as customary laws (Hirsch, Phanvilay and Tubtim, 1994, p. 10).

Law Enforcement and General Wildlife Management

TRAFFIC (2008, p. 64) notes that *"enforcement and broader governance were critical factors determining the effectiveness of legislation and regulations [...] rather than the presence of laws and regulations per se.*" Hansen and Jeppesen (2004, p. 49) observed a discrepancy between the top-down theoretical management approach and the grassroots actual management at the village level. Moreover, the management approach does not exhibit any feedback mechanism from the actual implementation to legislating bodies. ADB (2008, p. 17) observed that "*the national hunting and wildlife trading laws, currently so widely flouted that most quarry species of mammal approach ecological extinction, need effective enforcement.*"

Lack of enforcement was imputed to inconsistencies within and across national and provincial laws and decisions regulating wildlife (FMCP, 2000, p. 58), as well as a series of factors such as (ibid, p. 59):

- Inadequate management resources
- Lack of prioritization
- Inadequate and contradictory legislation
- Lack of full knowledge of relevant laws
- Lack of training in law enforcement

- Lack of adequate legal power for protected area management staff
- Impression among management staff that there is a lack of will at higher levels to see conservation laws enforced

Srikosamatara, Siripholdej and Suteethorn (1992, p. 36) observed that wildlife conservation was rendered complicated by ethnic issues: law promulgation and enforcement is in the hands of the non-hunting *Lao Loum*, while hunting is done by other groups. Nash (1997, p. 8) encountered similar problems and noticed that the enforcement of regulations on wildlife hunting and trade is hampered by communication issues between the government and local communities (i.e., language barrier). According to him, hunters and villagers are unlikely to follow new regulations for cultural and economic reasons. Hansen and Jeppesen (2004, p. 49) encountered similar issues in *Katang* villages, in which support given by the district to NTFP management was constrained by cultural and language barriers. They observed that "*the intensity of State involvement in NTFP management is insignificant […] and local villagers are de facto managers of NTFP resources*" (ibid, p. 49). The same authors highlighted how this approach can result in conflicting implementation, shown in Table 4.

Table 4 -- Example of Conflicting Formal and Customary Laws on Wildlife

State Law	Traditional Law	Practical Outcome
Possession and trade of 94 wildlife species is illegal (MAF Reg. 0360)	With small local modifications (taboos in sacred forests), all wildlife can be hunted	Villagers do not know exactly which species they can and cannot hunt. The law is rarely enforced

Source: Hansen and Jeppesen (2004, p. 57).

Hansen and Jeppesen (2004, p. 57) concluded that while traditional use rights and regulations may prove sufficient to regulate subsistence harvesting of NTFPs, their capability to control commercial harvesting under growing pressure is doubtful.

Hedemark et al. (2006, p. 20) illustrate how the law was interpreted in Khamkeut district (Bolikhamxay province), with villages establishing their own rules on wildlife conservation and hunting. In Ban Nong Kok, hunting with guns was prohibited and perpetrators were fined 300,000 to 500,000 Lao Kip (LAK). In Ban Keng Bid, hunting with guns and explosives was prohibited and those contravening the law were fined 500,000 LAK and jailed for three months (Hedemark et al., 2006, p. 24). Villagers are, however, often not aware or do not really care about legislation pertaining to wildlife hunting and trade (FMCP, 2000, p. 64). Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 32) observed that villagers in Attapeu province were not aware of the latest Decree and thought that hunting of all species for subsistence was still allowed, while trade was not. The same authors also observed that provincial officials carried out awareness campaigns on hunting seasons, emphasizing that it is forbidden to hunt

during the breeding season between May 1 and October 31. However, after such campaigns, some villagers thought that hunting is illegal throughout the year (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 32).

In Houa Phanh province, Schlemmer (1999, p. 39) observed that awareness of official hunting regulations (pertaining to species, gender, seasonality, and habitat) varied greatly among villagers.

While people were aware of hunting bans of large species[19] such as tiger, bear, elephant, *bovidae* and some deer species, their perception regarding protected medium- and small-sized mammals differed. Moreover, villagers did not agree on the inception of enforcement of hunting bans. While for some people hunting bans started in 1980, for others it started 15 years later. Similarly, some villagers mentioned different inception periods for different species. From these discrepancies, Schlemmer (1999, p. 39) concluded that villagers (as well as district and provincial authorities) are not necessarily aware of regulations and that their enforcement is loosely managed. De Beer et al. (1994, p. 22-23) had previously observed four main reasons why a strict enforcement of law was difficult for villagers:

- Tradition: villagers were used to hunting opportunistically
- Lack of awareness on the species covered by the different restrictions and bans
- Use of non-selective traps, leading to the death of protected species
- Reluctance to obey authorities who themselves practice hunting

IUCN (1999, p. 58) recommended that in face of the "*many ambiguities in the laws and a lack of established mechanisms for implementing regulations, effective conservation must rely heavily upon a strong relationship with the villagers.*"

In addition to implementation constraints at the village level, Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 32) observed that government officials accept various degrees of law enforcement, as they are themselves consumers of wildlife products. Government officials would consider trade of large volumes of wildlife as illegal, while small volumes would be tolerated (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 32). A PAFO cadre in Oudomxay province told Nooren and Claridge (2001, p. 133) in 1999 that not all forestry personnel at the district and provincial levels may be aware of the laws relating to wildlife trade.

Management of NPAs

By 1995, Lao PDR was said to have "*one of the most impressive systems of protected areas in southeast Asia*" (WCS, 1995b). However, WCS (1996a, p. 15) highlighted the fact that

[19] According to WCS (1996a, p.2), large mammals means "basically those identifiable in the field without capture."

"*although protected areas and wildlife legislation exist on paper, Lao PDR lacks the financial resources and the technical background needed to implement protection.*" The management structure of NPAs can be accessed in Annex 11.

According to Showler, Davidson, Salivong and Khounboline (1998, p. 43), "*the level of enforcement of the legislation varies considerably in different parts of the country*." They found it to be particularly low in and around the Nam Xam NPA in Houa Phanh province.

More generally, law enforcement on hunting and wildlife trade was found to be "*extremely low*" in and around all NPAs (FMCP, 2000, p. 59). According to the IUCN (1999, p. 65), there were no effective regulations pertaining to the use of natural resources within NPAs.

Boonratana, Sengsavanh and Chounlamounty (2000, p. 22) recognized the fact that "*setting aside areas for protection in the Lao PDR has done very little for biodiversity conservation and habitat protection in the country, as almost all these areas receive little or no active management or in most cases management has been hampered by bureaucratic and political issues.*" According to ADB (2008, p. 12) "*political commitment to NPA system at all levels is inadequate to support the NPA staff.*"

Steinmetz and Baird (1998, cited in WWF, 1998c, p. 45) remind that "*the policy of the Lao Government, as well as protected area management experiences from the region, dictate that local people both inside the protected area and resource users outside, must be involved as partners in the conservation and management of the NPA.*" In Nakai-Nam Theun, the collaborative efforts between DAFOs and NPA staff resulted in two guidelines: Village Conservation Monitoring Units (VCMU) guidelines and village/land-use agreements. VCMU guidelines draw upon the Forestry Law, but were discussed with villagers (IUCN, 1999, p. 65).

Schlemmer (1999, p. 39) reminds that for most villagers, for whom the only messages about ecology are passed through religious messages, environmental protection remains a largely abstract concept. Southammakoth (1998, p. 43) assessed that villagers in the Phou Xieng Thong NPA preferred a combination of local people and protected area (PA) authorities to be in charge of forest resource conservation, rather than a single authority (i.e., PA alone, villagers alone, or district authorities alone).

Hunting Bans

Schlemmer (1999, p. 41) observed that under pressure of the conservation lobbies, hunting bans tended to be radical (e.g., prohibiting all large mammals species) and therefore bore the danger to be contravened. He observed that partial limitations such as hunting bans during reproduction periods tended to be more respected by villagers. In Viengthong district (Houa Phanh province),

villagers observed that hunting bans resulted in a stabilization or even an increase of large-mammal populations, but a decline in small-mammal populations (Schlemmer, 1999, p. 42).

Alton and Sylavong (1997, p. AII-8) found that bans on wildlife hunting and trade in the NN-NPA induced a reluctance in villagers to mention their wildlife consumption and trade, although these practices obviously existed. In few cases, hunting bans seemed to have been decided by villages themselves rather than by higher authorities.

This was the case of Ban Phon Keo in Khamkeut district (Bolikhamxay province), which, together with three other *Liha* villages[20] and two *Phong* villages,[21] agreed on a hunting ban with guns. Penalties for infringers comprised firearm confiscation, 5,000 LAK for a first infringement, 10,000 LAK for a second one, and a summons to the village council for a third one. Birds and small mammals such as civets, rats, and squirrels were, however, still caught (Alton and Sylavong, 1997, p. B 11-12). Duckworth (1996, p. 229-230) was told by villagers in Sangthong district (Vientiane province) that they did not hunt gibbons as they were scared of the heavy fines if caught. He acknowledged that "*the existence of some communities heeding wildlife law*" was "*very rare in Laos*" (ibid, p. 239).

Chamberlain, Alton, Silavong and Philavong (1996, p. 37) were told by villagers on the Nakai Plateau that hunting bans had alleviated some of the pressure exerted on wildlife. The authors were, however, not totally convinced about these assertions. Chamberlain, Alton and Silavong (1996, p. 58) found that hunting bans may not have resulted in less hunting, but made villagers more reluctant "*to discuss the topic*." Indeed, Panthavong, Sisomphane and Poulsen (2005) noted how villagers were reluctant to discuss wildlife hunting with outside authorities, even though they have a right to hunt for subsistence. The same authors observed from previous work in NPAs that open discussions between villagers and authorities can occur only after years of trust building.

Weapon Confiscation Campaigns

Weapon confiscation campaigns have been regularly carried out throughout the country in conjunction with hunting bans. Provincial authorities in Attapeu province imposed a province-wide hunting ban in 1995 and subsequently confiscated firearms. This resulted, among other things, in higher confrontation with wildlife considered as pests (e.g., porcupines) (Davidson et al., 1997, p. 74). Another impact of gun confiscation in Attapeu was the increased use of "*the less efficient methods of traps and crossbows*" (ADB, 2001, p. 106). Similar effects of gun confiscation in Champassak and in Savannakhet were reported as well (ADB, 2001, p. 106). In the latter province, villagers reported that gun confiscation resulted in an increase in monkeys,

[20] Ban Phon Ngam, Ban Boung Ngam and Ban Na Meuang.

[21] Ban Am and Ban Mai Mon.

wild pigs, and deer, which "*must now be hunted by trapping and crossbow*" (ADB, 2001, p. 106). In the Phou Xang He NPA (Savannakhet province) guns were confiscated, but numerous muzzle-loading guns remained stashed in the forest and government-distributed weapons were widely used for hunting purposes (Boonratana, 1998, p. 66).

Firearms were confiscated in the NNT- NPA, but guns retained by the village militia were used for hunting purposes (IUCN, 1999, p. 20). Between 1997 and 1998, over 9,000 firearms were seized in Gnomalath and Nakai districts (Khammouane province) and Khamkeut district (Bolikhamxay province) (IUCN, 1999, p. 80) (Annex 12). Steinmetz (1998c, p. 7) was told by villagers that "*hunting, previously done at a limited scale, had practically ceased since Nakai authorities collected guns earlier in 1998*." In Dong Khanthung PPA, guns were regularly seized by the police and hunters used other means to hunt (e.g., fence snaring, trapping) (Round, 1998, p. 125). In Phin district (Savannakhet province), district authorities seized muskets from most villages in and around the Dong Phou Vieng NPA, while in other districts, arms were not confiscated (Steinmetz and Baird, 1998, cited in WWF, 1998c, p. 45).

In Ban Houay Leuk (Pakkading district, Bolikhamxay province), villagers handed over their guns during a district gun collecting campaign and subsequently used snares (Hedemark et al., 2006, p. 39). In the Xe Pian NPA, gun confiscation was thought to have resulted in less hunting of gibbons (FMCP, 2000, p. 20). A few years later, Bezuijen et al. (2007, p. 227), however, encountered firearms in the same NPA in all villages they surveyed. Any decline in daytime shooting was thought to have alleviated pressure on diurnal species, such as gibbons. The pressure may have not been alleviated on nocturnal and ground species, as night shooting and snaring continued (Duckworth, 2008, p. 26). Duckworth, Robichaud and Eve (2005, p. 45) observed that the GoL successfully managed to reduce the number of arms in circulation. Simultaneously they observed that in urban areas, children make lesser use of catapults to kill shrews and squirrels.

Hansen and Jeppesen (2004, p. 69) were told that a conflict arose after a gun confiscation raid remained uncompensated in Nyang village in the Dong Phou Vieng NPA. As a result villagers were reluctant to openly talk about hunting and wildlife trade. In Luang Namtha province, villagers of the *Tai Dam* community reported a decrease in hunting after a "*gun handover*." They, however, reported that villagers from *Akha* communities resumed hunting (Hedemark and Vongsak, 2002, p. 11). In some provinces, such as Phongsaly, firearms largely remained in civilian hands (Duckworth, 2008, p. 26). Boonratana, Sengsavanh and Chounlamounty (2000, p. 26) suggested that guns other than those belonging to the militia should be handed over to provincial authorities, and simultaneously the militia should restrict the use of their guns to security enforcement and refrain from hunting.

Schlemmer (1999, p. 34) viewed this campaign, intended to collect muskets as well as war weapons, as a means for the government to disarm previously belligerent communities, rather than to control wildlife hunting, as the same authorities simultaneously issued more powerful arms to militia.

Other Means to Control Wildlife Hunting and Trade

According to Hedemark (2009, p. 1), three main measures have been put in place to enforce interdictions encompassed in the wildlife law:

1. Road checkpoints team
2. Village and urban market patrols
3. Forest-based patrols

Table 5 -- Staffing of Checkpoint, Market and Forest Patrols

Patrol Team Members	Road Checkpoint	Market Patrols	Forest Patrols and Sub-station
DAFO	x	X	xx
Police	x	X	
Finance	x	X	
Commerce	x	X	
Village			x
Military			xxx

Source: Hedemark (2009, p. 1).

Road Checkpoints

Road checkpoints are situated along major roads and their staff inspects vehicles. They can be permanent or mobile and are manned by at least four staff representing the authority of each line ministry. Wildlife transported without authorizations across provinces is confiscated. Such checkpoints were supported by WCS in Nam Et-Phou Loey (three mobile) and Nam Kading (fixed) (Hedemark, 2009, p. 1). According to Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 15) staff at the road checkpoint between Attapeu provincial town and Sanamxay district do not check private, government, and project cars.

Forest Patrolling

Nash and Broad (1993, p. 21) recognize that monitoring illegal cross-border trade by patrolling along the border is difficult owing to the large area, long borders with neighboring countries, and terrain configuration. However, IUCN (1999, p. 67) found that joint border patrols comprising provincial border police, district police, district army and/or NPA staff were more effective in

controlling wildlife poaching within the NNT-NPA than any of these agencies alone. VCMU members in Ban Makgeuand told Bezuijen, Johnson, Johnston and Robichaud (2005, p. 3) that they did not have the power to arrest infringers themselves and thus they did not proceed to confiscation, arrest, or fining.

Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 31-32) were told that stricter rules and penalties, vehicle control at checkpoints and gun confiscation campaigns in Attapeu province were reported by villagers, traders and government officials to have resulted in less hunting and lower trade. Other stakeholders, however, reported that government officials contribute to the local wildlife trade by being consumers themselves and often release confiscated animals (if alive) without fining traders who are caught. In the Nam Phoui NPA, patrolling by the local NPA team was found to be rather efficient and hunters of gibbons were fined 4 million LAK. The NPA staff worked in collaboration with villagers who reported illegal activities occurring in the NPA (Phiapalath and Saisavanh, 2010, p. 17).

Village and Urban Wet Market Patrols and Wildlife Confiscation Campaigns

Under the Vientiane Capital City Illegal Wildlife Trade Project incepted in 2002, routine and response patrolling at wet markets, bus stations, and Wattay Airport were conducted in five districts of the Capital[22] by joint patrol teams of the Illegal Wildlife Trade Control Committee. At the beginning of the project, each district patrol team consisted of seven staff as follows:

- from the Forestry Department: to enact the Forestry Law
- from the Commerce and Finance Department: to cancel a market or restaurant license for operation
- from the Police: to enforce overall

Patrolling was done once a week at 18 markets, 30 restaurants, and one bus station (Stenhouse, 2006, p. 16). Warnings were issued, wildlife was seized, live animals were either euthanized or released in the Ban Keun Zoo, and wildlife burning ceremonies were organized for confiscated carcasses, meat, and body parts (Hansel, Vannalath and Johnson, 2004, p. 10-11; Stenhouse, Vannavong and Hansel, 2006, p. 5-8; Stenhouse and Johnson, 2006; Stenhouse, 2006, p. 17). Small mammals usually made up the bulk of confiscated wildlife (Stenhouse, 2006, p. 17).

It was observed that while some wet market vendors stopped their illegal activities, others went underground (Hansel, Vannalath and Johnson, 2004, p. 9). Undercover monitoring carried out in five key markets by project staff between the 2005 and 2006 patrol sessions and after the 2006 session showed that the number of stalls selling wildlife diminished from 190 in 2005 to 117 in 2006. The number of species seen decreased from 54 to 44 (Stenhouse, Vannavong and Hansel,

[22] Sisattanak, Chanthabouly, Sikothabong, Xaysetha and Xaythany.

2006, p. 9). Small vendors were deterred by fines, while larger traders went underground (Stenhouse, Vannavong and Hansel, 2006, p. 10). There are no fines for wildlife valued at less than five dollars (USD), but a warning is issued. For a value above this sum, infringers were fined double the amount of the value of wildlife sold. In both cases, wildlife was confiscated.

Large traders can be jailed, but are not sentenced by a court, as wildlife trade is not considered a crime (Stenhouse, 2006, p. 16-17). Seventy percent of the fines go to the government and the remaining 30% go towards informant and patrol team costs (Stenhouse, 2006, p. 56). When response patrols are activated upon tips given by informants, they can obtain a search warrant and inspect premises. Fines are given, wildlife is confiscated, and arrests are made (Stenhouse, 2006, A6, p. 4).

Since Phase 4, a memorandum of understanding has been signed between WCS and the Vientiane Capital PAFO in order to facilitate activities. The project is currently under Phase 5 and is still carried out with the DAFOs of the five aforementioned districts. However, only two agencies are now involved in patrolling teams: forestry officers and the forest inspection division (with newly established law enforcement responsibilities). Since July 2011 and the inception of Phase 5, 12 patrols were carried out from September 2011 to February 2012.

Whereas patrols used to be conducted daily under previous phases, they are now conducted once a week, in a less-routine way, so that retailers can be caught off guard (Bounnak, 2012, personal communication).

Trans-border Conservation Initiatives

Wildlife cross-border trade was addressed by a project[23] based in Vietnam and launched in 1996 with the aim of promoting bilateral conservation cooperation between Vietnam and Lao PDR (IUCN, 1997, p. 46).

International Treaties

The Lao PDR is signatory of several international treaties and conventions pertaining to environmental protection in general (ICEM, 2003, p. 53). Lao PDR joined CITES on May 30, 2004 (Hoang Quoc Dung, n.d., p. 5) and in 2005, it signed to the ASEAN Regional Action Plan in Trade of Wild Fauna and Flora (2005-2010) in Thailand (Stenhouse, 2006, p. 16). Since 1996, Lao PDR has become signatory to the Convention on Biological Diversity (CBD) and as such is

[23] Transborder biodiversity conservation project (RAS/93/102)

under obligation to stop illegal wildlife trade (Stenhouse, 2006, A6, p. 3). The country has also been a member of the Ramsar Convention on Wetlands since 28 September 2010.[24]

Summary Chapter 3.3: Institutional Framework of Wildlife Management in Lao PDR

In Lao PDR, wildlife is State property and is legally managed under the auspices of the Wildlife and Aquatic Law (No. 7/NA), dated 24 December 2007, promulgated by the National Assembly. The law comprises 74 articles and defines prohibited, managed, and common categories of wildlife pertaining to hunting, keeping, exhibiting, and farming. Theoretical law implementation is carried out in a decentralized way from the central level to the provincial and district levels, down to the village level – with the latter being the actual implementer of the law. Over the years, an erratic implementation of the law was noted by several observers. The main reasons evoked were: confusing legal body, decentralized management, communication issues, governance issues, acceptance by villagers, customary rights and rules at the village level, and taboos.

3.4 Wildlife Harvesting Versus Wildlife Extraction

Wildlife is technically a part of a large array of NTFPs. The aggregate annual value of NTFPs was estimated to exceed 20% of the country's GDP in 2001 (Robichaud, Marsh, Southammakoth and Kounthikoumanne, 2001 cited in WWF, 2004, p. 87).

Harvesting wildlife "*has formed an important occupation of the village populations for ages, providing a most essential part of the rural diet*" (De Beer et al., 1994, p. 22-23). For some communities of Sekong province, wildlife was "*the single most important NTFP for subsistence use*" (De Beer et al., 1994, p. 33). Wildlife has been such a crucial resource for rural communities, so that hunting intertwines with the cultural and historical background of some populations. This is the case of the *Khmu*, who recall owing their existence to the prophecy of a bamboo rat, which was dug out of its hole by a brother and a sister harvesting food into the forest (Simana and Preisig, 1997, p. 11).

Hunting is so widespread that it even allowed people to "discover" species hardly ever or never observed in their natural habitat by experts. Tizard (1996, p. 28) for instance found evidence of

[24] http://www.ramsar.org/cda/en/ramsar-pubs-annolist-anno-lao/main/ramsar/1-30-168%5E25050_4000_0__ (last accessed 1 March 2011).

the hoary bamboo rat (*rhizomys pruinosus*) in the wild only after having sighted specimens in market stalls or in captivity at private homes.

According to Salter (1993a, p. 4), De Beer et al. (1994, p. 23), Davidson et al. (1997, p. 73) and Grieser Johns (2008, p. 60), harvesting of wildlife serves two distinct purposes: subsistence and commercial (for cash). For Davidson et al. (1997, p. 73) subsistence hunting serves the purpose of protein supplementation and protection against depredation on crops and livestock, while for Grieser Johns (2008, p. 60), subsistence hunting serves nutritional, medicinal, and ritual purposes. According to Grieser Johns (2008, p. 60), while in the past hunting mainly served subsistence purposes, nowadays it is oriented mainly towards commercial ones. De Beer et al. (1994, p. 24) observed that previously, only surplus wildlife used to be commercialized. Robichaud and Stuart (1999, p. 54) distinguish between:

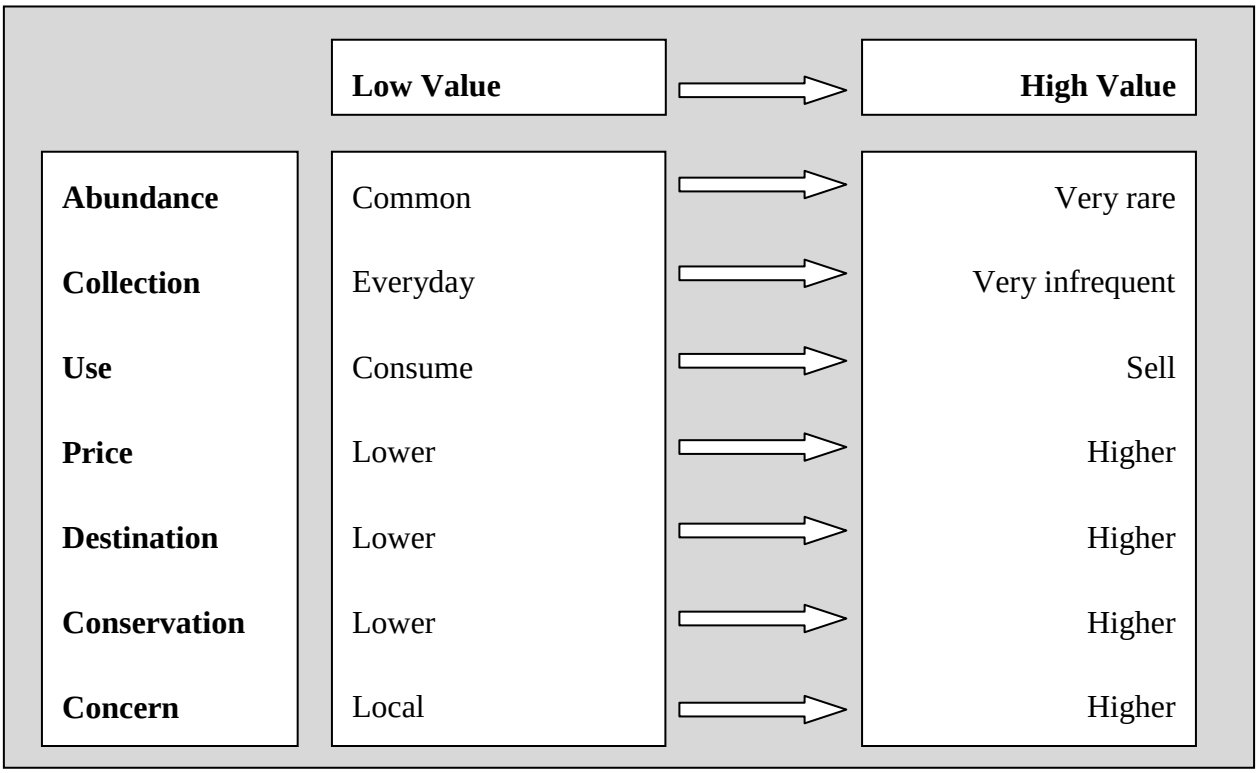
- Wildlife extraction by local people for their subsistence or for sale at local markets;
- Wildlife extraction by local people for trade to foreign networks; and
- Wildlife extraction by foreign poachers.

Until now, species collected from the wild have been commonly used in daily life for subsistence purposes, as well as cash-earning commodities (IUCN, 1997, p. 6; IUCN, 1999, p. 74; FMCP, 2000, p. 90; Ikeguchi et al. 2007, p. 48).

FMCP (2000, p. 90) considers local trading "*as subsistence because it supplies a portion of local animal protein requirements and has limited market at any particular time."*

Between both extremes (wildlife harvesting and wildlife extraction), many species are considered by villagers as important contributors to the local economy (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 41). These species exhibit the following characteristics: medium value, wide availability, and sustained market demand. These resources are considered crucial contributors to villagers' livelihoods. Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 41) also viewed that a resource may move along the value scale depending on prevailing economic, ecological, and social factors. Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 41) sketched a general pattern of resource trade as follows:

Figure 4 -- Characteristics of Resources Along the Value Scale from Low- to High-Value



Source: Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 41).

In a recent study carried out in Cambodia, Indonesia, the Lao PDR, and Vietnam,[25] TRAFFIC (2008, p. 26) sketched out a common, general profile of wildlife harvesters. Wildlife harvesting is mostly carried out by adult males[26] in a planned rather than opportunistic manner, and for cash rather than for sales of household surplus. Harvesting for other purposes (e.g., recreational, cultural, and pest eradication) played a negligible role. A third of respondents mentioned a year-round harvest, another third reported a seasonal harvest, and the last third mentioned an opportunistic harvest to cope with emergency situations.

Summary Chapter 3.4: Harvesting Versus Extracting

Wildlife is part of non-timber forest products, the latter accounting for an important proportion (20%) of the annual GDP. A distinction is made between harvesting resources (including wildlife) for subsistence consumption and extracting resources, mainly intended as a way to trade for cash. This distinction is ultimately reflected in the value, prices, availability of species, destination, and conservation of species of concern.

[25] Vietnam, Lao PDR, Cambodia, Indonesia.
[26] 20% of harvesting is done by females, 10% by children.

3.5 Subsistence Hunting (Harvesting)

Importance

Nash (1997, p. 1) reminds that previously, wildlife in the Lao PDR was "*primarily a locally consumable resource, mainly as food, and to a much lesser degree, as ingredients in traditional medicine formulations.*" Hunting is a tradition (Chape, 1996, p. 16) to such an extent that "*almost any vertebrate larger than a small passerine bird is taken whenever an opportunity arises*" (Duckworth, 2008, p. 24). In the Dong Phou Vieng NPA in 1998, "*local people felt that their own subsistence hunting was responsible for the decline in reptiles, some primates, and some squirrel species*" (Steinmetz and Baird, 1998). Hunting is often carried out opportunistically, as described by Simana and Preisig (1997, p. 17): *in the morning or in the evening, they* [fathers and older boys] *take their gun and go for a stroll in order to shoot some animal they may happen to meet. We* [the *Khmu*] *call this going for a stroll in the forest, but the actual meaning is going hunting with a shotgun of some kind.*" For Southammakoth (1998, p. 34) "*opportunistic hunting occurs when people enter the forest to undertake other activities, such as logging, cultivation, fishing or merely travel to other villages.*"

According to the Ministry of Commerce and IUCN (MoC and IUCN, 2000, p. 27), opportunistic hunting is "*an attempt (often successful) made to shoot or catch virtually every bird, mammal, amphibian and reptile which is seen.*"

According to Davidson et al. (1997, p. 74), subsistence hunting may be both "*opportunistic and species-specific."* In the former case, individual or groups of hunters happen to shoot whatever they encounter, while in the latter case they may be on the lookout for targeted species. Groups of hunters would go for trips of one to two days to look specifically for primates (Davidson et al., 1997 cited in Duckworth, 2008, p. 25). The prevalence of opportunistic hunting in Lao PDR is reportedly high, owing to the fact that villagers always carry guns with them (Davidson et al., 1997, p. 74). This confirms earlier observations made by Timmins (1997, p. 15) and Timmins, Evans and Duckworth (1993a, p. 24). The latter authors noticed a high level of opportunistic shooting with guns for small mammals (e.g., squirrels) and birds around villages. Payne, Bernazzani and Duckworth (1995, p. 35) noticed that fishermen and *mai dam* collectors who met in the Phou Khao Khouay NPA during a survey were equipped with firearms and hunted opportunistically. Opportunistic hunting also was reported to be high with fishermen and NTFP (*het phor* mushrooms and yang oil) collectors in Attapeu province (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 25).

Traditionally hunting was one of the subsistence pillars together with agriculture, fishing, and NTFP collection (Robichaud, 2005, p. 19) and was not aimed at surplus accumulation and cash

generation (Chamberlain, Alton, Silavong and Philavong, 1996, p. 35). Timmins, Evans and Duckworth (1993a, p. 24) noticed that hunting for subsistence was predominant at the beginning of the 1990s and that commercialization was opportunistic and concerned surplus. They, however, simultaneously observed that some species were already targeted for cash generation. WCS (1996a, p. ii) emphasized that "*hunting is not exclusively for subsistence*" and that "*rather, hunting occurs in order to supplement income, because the taste of wild meat is preferred and because hunting is enjoyable and constitutes part of the cultural identity of Lao people inhabiting within forests*," a view shared by IUCN (1997, p. 7), which observed that hunting is *"driven by deeply ingrained cultural traditions and by high prices for some market species.*" IUCN (1997, p. 44) observed that subsistence hunting served nutrition, crop protection, and cash-generating purposes. With the transition to the market economy in the mid-1980s, hunting became more commercialized, as did other traditional activities (ibid), and increased hunting could not be imputed to a higher local consumption (Anon., n.d.). WCS (1995c, p. 34) noticed that "*wildlife hunting in Lao is often not performed to meet subsistence food needs*" and further observed that wildlife was increasingly considered as a delicacy and as such sold to well-off urban consumers. Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 25) confirm that "*although the relative importance of wildlife to overall livelihoods was not assessed, it appears that it is most significant for exchange and income generation rather than meeting direct subsistence or food security needs.*"

The same authors highlighted the fact that evolving market demand changed hunting and consumption patterns.

Stakeholders

Cultural habits may strongly differ between populations across different groups -- and even within the same group. This is shown by Chamberlain's cultural typology of Vietic groups in Lao PDR (1997, p. I-8):

Table 6 -- Cultural Typology of Vietic Groups in Lao PDR in Relation to Natural Resources

	Eco-spatial Type	Vietic Group
I	Small group foraging nomads	*Atel, Themarou, Mlengbrou, (Cheut?)*
II	Originally collectors and traders who have become sedentary swidden cultivators	*Arao, Maleng, Malang, Makang, To'e, Ahoe, Phóng*
III	Swidden cultivators who move every 2-3 years between pre-existing village sites	*Kri*
IV	Combined swidden and paddy sedentary cultivators	*Ahao, Ahlao, Liha, Phong (Cham), Toum*

Source: Chamberlain (1997, p. I-8).

IUCN (1997, p. 36) reminds that until recently certain Vietic populations were "*nomadic in nature [...] to seek game, fish and forest products for food, fibre and shelter."* In the NN-NPA, "*the original Vietic populations probably cultivated only a few swidden plots, mostly corn, relying primarily on hunting and gathering*" (Chamberlain, 1997, p. I-11). In 1997, three populations of 'hunter-gatherers' belonging to the Vietic group (*Atel, Themarou, Mlengbrou*) were still encountered in the NN-NPA, while one, the *M'labri*, belonging to another Austro-Asiatic branch was still found in Xayaburi province (Chamberlain, 1997, p. III-4). Although people of the three Vietic hunter-gatherer groups settled in the late 1990s, they still mostly relied (up to 90%) on forest resources to cover their daily subsistence needs for food, shelter, clothing, and utensils (Alton and Sylavong, 1997, p. II-6). Chamberlain (1997, p. I-9) estimated that such populations preferred to keep their hunter-gatherer lifestyle, although they were "*perfectly capable, intellectually and technically, of practicing agriculture.*" In 1978, Ban Tha Meuang was created to settle hunter-gatherers in the Nam Xot sub-catchment of the NN-NPA. In this village some people kept their nomadic hunter-gatherer lifestyle until 1998 (Bezuijen, Johnson, Johnston and Robichaud, 2005, p. 9). According to Alton and Sylavong (1997, p. III-7), the *Themarou* found in Ban Vang Chang in the NN-NPA were the last nomadic population to settle down in the area in the late 1990s.

In the Nam Phoui NPA (Xayaburi province), "*Phi Tong Leung*" (aka *M'labri*) populations still practiced their hunter-gatherer lifestyle and exchanged their forest products for salt, clothes, and other commodities (Boonratana, 1998, p. 13-14).

However, according to Phiapalath and Saisavanh (2010, p. 21), the *Tong Leung* community met in 2010 in the Nam Phoui NPA did not possess any hunting device and did not hunt at all. They lived on vegetables, roots, tubers, and aquatic resources.

More generally, Chazée (1990, p. 17) reports that subsistence hunting has been traditionally carried out by mountain people, mainly by the *Lao Theung* and *Lao Sung*, an observation corroborated by Srikosamatara, Siripholdej and Suteethorn (1992, p. 35), who observed that *Lao Loum* rely more on fishing. Chazée (1990, p. 17) broadly sketched out the ethnic and geographic importance of hunting: he estimated that a large majority (approximately 80%) of the *Lao Loum* did not hunt, but to some extent (30% of *Lao Loum* living in mountainous provinces, 10% of *Lao Loum* living in the plains) consumed wildlife products they bought at markets. The same author further estimated that 70% to 80% of the *Lao Theung* used to hunt for consumption and trade. Finally, *Lao Sung* people were estimated to be the largest consumers of wildlife, but mainly for self-consumption. Tobias (1997, p. 36) estimated that 70% of hunting in the Nam Chat catchment area[27] was done by *Lao Sung* (*H'mong*) hunters, who were said to be more confident in the forest than the *Lao Theung*.

[27] In Bolikhamxay province.

However, Vongkhamheng (2002, p. 62) nuanced such assumptions by assessing a high reliance on wildlife for subsistence in all five villages surveyed in Nam-Et Phou Loey, comprised of *Lao Loum* (*Tai Deng*, *Tai Dam)*, *Lao Theung* (*Khmu)*, and *Lao Sung (H'mong and Yao)* populations.

Schaller (1995, p. 2) observed that except for *H'mong* villagers, most ethnic populations hunted "*incidentally.*" In their surveys pertaining to five villages in the NN-NPA, Alton and Sylavong (1997, p. III-11) noticed that "*all groups* [Vietic, Katuic and Tai-Kadai] *hunt and gather in the forest and fish in streams.*" However, the same authors also found that while Vietic populations still tended to hunt for subsistence, other groups such as the *Tai* and *Brou* had abandoned many of their taboos and hunted for commercial purposes for the "*burgeoning markets in Lak Xao and in Vietnam*" (Alton and Sylavong, 1997, p. IV-2). Similarly, Chamberlain, Alton, Silavong and Philavong (1996, p. 38) observed large differences between people of different ethnic background but living in the same area (the Nakai Plateau). They assessed that *Ahoe* people,[28] who are more familiar with forests, earned more cash from hunting than *Bo*[29] and *Brou*[30] people. *H'mong* people were reported to trap birds and rodents, to hunt larger mammals with guns, and to be the only northern population to use poison arrows. They also used dogs (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 23).

Tobias (1997, p. 55) noticed a large spatial difference in hunting pressure, which could not be related solely to the ethnic background of the local communities. He postulated that "*more stable and affluent villages may hunt less.*" A study conducted in 2003 in Luang Namtha province showed that 58% of hunting-for-subsistence and 62% of hunting-for-trade was done by residents within the NPA. The remaining -- respectively 42% and 38% -- was done by external stakeholders (Hedemark, 2003, p. 35).

In the area around the Nam Leuk hydropower dam, four types of "hunters/gatherers"[31] were found (SOGREAH, 1996, p. 15), with the following activities:

1. Short, daily visits by small groups, mainly women and children, gathering plants, small wildlife, and firewood for subsistence within a distance of five km of their village
2. Longer visits by groups specifically gathering for cash markets (fruit, resins)
3. Short, daily visits by small groups of men to hunt mainly birds and small wildlife (e.g., squirrels, viverrids)
4. Long visits, mainly in the dry season (November to June), by small groups of men to hunt all kinds of wildlife. Surplus of meat/trophies/medicine parts is sold for cash

[28] Vietic
[29] Previously Vietic linguistic group, adopted Tai language
[30] Katuic
[31] This term describes the activity of gathering and hunting (=harvesters) rather than the lifestyle as previously described

Round (1998, p. 124) identified three different groups of stakeholders as having an impact on wildlife in the Dong Khanthung PPA: local residents, outsiders, and the Lao Army.

Village militia is also involved in subsistence- and trade-oriented hunting (Nooren and Claridge, 2001, p. 90). Although staffed by villagers, the militia is armed with automatic weapons issued by the government. Militia members either hunt themselves or lend their weapons to friends or family members (Nooren and Claridge, 2001, p. 90).

Several authors (Payne, Bernazzani and Duckworth, 1995, p. 36; Salter, 1993a, p. 4-5; Nash, 1997, p. 10; Boonratana, 1997, p. 18; Nooren and Claridge, 2011, p. 90-93) mention that subsistence hunting is not practiced exclusively by villagers but also by government stakeholders (e.g., soldiers or police officers posted in remote areas), as well as private companies stakeholders (e.g., dam surveyors or forest workers). Wildlife consumption by soldiers dates back to the second Indochina war when both Viet Cong soldiers and their Pathet Lao allies relied on forest resources to complete their diet (Baird, 1993, p. 2-3). Robichaud, Hedemark and Johnson (2002, p. 49) noted that army posts in Dong Khanthung Provincial Protected area (PPA) in Champassak province contributed to a large extent to wildlife extraction. The involvement of soldiers in wildlife extraction in Dong Khanthung PPA was still prevailing in 2010 (Phiapalath and Saisavanh, 2010, p. 26).

In Sangthong district (Vientiane province), Duckworth (1996, p. 231) was told by villagers that a police team shot 20 squirrels *(Callosciurus* spp.). Boonratana (1997, p. 24) found a smoked and dried black giant squirrel at an army camp in the Nam Phoui NPA, besides "*the officer in command at that outpost reported that a gibbon had been shot for food during a military patrol."* The same author came across a group of civilians and soldiers carrying a killed pig-tailed macaque. Boonratana (1998, p. 45) observed that *"Army personnel in the NPA frequently indulge in wildlife poaching activities, using snares and muzzle-loading guns.*"

In the Xe Sap NPA, "*gun-sharing*" between soldiers and the local population was practiced in villages where soldiers were stationed for security reasons (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 40). Baird and Phylaivanh (1988, cited in Round, 1998, p. 38) reported how soldiers posted near Ban Tahin in Dong Khanthung PPA in the 1980s hunted up to 50 langurs per day. Round (1998, p. 39) estimated that the number of gibbons in Dong Khanthung PPA may have been reduced by hunting by soldiers, previously from the Khmer Rouge and Vietnamese, and later from the Lao Army (ibid, p. 123).

Duckworth et al. (1994, p. 203) estimated that the "*permanent establishment of soldiers*[32] *would affect wildlife much more severely than does the current laissez-faire hunting by villagers*."

[32] in the Xe Pian, an area then prone to Cambodian rebel insurgents.

Habitat and Geographic Coverage

As reminded by Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 25), "*village location influences the availability and proximity of wildlife and thus the extent of its use."* According to Vongkhamheng (2002, p. 29), people living in upland areas far away from water bodies rely more on wildlife, while people living in lowland areas rely more on fish and invertebrates for their subsistence. Schlemmer (2001, p. 58) confirms that "*the reason for the variations in the type of wildlife consumed is the location of a village, rather than ethnic preferences.*"

Several authors observed that subsistence hunting remained primarily confined to areas close to villages (Timmins, Evans and Duckworth, 1993a, p. 22-23; De Beer et al., 1994, p. 32; Duckworth et al., 1994, p. 202; Johnson, Singh, Duongdala and Vongsa, 2003, p. 5). According to WWF, (1998b, p. 3) snakes and small mammals are caught in nearby villages, while overnight expeditions are necessary for large-sized wildlife. Timmins and Evans (1996, p. 26) confirm that snaring of small mammals is widespread and occurs in the vicinity of villages. A survey carried out in *Phrai* communities in Xayaburi province confirms that villagers hunt predominantly in hills and rice fields rather than the forest (WWF, 2006, p. 99). In her site typology for forest food resources in three villages of Saravan province, Clendon (2001, p. 20) assessed that rats and squirrels are caught in lowland open forest, while other wild animals are caught in the adjacent Xe Bang Nouan NPA. Rats are hunted mainly in fallows and *hai* (Vongbounthane, 1998a, p. 6). Schlemmer (1999, p. 37) found that cultivated rice fields and recent fallows covered with roofing grass harbor mainly rats, while older *hai* (4 to 9 years fallows) host bamboo rats and other small rodents. Forested areas (over 10-year-old trees) harbor squirrels and civets, among others. Most larger-sized animals (e.g., porcupines, squirrels, etc.) hunted are procured from all types of forests. However, Tobias (1997, p. 55) noticed that "*wildlife found in mature forests away from settlements is increasingly hunted for food and trading.*" Indeed, Round (1998, p. 17) realized that "*there were probably few, if any, areas in Dong Khanthung that were not visited on a fairly regular basis by villagers.*" According to Duckworth, Salter and Khounboline (1999, p. 21), the higher pressure of subsistence hunting in open spaces and wetland than in forests is induced by the higher density of human activities in these areas. Robichaud, Hedemark and Johnson (2002, p. 8) mentioned that human activities such as logging and swidden agriculture led to a decrease in wildlife habitat, thus exerting a higher pressure on remoter grounds. They determined the following factors of influence on hunting pressure: (1) ethnicity, (2) degree of food security, (3) government land allocation programs and their implementation, and (4) access to roads and markets for wildlife.

Although hunting is subject to national legislation, it is in practice governed by customary rights within village boundaries as well. According to Hansen and Jeppesen (2004, p. 52), such customary rights usually foresee unrestricted collection of non-protected NTFPs and hunting during the permitted season. For instance, Chamberlain, Alton and Silavong (1996, p. V-2) were told by the village chief in Ban Nakai Neua that 1,000 ha were open for hunting and NTFP

collection for the whole village, comprising 57 households in 1996, while 380 ha were devoted to livestock grazing and 18 ha to rice cultivation. Other customary rights foresee the sharing between hunters and village authorities of animals killed on other villages' territories (De Beer et al., 1994, p. 41).

However, as Hansen and Jeppesen (2004, p. 52) remind, "*for customary community land inside a NPA, use rights can be restricted if village land is overlapping with core or corridor zones where collection of NTFP is illegal*." Robinson (1998, p. 168) warned that "*it would be unrealistic to try and prevent people from hunting, as it probably provides an important source of protein to the diet,*" and recommended that only people living within the NPA shall be allowed to hunt. Moreover, only certain techniques, such as mist nets and guns, and killing of certain species shall be controlled or prohibited.

WWF (2004, p. 94) found that subsistence (and trade) hunting was most prevalent in the following NPAs:

- Phou Loey (highest ranking with 16 points)
- Dong Amphan
- Phou Xang He
- Nam Phoui

In Phou Loey, Dong Amphan, and Phou Xang He, the threat was found to exceed pressure. Anon. (n.d.) warned about the threat of the "empty forest syndrome" faced by Lao PDR, "*wherein forests are largely intact but the animals have been hunted out.*"

Seasonality of Hunting

Krahn (2005, p. 69) found that in the past, *Katu* villagers used to hunt throughout the year given sufficient wildlife resources and the absence of any legal restrictions. Hansen and Jeppesen (2004, p. 188-189) observed that wildlife can be harvested as a NTFP for subsistence throughout the year in Phou Xang He and Dong Phou Vieng NPAs (Savannakhet province). Indeed, some species can be collected throughout the year (e.g., rats and squirrels (Clendon, 2001, p. 22)), bamboo rats (Chaleurnsouk and Latsamy, 2006) and bats (Vongbounthane, 1998a, p. 9). However, even for such animals, **seasonal peaks** are observed as well. Factors affecting the seasonal peaks are: the law, species-specific behavior, location, and the calendar of human activities.

Legal Hunting Season

The hunting season is nowadays also -- in theory -- influenced by the law. Johnson, Singh and Duongdala (2003, p. 196) specify that according to the Regulation No. 0524/2011 issued by the

Ministry of Agriculture and Forestry (MAF), hunting is allowed between November 1 and April 30. The Wildlife and Aquatic Law (No. 7/NA), dated 24 December 2007, defines hunting and seasonality as follows:

- According to Article 24, animals belonging to (common/general) Category III can be hunted only in specified seasons.
- According to Article 52 hunting is prohibited during the breeding season in the conservation zone. Similarly, pregnant or nursing animals are prohibited from hunting.

However, the hunting season is not specified in the Law.

Species-specific Behavior

Originally, harvesting of wildlife was based on natural cycles. Traditionally, local people, the *Khmu* for instance, were able to assess the species of wild animals they would find in the forest based on the seasonality of edible wild plants and fruit (Preisig and Simana, 1997, p. 14). Species-related seasonal availability was confirmed by Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 28) and Schlemmer (1999, p. 36). WCS (1995c, p. 16), for instance, observed reduced encounters between human and wildlife during the cold season, as some species (such as carnivores) seem less active. Such assumptions were confirmed by Duckworth (1997, p. 17), who observed a depression of civets' activity during the dry-cold season (October to January).

Encounters with civets were more frequent during the dry-hot season (February-May). *Toum* people in Ban Phou Lan hunt civets mainly during the fruiting season (Alton and Sylavong, 1997, p. BIV-11). According to Chaleurnsouk and Latsamy (2006), squirrels are hunted the whole year round in the Nam Kading NPA, but the incidence increases between July and February, as these animals come closer to the fields. In the previous Khammouane Limestone NPA, villagers reported to hunt bats mainly during the rainy season when they are more numerous and more active (Robinson and Webber, 1998, p. 28). Bats seem to form larger and more conspicuous clusters during the rainy season, which is also the breeding season (Robinson and Webber, 1998, p. 35). Chamberlain (1997, p. IV-7) was told that "*many animals begin to emerge with the rains*" (in June and July) and "*large mammals mostly disappear*" between November and January.

Primates are hunted between June and February in the Nam Kading NPA (Chaleurnsouk and Latsamy, 2006).

Rats are harvested at rice sowing in June-August and rice harvest in November-December and **squirrels** during the fruiting season in July-September and December-January in Viengthong

district (Houa Phanh province) (Schlemmer, 1999, p. 36). In the Nam Ha NPA, squirrels are hunted mainly between September and February (Johnson, Singh, Duongdala and Vongsa, 2003, p. 12). Aplin et al. (2007, p. 298) observed that common house rat infestations in villages of the uplands usually start from December onwards, when granaries are filled.

Bamboo rats are harvested between May and October and December-January in Houa Phanh province (Schlemmer, 1999, p. 36), between June and October in Vientiane province (Vongbounthane, 1998a, p. 45) and between December and February in Nam Kading (Chaleurnsouk and Latsamy, 2006). In the Nam Ha NPA, hoary bamboo rats are hunted throughout the year, with peaks in February and March (Johnson, Singh, Duongdala and Vongsa, 2003, p. 12).

Civets are hunted between March and April in Houa Phanh province (Schlemmer, 1999, p. 36), and between July and November in Nam Kading NPA (Chaleurnsouk and Latsamy, 2006). In the Nam Ha NPA, civets are hunted mainly between September and February (Johnson, Singh, Duongdala and Vongsa, 2003, p. 12).

Human Activities

The seasonality of hunting is subject to anthropogenic factors, such as agricultural activities and their timing. Periods of food scarcity play a crucial role in wildlife harvesting as well.

Several authors observed that the dry season was the main hunting season (Davidson et al., 1997, p. 73; Payne, Bernazzani and Duckworth, 1995, p. 35; Alton and Sylavong, 1997, p. B I-3; Steinmetz, 1998a, p. 4; Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 6). Clendon (2001, p. 21) noted that villagers relied more on forest animals in the dry season (8% of collected forest resource values) than in the rainy season (1% of collected forest resource values). The incidence of NTFP collection was found to rely heavily on cycles of other activities, such as rice cropping (Hansen and Jeppesen, 2004, p. 38). Villagers in Xaythany district (in Vientiane Municipality) were reported to hunt rats mainly after the rice harvest between October and December (Vongbounthane, 1998a, p. 6). Johnson, Singh and Duongdala (2003, p. 198) also found that hunting efforts in Luang Namtha are "*greatest from September to February*. Chazée (1990, p. 8) and Nash (1997) mention two main hunting seasons: during the dry season[33] and between July and October, both periods of rice scarcity. Johnson, Singh and Duongdala (2003, p. 204-205) observed that the period (September and October) showing high hunting intensity outside the legal hunting period (November-April) coincides with a period of food shortage. WWF (2006, p. 96) observed a similar connection between hunting season and rice shortage, however, with a season extending from December to March.

[33] Nash specifies that is extends between February and March for the Lao Theung

In *Katu* communities in Sekong province, according to Krahn (2005, p. 64), the hunting season extends from April to December. She, however, noticed hunting peaks coinciding with the harvest of major staple crops: cassava (February to March), maize (July to August) and rice (October to December) (ibid, p. 101). Krahn (2005, p. 101) specifically assessed the hunting seasonality for some species, as shown in Table 7.

Table 7 -- The Main Hunting Seasons of Wildlife in *Katu* Communities, Sekong Province

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rats								■	■	■	■	
Squirrels			■	■	■					■	■	
Loris	■	■										
Macaques	■	■					■	■			■	■
Wild boars		■	■				■	■			■	■
Sambar deer									■	■		
Snakes			■	■	■							
Monitor lizards			■	■	■	■						
Tadpoles	■	■	■								■	■
Soft-shell turtles	■	■	■	■	■					■	■	■
Fish	■	■	■	■	■	■	■	■	■	■	■	■

Source: Krahn (2005, p. 101).

Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 7) found two main subsistence hunting seasons in Attapeu province. The first one occurs after the rice harvest in December and January, while the second takes place before the next rice planting in February (swidden fields) and May/June (irrigated rice). Chaleurnsouk and Latsamy (2006) observed that in the Nam Kading NPA, hunting extended between June and February, when villagers protect their crops from pests.

Duckworth et al. (1995, p. 19) report that in the Xe Pian NPA "*hunting and snaring activities in the forest peak towards the end of the dry season (March to May).*" Squirrels are hunted after the rice harvest in December (Vongbounthane, 1998a, p. 4), while bats are harvested at any time of the year, during leisure time (Vongbounthane, 1998a, p. 9). According to Chamberlain, Alton, and Silavong (1996, p. V-4), the main hunting season in Nakai extended from November to April when leaches are less abundant.

Weather and Timing

Weather conditions, as well as time cycles, play a great role in the outcome of wildlife harvesting (Simana and Preisig, 1997, p. 14). Lao hunters claimed that hunting under a full moon or bright

moon is not as successful as under darkness, and the same was reported with bad weather conditions, such as rain, thunderstorms or wind (Duckworth, 1997, p. 18). Animal activity was reported to be depressed during bright-moon nights (WCS, 1996a, p. 4). WCS (1996a, p. 15) assumed that the following natural factors may have an impact on human-wildlife contact rates: rain, mist, thunderstorms, temperature, moon phase, season, and time of night.

Hunting Methods and Devices

The number of hunting methods is large and may differ across locations (De Beer et al., 1994, p. 24). Chazée (1990, p. 20) observed a difference in hunting practices between northern people with an ancient hunting knowledge and southern people with more recent hunting tradition (see Annex 13). He found that northern people had a long lasting relationship with Chinese merchants who supplied them with weapons and ammunition against the supply of wildlife products destined to traditional medicine. Some fire arms were as old as 150 years. On the other hand, southern people rely more on "*less sophisticated,*" self-made hunting devices such as bows and crossbows. Consequently, northern populations were reported to hunt more intensively than southern ones (ibid). Nash (1997, p. 9) also differentiates between traditional and "modern" hunting devices, but in the opposite way. According to him, traditional hunting devices and weapons include traps, snares, bows and crossbows, while modern weapons are firearms and explosives, which were gradually introduced during the first and second Indochina wars.

Simana and Preisig (1997, p. 17-18) describe different types of weapons used by *Khmu* communities (guns, bows and crossbows) targeted at different species, as well as different tracking methods.

Salter (1993a, p. 5), as well as Duckworth, Salter and Khounboline (1999, p. 12) differentiate between passive (e.g., snares, traps, nets) and active (e.g., dogs, guns, slingshots, bows) hunting methods. The same authors remind that passive methods are mostly non-selective. Whatever the methods, "*the intensity and efficiency of hunting in almost all parts of the Lao countryside is remarkable*" as stated by MoC and IUCN (2000, p. 27).

Active Methods

Active hunting methods comprise a range of weapons and means to kill or catch wildlife, ranging from firearms, both traditional and modern, to bows, crossbows and slingshots, as well as devices to extract animals.

Guns, village-made muzzle-loading smooth bore guns or AK-47, are commonly found in the country (MoC and IUCN, 2000, p. 27). Krahn (2005, p. 65) found that *Katu* hunters in Sekong province are acquainted with as many as 20 different weapon types. According to her, weapons, mainly AK-47, appeared in the community during the second Indochina war in the 1960s and

quickly replaced traditional methods. According to Chazée (1990, p. 17), the use of firearms started in the 1940s with the first Indochina war. According to Steinmetz and Baird (1998, cited in WWF, 1998c, p. 66), rifles were issued by the government to the village militia, while muskets were locally made. The former are more powerful than the latter. In the Xe Pian NPA, hunting parties carry homemade long-barrel guns or semi-automatic weapons issued by the government (Timmins, Evans and Duckworth, 1993b, p. 20). War weapons (automatic rifles, grenades and other explosives) were used as well (Chamberlain, Alton, Silavong and Philavong, 1996, p. 43).

The use of weapons was found to vary according to location. In the Kadian sector of the Dong Khanthung PPA, guns were more widespread than in any other areas (Round, 1998, p. 24). Johnson, Singh and Duongdala (2003, p. 199) found that guns were the most-used hunting weapon in rural communities in Luang Namtha province, followed by snares and other means. This was the case as well in Phou Den Din NPA (Phongsaly province), where shooting could be confirmed rather than snaring and trapping (Duckworth, Robichaud and Eve, 2005, p. 5). MAF (2011, p. 13) confirms that gun hunting (of gibbons) is more intensive in the north than in other parts of the country. In Xayabury province, crossbows and guns were the most common weapons used by *Phrai* communities, followed by snares. Out of 117 interviews, 58 households (HH) use guns and crossbows, 46 HH use snares, and 13 HH use other methods, mainly slingshots and extraction by hand (for bamboo rats).

Crossbows and guns are usually the main devices used to hunt large mammals and arboreal species. However, animals hunted with guns and crossbows were mostly small mammals (WWF, 2006, p. 99).

Table 8 -- Hunting Devices Used by *Phrai* Communities in Xayaburi Province

Animals Most Frequently Hunted	% of HH (N=65)	Frequently Hunted with Guns and Crossbows -- % HH (N=65)	Frequently Hunted with Snares --% HH (N=65)
Large Indian civet	9	3.5	5.1
Common palm civet	40	3.5	5.1
Pallas squirrel	84	13.8	9.4
Mouse	26	0	2.6
Porcupine	51	1.7	3.4
Bamboo rat	62	0	5.1

Source: WWF, 2006, p. 99.

Boonratana, Sengsavanh and Chounlamounty (2000, p. 20) exhibited a photograph of a Phayre's flying squirrel shot with a muzzle-loading gun in the Dong Sithouane Production Forest. Powerful arms such as automatic weapons and rocket launchers were found with Cambodian hunters in the Xe Pian NPA (TRAFFIC, 1999, p. 10). Landmines were reportedly used to kill large cats and bears in some areas of the Nam Et-Phou Loey (Vongkhamheng, 2002, p. 116).

In Ban Kou Ne in the NN-NPA, the low hunting pressure compared to other villages was imputed to the absence of firearms, owing to the isolation and poverty of the village (Alton and Sylavong, 1997, p. A IV-4). In Viengthong district, it was estimated that 75% of the HHs possessed a gun, while the remaining were too poor to afford any gun (Schlemmer, 2001, p. 59).

Guns are found to be more prestigious and more powerful, but more expensive and noisier than bows (Schlemmer, 1999, p. 34). Schlemmer (1999, p. 34) explained how ammunition for local muskets, called *kep* in Houa Phanh province, is made:

How to Make a Gun and Ammunition with Local Resources

Bat guano *(kichia)* is boiled until it forms a white liquid. A solid yellow material called *maat* is mixed with the liquid *kichia* and charcoal to make powder. *Kichia* can be bought or collected. It costs between 200 LAK and 3,500 LAK per 100 g. and 100 g. to 500 g. are necessary for one year. *Maat* is bought at a cost of 2,000 LAK/100 g. and 100-200 g. are needed per year. Lead bullets cost between 1,000 and 3,000 LAK/kg. Detonators cost between 500-1,000 LAK/box (100 detonators/box). The powder is always made locally; lead bullets and the detonator are bought from China or Thailand. Muskets are bought (15,000 to 30,000 LAK in 1999[1]) and can last for 10 to 30 years. H'mong hunters were said to make their muskets themselves. The metal part is bought while the wooden part is made by the owner. It takes between three and five days to make a gun.

In Attapeu province (Davidson et al., 1997, p. 73) and in Houa Phanh province (Showler, Davidson, Salivong and Khounboline, 1998, p. 42), all types of guns and rifles (and snares) were found, as were bows and crossbows with poisoned tips. Similarly, homemade crossbows used both my men and children were frequent in the Xe Sap NPA (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 40). Crossbows were mainly used for birds and small mammals, but could also be used for large mammals when arrow tips were dipped into poison. Blowpipes with poison-tipped arrows were observed as well. In the NN-NPA, *Atel* and *Mlengbrou* 'hunter-gatherers" hunt hog badgers with domestic dogs and bamboo spears. This technique is the only one traditionally used by these populations, who do not use crossbows or

other hunting devices (Chamberlain, 1997, p. III-7). The same author, however, was told that the *Atel* population uses some trapping and snaring techniques possibly taken from other populations to catch ground animals (e.g., bamboo rats, porcupines, squirrels, tree shrews) (Chamberlain, 1997, p. III-9-10). *Phong* people in three remote villages near the NN extension NPA hunted civets, squirrels and rats with arrows, *katam, and kabok*[34] (Alton and Sylavong, 1997, p. BIV-3).

In Phongsaly, children use catapults to kill squirrels (Duckworth, Robichaud and Eve, 2005, p. 44) and in Savannakhet, Francis, Guillén and Vongkhamheng (1997, p. 9) observed how children harvested 40 juvenile bats with slingshots.

Active methods also encompass manual extraction of specific species. Rodents are dug out of their holes with special spades or pointed sticks (Simana and Preisig, 1997, p. 17-18).

De Beer et al. (1994, p. 24) mention that some rodents are caught out of their nests by hand by children. Burrows of bamboo rats are smoked and animals are subsequently extracted (Showler, Davidson, Salivong and Khounboline, 1998, p. 60). In a village of the previous Khammouane Limestone NPA, Robinson and Webber (1998, p. 11) witnessed how four boys and a dog dug a tree shrew[35] from a hole in the ground, while in another village they found tree shrews caught in a bamboo trap. In both villages, tree shrews were caught for food.

Active hunting is also supported by dogs (Chazée, 1990; Timmins, Evans and Duckworth, 1993b, p. 20; De Beer et al., 1994, p. 26; Round, 1998, p. 125; Robichaud and Stuart, 1999, p. 39; IUCN, 1999, p. 20; Schlemmer, 1999, p. 34; Van der Helm and Johnson, 2007, p. 37). Timmins, Evans and Duckworth (1993a, p. 24) observed that dogs were mainly used to hunt tortoises and turtles, while IUCN (1999, p. 20) reported that hunting dogs were used mainly for hog badgers. Robinson (1998, p. 167) mentioned that the wide practice of hunting monitor lizards with dogs has a direct impact on bats. Lizards seek refuge in hollow trees, often used by specific bat species to roost. Hunters will light a fire or fell the tree to dislocate lizards, thus also dislocating bats. This practice may bring humans into close contact with bats.

According to De Beer et al. (1994, p. 26), hunting dogs need to be trained and are thus more expensive, leading to a phasing out of this practice. This observation is contradicted by Bezuijen et al., (2007, p. 227), who observed hunting dogs in all villages they surveyed in the Xe Pian NPA. In the Nam Kading NPA, encounter rates with hunting dogs were counted. Encounter rates were as low as 0.03 per km walked (three dogs encountered in a total of 233.29 km transect walk) in one zone of the NPA. In all other zones of the NPA, no hunting dog was seen (Van de Helm and Johnson, 2007, p. 37).

[34] No explanation for these terms could be found, presumed to be passive devices
[35] Tupaia belangeri

Active hunting is also supported by lamps, used to hunt at night (Duckworth, 1994, p. 1) and by other means to chase animals, such as fires. In the Nam Phoui NPA in Xayaburi province Boonratana (1997, p. 23; 1998, p. 43) found that some hunters "*deliberately set fire to the forest, especially along the ridge trails to flush out animals*." In the proposed Dong Khanthung PPA, fires were purposely set to increase visibility for hunting (Round, 1998, p. 129). This practice was observed in the Nam Kading NPA (Philakone, 2009, p. 7) and the Xe Pian NPA (Bezuijen et al., 2007, p. 227) as well.

Passive Methods

Passive methods encompass devices (e.g., snares which do not require human intervention at the actual time of capture (Johnson, Singh, Duongdala and Vongsa, 2003, p. 13)). Simana and Preisig (1997, p. 17-18) describe various trapping devices used by *Khmu* populations to harvest small game.

De Beer et al. (1994, p. 26) observed that for some species, live trapping methods were preferred over killing traps to avoid putrefaction. Krahn (2005, p. 65) observed that *Katu* hunters usually check snares and traps every two or three days. After a week, the meat is considered inedible.

Chamberlain, Alton, Silavong and Philavong (1996, p. 37) observed that local populations on the Nakai Plateau adapted their hunting techniques as wildlife resources dwindled. Longer snare lines were used to increase trapping intensity. In the Laving-Laveun PPA, snaring and dog hunting was more widely used than shooting, and this had a positive incidence on arboreal mammal species (Duckworth et al., 2010, p. 84). Duckworth, Robichaud and Eve (2005, p. 45) also observed the damaging effects of snares. The density of snare lines was found to be particularly high in the Xe Sap NPA around Ban Ayun[36] and was considered as the highest encountered in Lao PDR at that time (Timmins and Vongkhamheng, 1996, p. 18). Long snare lines (up to 1 km) set up along drift fences were found in the Laving-Laveun PPA in Savannakhet province (Duckworth et al., 2010, p. 82).

Duckworth, Salter and Khounboline (1999, p. 12-13) mention some differentiation in devices and methods depending on the targeted species. Hunting methods are often tailored to species and their habits such as habitat, eating habits, and migration patterns (Krahn, 2005, p. 65). Krahn (2005, p. 65-67) identified approximately 50 different hunting techniques used by the *Katu* population in Sekong province. In the Dong Phou Vieng NPA, Steinmetz and Baird (1998, cited in WWF, 1998c, p. 66-68) identified 32 different hunting and trapping techniques to catch mammals, birds, reptiles and aquatic resources. In Viengthong district (in Houa Phanh province), Schlemmer (1999, p. 34) observed that active methods (guns and bows) are used to hunt fast and large-sized animals, while bows are used mainly for birds. Crossbows were seen but not used.

[36] Dakchung plateau in Saravan province.

Traps and snares are often used for small-sized mammals and for birds (Schlemmer, 1999, p. 35).

The following examples illustrate the diversity of methods and devices tailored to species, their environment, and their habits.

- **Primates**, such as gibbons, are highly threatened by "*hunting by projectiles, especially guns*" (MAF, 2011, p. 12).
- **Rats** are captured by traps (baited or not) and during rat invasions, hunters equipped with lamps beat them to death with sticks (Schlemmer, 1999, p. 9). Rats, such as the long-tailed giant rat, can also be captured by hand (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 18). Bamboo rats are also hunted by gun (Vongbounthane, 1998a, p. 45).
- **Squirrels** can be trapped with a baited log, as practiced by hunters of the *Katu* community (Krahn, 2005, p. 65), by slingshots manipulated by children (Duckworth, Salter and Khounboline, 1999, p. 13), by snares and ground fences (ground squirrels and tree shrews), or by guns (arboreal squirrels) (Johnson, Singh, Duongdala and Vongsa, 2003, p. 12; Timmins, Evans and Duckworth, 1993a, p. 24). Squirrels are hunted at night with lamps and dogs while they forage in trees (Vongbounthane, 1998a, p. 4). Schlemmer (1999, p. 9) found that squirrels are hunted mostly at dawn or at dusk with lead-bullet guns and bows, but mostly with different varieties of traps (baited or not). Flying squirrels are frightened out of their nests and beaten to death by sticks. Robinson and Webber (1998, p. 28) found that rats, squirrels and tree shrews are hunted with dogs, catapults, crossbows or home-made noose traps. Ground and arboreal snaring and trapping were found to be specifically high in the Xe Sap NPA (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 40).
- **Brush-tailed porcupine** (*atherurus macrourus*) and bamboo rats are hunted at night with a torch and shot. Hunters know their habits depending on the ascending or descending moon. They can also be caught during the day and dug out of their burrows in bamboo or can be trapped. Other porcupines (*hystrix spp.*) can be trapped or dug out like brush-tailed porcupines (Schlemmer, 1999, p. 9).
- **Civets** are said to be difficult to catch. Frugivorous species can be shot while preying in fruit trees. They can be captured by sliver-traps or noose-traps (Schlemmer, 1999, p. 9). Most camera-trapped civets in Nam Et-Phou Loey NPA showed a nocturnal behavior, except for 8% (n=36) of Masked Palm Civet and 10% (n=31) of Common Palm Civet, which showed diurnal activity (Johnson, Vongkhamheng and Saithongdam, 2009, p. 9).
- **Bats** can be caught by different methods as well. Krahn (2005, p. 65) describes different methods to catch bats depending on their habitat: cave-dwelling bats can be caught by a wooden funnel placed at the entrance of the cave or they can be beaten to death after being scared off through smoke emanating from a fire lit at the entrance of the cave.

Francis and Salivong (1998c, p. 3) describe how villagers chased bats out of an underground cave in the Dong Houa Sao NPA to catch them with fishing nets at the entrance of the cave. Villagers claimed that they caught up to 100 individual bats in a single action. Francis and Salivong (1998c, p. 4) observed that small colonies were less prone to hunting, as villagers would invest less effort to harvest small colonies than large ones. While surveying bat colonies, Robinson (1998, p. 158) usually searched for evidence of hunting, such as long bamboo poles used to knock down bats, nets or clay balls used as catapult ammunition. Tree-dwelling bats are usually caught by nets (Krahn, 2005, p. 66, Duckworth, Salter and Khounboline, 1999, p. 13). Robinson and Webber (1998, p. 27) describe how bats are caught depending on the wealth of the hunters. Well-off hunters can afford mist-nets, while poorer hunters use sticks to knock bats down or shotguns. The latter method was thought to be ineffective.

In other places, hunters would use catapults to knock down bats from a large cave-roosting colony.[37] Mist-nets were afforded by better-off hunters who sold wildlife to traders, while subsistence hunters used less-expensive devices (Robinson and Webber, 1998, p. 36). Fruit bats are hunted at night (Vongbounthane, 1998b).

As illustrated by the example of bats, within the same order, different families and species may show a different behavior and are thus susceptible to different hunting methods. Bear macaques (aka, stump-tailed macaques, *macaca arctoides*) exhibits a "*more ground-living nature compared with the other macaques. This exposes it more to snaring*" (Duckworth et al., 2010, p. 64). The ease of catching a targeted species ultimately affects hunting pressure. Robinson (1998, p. 165) was told by inhabitants of three villages[38] of the Xe Pian NPA that rats and squirrels were frequently hunted (by catapults, traps, poles) for food, while bats were not, as they were more difficult to catch.

In the Nam Kading NPA, a survey carried out with 168 households interviewed in eight villages, in four districts of Bolikhamxay province showed that villagers use different methods to hunt different species, as shown in Table 9.

[37] Living at 70 m., 1,000 to 2,000 animals in the colony
[38] Ban Nong Kae, Ban Taong and Ban Phon Visai,

Table 9 -- Hunting Methods Used in the Nam Kading NPA in Bolikhamxay Province

	Gun	Trap	Arrow	Dog	Others Not Specified
Primate	67%	0%	33%	0%	0%
Civet	28%	2%	69%	0%	2%
Squirrel	12%	15%	62%	1%	10%
Porcupine	8%	0%	75%	11%	6%
Rats	67%	0%	20%	13%	0%
Bamboo Rats	0%	0%	17%	1%	82%

Source: Chaleurnsouk and Latsamy (2006).

The location of hunting is another factor affecting human-animal interface. Hunting can be done from posts erected at mineral licks (Schlemmer, 2001, p. 59). Boonratana (1997, p. 20) found that a hunting post had been erected in a tree overlooking a mineral lick in the Nam Phoui NPA. Besides tracks of large mammals, tracks of civets and porcupines were found at the lick. Steinmetz (1998c, p. 16) found evidence of human use and trapping at mineral licks in the previous Khammouane Limestone NPA.

Hunting is often carried out from permanent or temporary forest camps. Camps may be erected specifically for hunting (Duckworth et al., 2010, p. 82) or fishing and NTFP collection (see Chapter 3.16). Guillén, Francis and Salivong (1997, p. 8) came across numerous bamboo shelters erected by hunters in the Phou Khao Khouay NPA and evidence (e.g., bottles of expensive liquor brands) showed that such camps were used by wealthy outsiders rather than local villagers. Boonratana (1997, p. 23) also came across several old and newly erected hunting camps in the Nam Phoui NPA (Xayaburi province). In the Laving-Laveun NPA, a survey team found 13 such camps, of which three were still active (comprising respectively six, nine and three hunters).

The hunters' intention was to stay in the forest for three months. They hunted all types of wildlife for local consumption, and pangolin and turtles for trade. They used mainly dogs, traps, and snares (Duckworth et al., 2010, p. 82). In January 1995, Evans, Duckworth and Timmins (2000, p. 61) came across a group of over 70 people who entered the Nam Kading NPA by boat to hunt for several days. In the same NPA, 179 independent hunting camps were recorded during a transect survey of the NPA. This gave an average of 0.77 camp per km walked. The density was higher in Viengthong district, with 38 camps (1.01 camp per km walked) than in the three other districts (Van der Helm and Johnson, 2007, p. 44). One hundred seventy-seven of these camps were classified and 22 of them were considered new, with evidence of current human occupation (e.g., fire, food remains), while 155 were considered abandoned. The density of new camps was highest in Khamkeut district, with 14 camps (Van der Helm and Johnson, 2007, p. 44-46). Hunting camps were estimated to be the main threat in the Nam Kading NPA (ibid, p.

63). In Phou Dendin NPA, hunters established camps at abandoned villages or on sandbars in the river (Duckworth, Robichaud and Eve, 2005, p. 5).

Hunting and Socio-cultural Aspects

Gender Division

A few authors noted a clear gender demarcation with regard to wildlife harvesting (Schlemmer, 1999, p. 31; Clendon, 2001, p. 20). Men hunt forest animals, while women collect other NTFPs, such as small wildlife (Claridge and Phanthavong, 1996, p. 13; Alton and Sylavong, 1997, p. IV-5; Schlemmer, 1999, p. 32; Schlemmer, 2001, p. 59; Clendon, 2001, p. 20; Hedemark, 2003, p. 23). While adult men are in charge of hunting medium- and large-sized animals, young men armed with bows or crossbows hunt small mammals and birds, and females usually collect insects, amphibians, fish and crustaceans (De Beer et al., 1994, p. 23). In *Katu* communities, while males hunt, females are entrusted with tasks such as checking traps and snares (Krahn, 2005, p. 64). Schlemmer (1999, p. 31) observed that women are usually shunned from hunting techniques that result in blood being shed. While men may help women collect small mammals/amphibians/aquatic animals in open spaces and water bodies, women are not allowed to hunt in forests. In *Khmu* communities, hunting is strictly reserved for males, and women are forbidden from touching weapons (Simana and Preisig, 1997, p. 17-18).

Schlemmer (1999, p. 31) observed that while hunting or harvesting wildlife, children usually help adults of the same sex; therefore, there is no specific children's category that encompasses both sexes. However, children collect or harvest mostly small animals requiring simple techniques and low levels of strength. Children usually trap rodents (Bergmans, 1995, p. 302). In *Katang* communities in Saravan province, rats and squirrels are caught by men and boys (Clendon, 2001, p. 22). Schlemmer (2001, p. 59) observed that boys usually start hunting at the age of 15 by using spear guns. At the age of 18, young men are legally allowed to carry guns.

Clendon (2001, p. 20) observed that when women and girls seek wildlife, they make shorter, but more frequent and purposive, NTFP (including small mammals) collection trips than men. The latter make less frequent but longer trips to harvest animals in the forest.

Community Hunting

Hansen and Jeppesen (2004, p. 47) observed that "*forest resources have historically been abundant and readily available [...] and therefore it has not been necessary to organize collection to the degree that e.g. rice production is organized. For NTFPs the limited organization of collection that has been necessary is ancient and rooted in culture and traditions.*" Collective hunting was found in the Phou Xang He and Dong Phou Vieng NPAs (Hansen and Jeppesen, 2004, p. 46). Krahn (2005, p. 64) highlighted the significance of hunting

as a social cohesion factor. Large-sized catches were used to benefit the whole *Katu* community. She further describes how individual hunting grounds are attributed on a yearly basis. In previous years, *Katu* hunters used to hunt throughout the sacred forest, with exception of areas reserved for the deceased. Nowadays the attribution of hunting grounds is rendered difficult by hunting restrictions or bans in conservation areas (Krahn, 2005, p. 64). Krahn (2005, p. 65) observed how, over time, in *Katu* communities, hunting shifted from being a communal activity to becoming an individual initiative. Nowadays small groups of hunters, consisting of friends or kin, have replaced the traditionally larger groups. *Khmu* people were reported to hunt more cooperatively than other communities (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 35).

Hunting Rituals

Wildlife plays an important role in the spiritual life of some population groups, especially the *Lao Theung*, who are often animists (Baird, 1993, p. 28). Krahn (2005, p. 76) highlighted the spiritual dimension behind the use of specific wild and domestic animals by *Katu* communities in Sekong province. She found that domestic animals, as well as some wild species including[39] civets, are believed to possess a soul (Krahn, 2005, p. 77).

She further noted that animal offerings to various spirits[40] concern exclusively domestic species.[41] Namely, *Katu* people believe that spirits would reject offerings of wild animals. Krahn (2005, p. 65) describes a *Katu* hunting ritual to thank spirits for a large-sized catch. Hunters smear blood of the freshly killed animal on two bamboo sticks symbolizing an arrow and a ghost. Hairs are plucked from various parts of animal's body (nose, ear, neck, tail, eyebrow and legs) and stuck on the blood-smeared sticks. The latter are then stuck on a large tree as an offering. Bezuijen, Johnson, Johnston and Robichaud (2005, p. 5) were told that small offerings were made to spirits before the VCMU started patrolling in some forest stretches of Ban Vangchang. Vongkhamheng (2002, p. 105) describes how *Khmu* people make sacrifices -- consisting of a chicken every year and a buffalo every three years -- to the sacred forest spirit dwelling in a fig tree. *H'mong* and *Tai Dam* people have similar practices. Hunting is prohibited in such forest stretches.

Hunting Taboos

Krahn and Johnson (2007, p. 21) mention that some populations have refrained from hunting and consuming certain species. Krahn (2005, p. 77) specifies that this behavior derives from three

[39] In addition to elephants, bears, tigers, sambar deers, muntjacs, serows and turtles
[40] Seven spirits being for: (1) village, (2) house, (3) ancestors, (4) deceased from violent death, (5) forest, (6) *phee phob* and (7) meat provider spirits
[41] Buffalo being the first choice, followed by pigs, goats and chicken

distinct reasons: (1) species taboos;[42] (2) inedibility (e.g., *hylomyis suillus* rat); or (3) lack of taste (e.g., Indochinese ground squirrel, *dremomys* spp., squirrels, and some mongoose species).

Robichaud and Stuart (1999, p. 4) and Duckworth, Salter and Khounboline (1999, p. 12) mention **species-related taboos** prevailing in some non-Buddhist populations: snakes (*H'mong* and *Kri*), various types of medium- and large-sized mammals (*Kri*), and black-crested gibbons (local tribes in Bokeo province). Traditionally, *H'mong* people do not kill gibbons, as the latter are thought to be protective against evil spirits and are able to tell the time through their vocalizations. Similarly, *Tai Dam* people view gibbons as close to humans and harming a gibbon would bring bad luck. *Khmu* people view gibbons and langurs as harmless to crops and do not view a necessity to kill them (Vongkhamheng, 2002, p. 106). *Liha* people in Khamkeut district (in Bolikhamxay province) observe a total hunting taboo on primates (Alton and Sylavong, 1997, p. B II-13). In the Nam Ha NPA, local people also have a strict hunting taboo on primates, as they believe that they embody spirits of ancestors (Nasombath and Chanthasone, 2003).

Location-specific hunting taboos (e.g., in traditional protection forests) are encountered throughout the country with various populations. Around Phou Leung in the Xe Sap NPA, Douc langurs are not hunted for religious reasons in a "spirit place" (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 15).

In the Dong Phou Vieng NPA, some villages with *Katang* and *Makong* populations observe hunting and harvesting taboos in sacred forests or locally protected forests, and protect primates, among other species (WWF, 1998c, p. 14 and Steinmetz and Baird, 1998 in WWF 1998c, p. 55). Hansen and Jeppesen (2004, p. 56) report the following taboos and customary rules observed by *Katang* communities in Savannakhet province:

- Hunting is prohibited in a burial forest
- Monkeys cannot be hunted in a sacred forest
- Large wildlife (boar, deer) shall be shared among the community
- Hunting in another village is allowed, but game shall be shared within the village

Steinmetz (2000, p. 36-39) describes how local communities in the Phou Hin Poun NPA observe hunting restrictions in specific habitats (e.g., forests, caves, limestone areas) that are believed to be inhabited by spirits (e.g., village spirit forests, spirit protectors) or during "Buddhist days" twice a month. In Nam Et-Phou Loey, most villagers surveyed by Vongkhamheng (2002, p. 68) exhibited such bans for religious (burial) places, as well as for environmental purposes (e.g., watershed protection).[43] In some *Khmu* villages, if someone shoots an animal in a burial forest

[42] Often in combination with a specific social group (e.g., pregnant women, elderly) and/or specific event (e.g., wedding, first harvest day, etc.)
[43] The ban pertains to any human activity (e.g., hunting, cutting trees)

and if someone subsequently dies in the community, sacrifices have to be made by the offender in the form of a pig or a buffalo (Vongkhamheng, 2002, p. 106). In Ban Phon Visai, Robinson (1998, p. 165) observed that people did not hunt bats for superstitious reasons, as they feared caves and darkness.

Taboos also apply to criteria other than species or location. Krahn (2005, p. 69) found that in *Katu* communities, taboos also applied to specific times of the year and to specific life cycles. In the Nam Et-Phou Loey, *Khmu* people observe a clan-specific taboo on totem animals from which the clan borrows its name (Vongkhamheng, 2002, p. 64). For example, Tamong is a *Khmu* clan name, meaning masked palm civet. For the clan, hunting, consuming, touching, or exhibiting parts of its totem species is taboo. Any action of this type is believed to bring bad luck or death (ibid, 2002, p. 107). While hunting, some populations (e.g., the *Ahlao)* may use "secret names" -- such as "*red teeth"* in lieu of bamboo rat -- in the belief that animals will run away if their proper name is pronounced (Chamberlain, 1997, p. III-13).

Krahn (2005, p. 69) noticed a change in attitude towards taboos. The dwindling importance of taboo concerns has affected primates, among others, which are now widely hunted, irrespective of their past social and religious importance (Krahn and Johnson, 2007, p. 21). Hunting taboos were found to be promising, but certainly not sufficiently effective, means to control commercial trade of wildlife (WWF, 2004, p. 95). Vongkhamheng (2002, p. 105) observed how some *H'mong* people gradually abandoned their hunting taboos in villages of the Nam Et-Phou Loey NPA.

Impact of Hunting on Wildlife

During a survey carried out in February and March 1996 in the Vientiane Forestry College Training and Model Forest in Sangthong district of Vientiane province, Duckworth (1996, p. 223) observed that the "mammalian sighting"[44] rate was much lower than the usual rate of one mammal per hour during daytime. Hunters met during the survey mentioned a sighting rate of one mammal per four hours for night incursions, while the usual rate in other areas of Lao PDR is one mammal sighting per 20 minutes at night. In central and southern Lao PDR, the average nocturnal contact rate with mammals was of one per hour (Steinmetz, 1998c, p. 18). Johnson, Singh, Duongdala and Vongsa (2003, p. 5) stated that "*wildlife populations are in serious decline from over harvest for subsistence and trade.*"

[44] Excluding bats and rats.

Summary Chapter 3.5: Subsistence Hunting (Harvesting)

It is generally acknowledged that people involved in subsistence hunting are rural communities relying on forest resources for their livelihood. "Mountain" people such as the H'mong are often mentioned to be more dedicated to hunting than other populations (e.g., the Lao Loum), as the latter have easier access to aquatic resources. However, virtually anyone living close to wildlife sources is to some extent involved in subsistence hunting. This includes not only rural communities, but also staff working in the extractive industries, as well as some government stakeholders, such as soldiers or policemen in camps.

Hunting occurs in various habitats, depending on the species of wildlife hunted and the local conditions. Although hunting is theoretically banned from core zones of the NPAs, it is likely to occur everywhere. Hunting pressure, where it has not yet extirpated most animals (empty forest syndrome), has pushed large mammals deeper into the forest to still-inaccessible grounds. Hunting in these tracts requires longer hunting parties, comprising several men. On the other hand, some species (e.g., civets and rats) seem to thrive under degraded habitat -- the so-called mosaic pattern combining forest, cultivated areas, and villages. For such species, hunting is easier and can be done by children or women in combination with other activities (e.g., rat trapping and other NTFP collection). As of 2004, the Nam Et Phou Loey NPA showed the highest incidence of subsistence hunting. It is therefore worth verifying if this is still the case so far and if so, to target this area for sample collection and awareness campaigns.

Factors influencing subsistence hunting are: the law, geography, natural cycles of wildlife and their ecosystems, natural obstacles and repellents (e.g., rain, leeches), human occupations and idle time, and periods of rice scarcity. In general, two main harvesting peaks are reported, one between July and September and the other during the dry season between October and March.

However, the evolution into a cash economy has led populations to increasingly neglect natural cycles and to hunt irrespective of animal behaviors and laws which forbid hunting during the breeding seasons of specific species.

Hunting methods are numerous and can be disaggregated into two broad categories: active (e.g., shooting, beating to death, netting) and passive (e.g., trapping, snaring) methods. Similarly, hunting devices are numerous and can serve active hunting (e.g., guns, bows, crossbows, slingshots, manual extraction from burrows) or passive hunting (e.g., snares, traps). Passive and active methods, as well as devices, can be combined (e.g., live trapping of bamboo rats and beating them to death). Methods and devices vary along the following main factors:

geography, cultural background of hunters, history, gender, age, local terrain conditions, targeted species, and seasonality.

It appears that hunting is heavily influenced by socio-cultural aspects or formulated through another perspective; socio-cultural aspects are reflected in hunting habits. Gender and age are the more obvious social factors affecting hunting, irrespective of ethnic background. Hunting is also influenced by rituals and taboos, which differ across populations. Taboos were found to be species-related (e.g., inedibility, lack of taste, spiritual embodiment), location-specific (e.g., sacred forests), season-specific, specific to life-cycles, and clan-specific. Taboos are generally on the decline and subsistence hunting is so widespread and increasing that it exerts considerable pressure on wildlife resources.

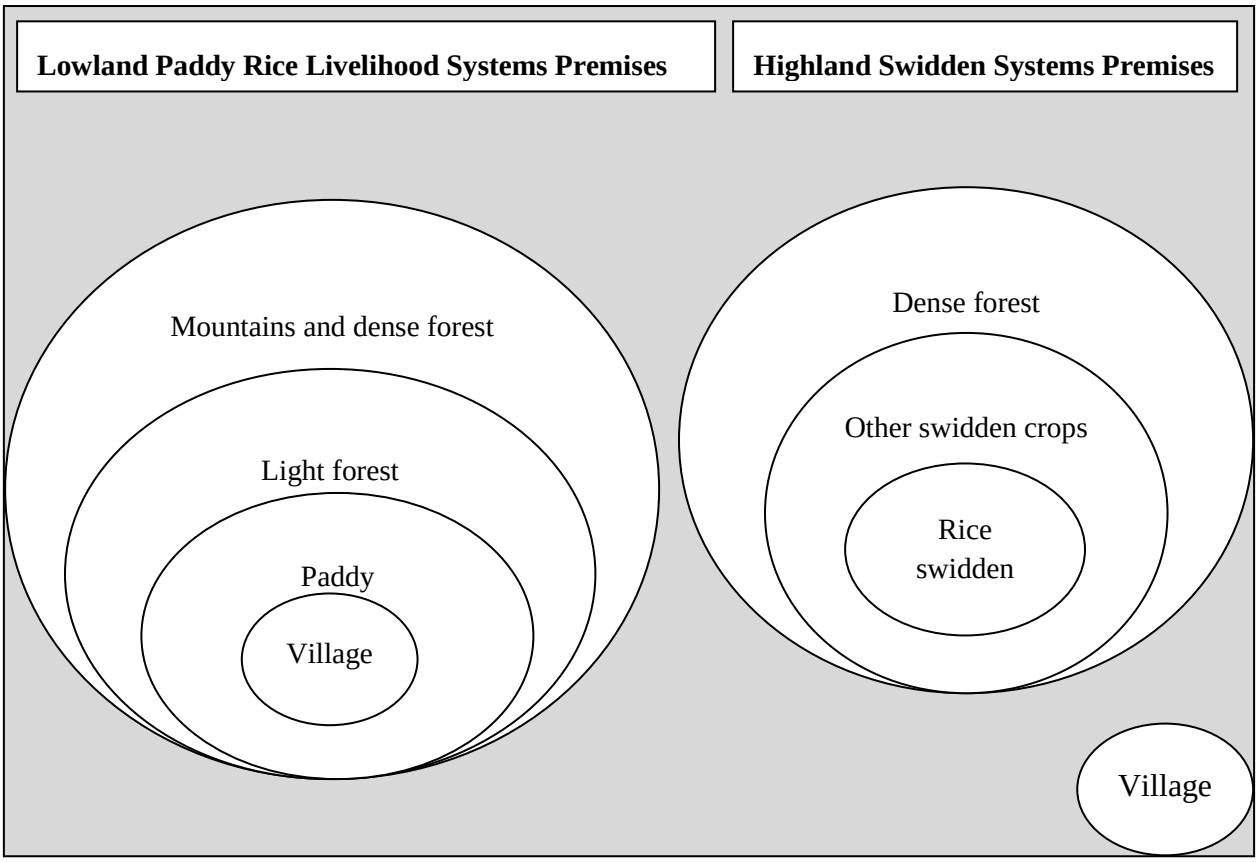
3.6 Household Consumption (Livelihood Consumption) of Hunted Animals

Importance of Subsistence Hunting in Livelihoods

As stated by ADB (2001, p. 80), "*livelihoods systems in Laos may be said to comprise (1) cultural beliefs (ritual technology), (2) land territory, (3) rice cultivation, (4) livestock, (5) corn, tuber and vegetable crops, and (5) natural resources (fish, wildlife and other forest products).*"

In Lao PDR, two main livelihood systems are distinguished, as illustrated by the following figure.

Figure 5 -- Livelihood Systems in the Lao PDR



Source: ADB (2001, p. 85).

NTFP, of which wildlife is technically a component, were estimated to make up 40% of the total rural income and to substantially contribute to food security (IUCN, 2001, p. 25). In these systems, wildlife, like other NTFPs, was found to be (IUCN, 1999, p. 86):

- Direct input to subsistence-oriented livelihoods
- Items which can be sold or bartered
- Resources collected or used by outsiders

ADB (2001, p. 93) observed that "*the most common form of compensating for rice shortages among poor villages was found to be consumption and sale of forest products*." This observation confirms observations made by Nooren and Claridge (2001, p.14), for whom many rural people have *"no affordable alternatives to wildlife foods or alternative ways of dealing with rice shortfalls*." Failing rice harvests, population increase, and lack of alternative protein sources put increasing pressure on wildlife (MoC and IUCN, 2000, p. 27). Alton and Sylavong (1997, p. AI-12), however, found the following strategies applied by villagers of Ban Navang in the NN-NPA to overcome rice shortages in 1997:

1. Increased gathering of forest plant products for consumption and sales
2. Increased planting of corn, roots and tubers
3. Increased sale of livestock
4. Increased fishing
5. Increased sales of wildlife

TRAFFIC (2008, p. 3) reminds that consumption of wildlife "*is heavily influenced by socio-economic factors such as people's tastes, aspirations and perceived needs, as well as their relative affluence or poverty and purchasing power*." NTFP harvesting, of which hunting/trapping is an important part, contributes both directly (consumption) and indirectly (barter, sale) to food systems (Clendon, 2001, p. 24). In the Phou Xang He NPA, sale of wildlife (along with other NTFPs and aquatic animals) was found to be one of several coping strategies used by poorer segments of the communities along with wage labor, sending children to the gold mine, selling handicrafts, and borrowing rice from relatives (Hansen and Jeppesen, 2004, p. 44). In the Phou Xieng Thong NPA, Southammakoth (1998, p. 33) found that all villagers interviewed depended "*on forest resources either for food, other household needs or cash income.*" Moreover, "*villagers hunt wild animals either big or small, regardless of what category of protection they are in, on sight, for home consumption, as well as for sale.*" In its participatory poverty assessment, ADB assessed that the "*poverty in Laos in not synonymous with hunger. Abundant natural resources have provided sustenance for poor villages, but these resources are showing signs of dwindling through over-exploitation in search of food or cash with which to purchase food and to meet the new expenses associated with health, education, and market*" (ADB, 2001, p. 143).

Nutritional Importance

"*Without forest resources the villagers say they would starve*" (ADB, 2001, p. 106). As IUCN (1999, p. 11) highlights, "*wildlife and other NTFPs are an important component in food security and general subsistence.*" Hedemark et al. (2006, p. 11) observed that "*villagers harvest considerable wildlife and NTFP to supplement food. This is especially true in times of crop failures due to drought and livestock death due to diseases. Villagers also use wildlife and NTFPs for traditional healing and maintenance of culture."* For Southammakoth (1998, p. 37), rice deficiency in villages around the Phou Xieng Thong NPA was the main driver behind people's reliance on forest resources and their destruction. Indeed, hunting of small animals (e.g., squirrels, rats) provides important sources of protein in times of rice scarcity (Hedemark, 2003, p. 23). Forest resources, including wildlife, are considered a safety net to compensate for rice deficiency (ADB, 2001, p. 97).

"*For many ethnic groups, wild meat, fish and other aquatic animals are the main sources of protein, fat, iron and other fat soluble vitamins*" (MoH, p. 7). Traditionally, hunting and gathering contribute more to the household protein intake than livestock rearing (De Beer et al., 1994, p. 21; Chamberlain, Alton, Silavong and Philavong, 1996, p. 38.; Foppes, Saypaseuth, Sengkeo and Chantilat, 1997, p. 6; Phaphouamphang, 2006). A country-wide participatory poverty assessment carried out in 2011 highlighted the fact that many villages depended on wild resources for meat, as domestic animals were "*reserved strictly for ceremonial purposes or maintained as symbols of wealth and status or as social safety nets*" (ADB, 2001, p. 97).

The same survey assessed the percentage of the non-rice diet provided by forest resources (meat and vegetables) for the main population groups, as shown by Table 10.

Table 10 -- Percentage of Non-rice Diet Comprised of Wild Food (meat/vegetables)

	Mon-Khmer	**Tibeto-Burmese**	**H'mong-Mien**	**Lao-Tai**	**Total**
North	68/73	66/63	38/46	50/50	61/65
East	85/84	-	55/35	76/72	79/75
Central	92/88	-	5/30	90/80	67/71
South	93/79	-	-	92/78	93/79
Total	82/79	66/63	35/40	81/74	74/71

Source: ADB, 2001, p. 97.

Overall, wild meat resources were estimated to make up 74% of the non-rice diet. *Mon-Khmer* people of the South showed the highest reliance on wild meat sources, while *H'mong-Mien* people of the Center were the least reliant on wild meat as they purchased meat from markets.

The overall rather low reliance of *H'mong-Mien* groups was imputed to the fact that they had been relocated to places with scarce forested areas (ADB, 2001, p. 97).

IUCN (1999, p. 86) found that out of 279 edible NTFPs (e.g., shoots, vegetables, tubers, fruit, mushrooms, wildlife) collected by villagers in the Nakai-Nam Theun NPA, 148 were wildlife.

In a survey carried out in nine villages[45] of the previous Khammouane Limestone NPA, Claridge and Phanthavong (1996, p. 2) distinguished three groups among communities. The main criteria for the distinction were the communities' reliance on the NPA:

1. Those who depend on the NPA for their essential protein supply;
2. Those who depend on the NPA for income from products harvested there (NTFPs); and
3. Those with little dependence

Communities most reliant on the NPA for protein supply were the ones with low access to fish resources. The authors expected that the number of people in this group would increase in the future due to population increase and declining fish stock. Wild animals caught by villagers were mainly small mammals: porcupines, squirrels, and rats. Primates, such as macaques and Francois langur, were caught for food as well. Domestic species were mostly considered as festival food, squirrels were occasionally sold (Claridge and Phanthavong, 1996, p. 9-20). In Ban Boneng, a village with a high dependency on cash income from the tin mine, wage work was allowed to buy rice. There, chickens, pigs and buffaloes were not regarded only as festival food, but as daily protein sources as well. In this village, people disregarded small wild mammals (e.g., squirrels, rats) as important protein suppliers (Claridge and Phanthavong, 1996, p. 12). In Ban Thatthot, the sale of NTFPs (rattan shoots and canes, *kisii*[46]) for cash allowed people to buy beef from the Gnomalath market on a daily basis. There, the dependence on wild animals was very low (ibid, p. 19). In general, hunters noted that they would stop hunting if they could get the same amount of protein from less-distant areas (e.g., vicinity of their village) (ibid, p. 2). A survey carried out in 2006 in eight villages of the Integrated Ecosystem and Wildlife Management Project (IEWMP) around the Nam Kading NPA (in Bolikhamxay province), assessed that out of 338 items listed as forest resources, 240 items (71%) were identified as food sources. Among the latter, 65 items (27%) were fish, 71 items (30%) were plants, and 104 items (43%) were wildlife (Hallam and Sisavath, 2007, p. 8). In a survey carried out in four villages of the Nam Kading NPA (n=84 households), Phaphouamphang (2006) found that meat consumption came from fish (48%), followed by wild animals (27%) and domestic animals (25%).

[45] Ban Phonethong, Ban Phondou, Ban Boneng, Ban Houana, Ban Naphouak, Ban Nakham, Ban Konglo, Ban Louang, Ban Thatthot
[46] Damar resin (parashorea spp.)

One of the most recent surveys on nutrition in Lao PDR, carried out in June 2011 in two villages in Sing district (in Luang Namtha province) and two villages of Xay district (in Oudomxay province) within the Northern Uplands Rice Based Farming Systems Research (NURIFaR) project showed that wildlife is ranked equal to meat from domestic animals in terms of importance. The diversity of wildlife (41 species)[47] was, however, much wider than the spectrum of domestic meat (eight types)[48] (Foppes et al., 2011, p. 29).

Steinmetz and Baird (1998 in WWF, 1998c, p. 50) assumed "*an inverse relationship between reliance on fish and wildlife, so that abundant fish resources may prevent increases in the reliance on wildlife and NTFPs for food or income.*" Round (1998, p. 128) warned that large-scale fishing with poison and dynamite in the proposed Dong Khanthung PPA will result in over fishing and ultimately push villagers to increasingly target wildlife for protein consumption. Johnson, Singh and Duongdala (2003, p. 199) report that wildlife and fish made up 66% of the overall weekly meat consumption of various ethnic groups interviewed in Luang Namtha. In the Phou Hin Poun NPA, some villages rely on "*small game such as rats, squirrels and porcupines and birds [which] supply most of the protein for seven months of the year*." In villages with poor aquatic resources, rodents, mainly rats, were the most frequent source of protein (Steinmetz, 1998b, p. 12).

In a survey carried out in Viengthong district in Houa Phanh province, Schlemmer (1999, p. 5) found from a panel of 45 households that, on an average, 65% of the meat consumed came from wildlife (between 44% and 80%). He found that the bulk of wildlife consumed was small mammals.

Out of 50 households interviewed, 48 responded and 23 stated that they hunted one to two large animals (e.g., wild pig, deer) per year (ibid, p. 7-8). On the other hand, 47 out of 50 households hunted small wildlife, mostly squirrels (42 HH) and rats (36 HH). Civets and bamboo rats were hunted by nine families. In terms of absolute numbers of heads, a household captured more rats than squirrels (35.5 and 22.5, respectively, per year). In terms of weight, intake of squirrels slightly outweighed intake of rats, with 5.5 kg/HH/year, against 5 kg/HH/year (taking an average of seven rats per kg and four squirrels per kg) (Schlemmer, 1999, p. 9).

IUCN (1999, p. 20) noted that most protein is supplied by trapped wildlife (such as rats and hog badgers), as well as aquatic resources. Clendon (2001, p. 25) assessed that wild meat make up between 44% and 99% of all NTFP collected by *Katang* communities during the dry season. During the wet season, their diet was composed mainly of plant products. She assessed that some households entirely relied on forest resources for their protein intake, while others relied predominantly on reared livestock. Iron intake was covered mostly by wild animal consumption.

[47] Encompassing the broad spectrum of aquatic resources, insects, non mammals and mammals.
[48] In order of importance: chicken, ducks, pigs, cattle, dogs, buffalo, goats, fish.

Foppes, Saypaseuth, Sengkeo and Chantilat (1997) found that villagers interviewed in the Nam Theun-Nakai area could identify 306 NTFP species, out of which 223 were food and 67 were non-food species. Among food species: 50 were edible leaves, 50 fruit, 31 mammals, and 28 fish. People considered wildlife (along with *kisii* resin, fish/frogs, edible rattan shoots and cardamom) as the main edible forest resource.

Out of 303 NTFPs identified by villagers in the NN-NPA, 24 were non-food items, 279 were food items, among which 131 were vegetable and 148 wildlife (IUCN, 1999, p. 86). Wildlife was ranked third both by *Brou* women and men in Makfuang village on a scale ranging from one (highest importance for subsistence use) to nine (lowest importance for subsistence use) (IUCN, 1999, p. 19). In Attapeu province, Malayan porcupine, Douc langurs and civets were among the 18 most important NTFPs collected by three villages for subsistence in 1999 (Epprecht, 1999, p. 17). In four villages of Dong Phou Vieng NPA, wildlife was consumed by 78% (n=117) of the households interviewed (Hansen and Jeppesen, 2004, p. 38). The same authors found that wildlife is traded for consumption within the two villages[49] surveyed in the Phou Xang He NPA (Hansen and Jeppesen, 2004, p. 41). Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 25) showed that although wildlife was less consumed than fish, it was still an important component of the daily diet in some villages of Attapeu province. Krahn (2003, p. 6) highlighted the nutritional importance of wildlife, including civets, rats, and monkeys, in the diet of upland communities with regard to protein, fat, and essential elements such as zinc, iron, vitamin B_1 and B_2. She highlighted the fact that *Katu* communities show a marked preference for meat over vegetables and for wildlife meat with high fat content. According to her, these preferences derive from a calorie optimization reflex (Krahn 2005, p. 79). She, however, noticed that small mammals increasingly make up the bulk of wildlife consumed on a subsistence basis (Krahn, 2003 p. 6).

In Saravan province, Clendon (2001, p. 18) found that human impact on the environment (e.g., population growth, logging and rice cultivation) resulted in "*ecological decline to remaining forests nearby villages. Only small wildlife, edible plants and mushroom remain*." This outcome is in line with results obtained by Johnson, Singh and Duongdala (2003, p. 200) in Luang Namtha province. According to them, rodents, birds, wild fowl, and frogs made up 87% of wildlife sold by villagers. Krahn and Johnson (2007, p. 23) observed a gradual and irreversible shift in wildlife consumption from large-sized mammals to small-sized (less than two kg) ones. For these researchers (ibid, p. 25), this shift results in a lower-calorie intake, as small mammals, amphibians, and crustaceans are poorer in fat than large-sized mammals (e.g., deer, primates). Krahn (2005, p. 75) assessed that the "modernizing" way of life of *Katu* communities, among others the intensification of their livestock production, did not make up for the marked decrease in opportunistic hunting.

[49] Paphaknao village with 65 households and 387 inhabitants, and Nasalor village with 75 households and 478 inhabitants, Phin district, Savannakhet province.

Krahn and Johnson (2007, p. 19) postulate that a decrease in wildlife consumption coupled with a partial and incomplete substitution of meat from domestic livestock species, created a dietary imbalance within upland communities.

Economic Importance

During a ranking exercise carried out with villagers in the Nam Theun-Nakai area, Foppes, Saypaseuth, Sengkeo and Chantilat (1997, p. 19) assessed that NTFPs accounted for 76% of the family income, and livestock rearing for 16%. Within NTFPs, *kisii* resin accounted for 14% of the sales, fish for 12%, cardamom for 11% ,and wildlife for 10%.[50] A deeper survey carried out with 100 out of 1,919 households in the same communities showed that 41% of their total income is derived from NTFPs, 32% from livestock, and 28% from other sources.

Clendon (2001, p. 33) estimated the monetary contribution of NTFPs in the total diet of *Katang* communities. She found that forest foods make up 11% of the monetary value of the dry season diet and 19% of the monetary value of the wet season diet. Foppes and Kethpanh (1997, cited in Nooren and Claridge, 2001, p. 15) found that wildlife was the second-largest cash-earning opportunity for rural households, after fishing. Duckworth, Salter and Khounboline (1999, p. 38) emphasize the fact that economic benefits generated by hunting cannot be disaggregated into household consumption and market sale, as the proportion of commercialized wildlife varies greatly. According to the same authors, sale of wildlife depends on an array of factors such as ethnicity, distance to markets, seasonality, and catch rate. Hansen and Jeppesen (2004, p. 62) found that wildlife (mainly small mammals) was among the 10 most important NTFPs traded by villagers in four villages of the Dong Phou Vieng and Phou Xang He NPAs.

Social Importance

Clendon (2001, p. 33) notes that the "*intrinsic worth of consumption of forest foods has to do with their cultural and social significance, whether used as customary daily food, gifts or for ceremonial occasions.*" Villagers expressed different preferences for domestic meat over wildlife and vice versa, depending on their location and cultural background. Johnson, Singh and Duongdala (2003, p. 202) assessed that the most frequently hunted species are the most frequently consumed (or sold for food) species as well. Species sold for medicinal purposes were less-frequently hunted, but were ranked by villagers as "*the most valuable for trade*" (Johnson, Singh and Duongdala, 2003, p. 203).

[50] Among others, squirrels, tree shrews, primates, rodents, porcupine, binturong, civets.

Alternatives to Wildlife Harvesting

Southammakoth (1998, p. 35) states that the "*livelihood is one of the most important driving forces determining the pattern and extent of dependency on forest resources by people*." IUCN (1999, p. 85) assessed that "*agricultural and livestock production are insufficient to meet dietary and other consumption needs.*"

Clendon (2001, p. 25) found that wild meat consumption by *Katang* communities was not affected by the availability of home-produced meat. Better-off communities with livestock production even tended to consume more wild meat than poorer communities. Krahn (2005, p. 79) showed that hunting was viewed by *Katu* communities as less risky and less energy consuming than domestic livestock rearing. Tobias (1997, p. 45) warned that potential alternative protein sources to wildlife should be evaluated carefully. Large livestock is generally not consumed but is considered as a repository of wealth. Feasible alternatives would be small livestock and fish. Domestic livestock species, on the other hand, are considered "*festival food*" and potential sources of cash (Meusch, Yhoung-Aree, Friend and Funge-Smith, 2003, p. 13). Krahn (2003, p. 9) further emphasized the fact that, for the time being, wildlife as the main source of protein in the diet of upland communities cannot be sustainably replaced by other sources. Krahn and Johnson (2007, p. 23) state that "*the consumption of domestic meat is particularly related to sacrifice and not part of the daily diet*"; pork, poultry or beef are usually associated with weddings, funerals or birth festivities (ibid, p. 23-24). This confirms findings made by Chamberlain, Alton, Silavong and Philavong (1996, p. 38) with *Bo*, *Brou* and *Ahoe* populations on the Nakai Plateau. De Beer et al. (1994, p. 22) observed that domestic animal species are too expensive for subsistence consumption compared to wildlife. Schlemmer (1999, p. 15) observed that domestic animals are mainly consumed after being sacrificed for religious ceremonies or healing rituals and do not serve nutrition purposes as wildlife does. Krahn and Johnson (2007, p. 20) view a combination of wild and domestic sources of meat as a means to reach a nutritional (in terms of fat, protein, etc.), social (meat is shared among members of the community), and spiritual (domestic animals used as offerings) balance.

Volume

Duckworth, Salter and Khounboline (1999, p. 13) emphasize that wild meat is part of the daily diet of rural communities and that most of the meat consumed originates from wild captures, including aquatic resources. Timmins, Evans and Duckworth (1993a, p. 24) observed that "*almost any animal sizeable enough to be eaten seems to be taken.*" Duckworth, Salter and Khounboline (1999, p. 12) report that the scope of human use of wildlife for food, trade and medicinal purposes is so wide that it encompasses most, if not all, vertebrate taxa. Duckworth, Salter and Khounboline (1999, p. 12) view the high pressure imposed on wildlife by hunting as a tradition driven by subsistence needs, rather than as a necessity deriving from the wars which affected the region over the last century.

According to Robichaud, Hedemark and Johnson (2002, p. 36), Lao Ngam in southern Lao PDR (in Champassak province) is the region in Lao PDR where wildlife is the most depleted among all other regions surveyed. Villagers claimed: "*We shot and ate them all.*" In 1995, Schaller (1995, p. 2) evoked the pressure on wildlife in these terms: "*Wildlife in Laos is so heavily trapped and shot, that it is scarce and elusive, seldom seen. The best place to observe animals is in the town markets where dead animals are sold for food.*"

Schlemmer (1999, p. 39) was told by villagers in Houa Phanh province that most wildlife resources were in decline,[51] as opposed to wild plant resources, which showed a higher proportion of constant[52] or even increasing[53] volumes. A relatively recent survey in 10 villages in the Xe Pian-Dong Houa Sao NPAs showed that wildlife harvesting of small mammals and birds is increasing and resources are getting so scarce that they reach local extinction for some species (ADB, 2008, p. 65-75).

Phrai villagers in Xayaburi province complained that the availability of all favorite species, such as civets, macaques, gibbons, and hog badgers, has drastically been reduced by intensive hunting (WWF, 2006, p. 105) and that "*the problem of wildlife hunting is three times as bad as it was in the past (20 years ago).*" For the villagers, dwindling resources had an impact on their food and income resources. In Attapeu province, a survey team found that wildlife was rarely consumed by villagers.[54] The following reasons were evoked for such an outcome (Meusch, Yhoung-Aree, Friend and Funge-Smith, 2003, p. 13):

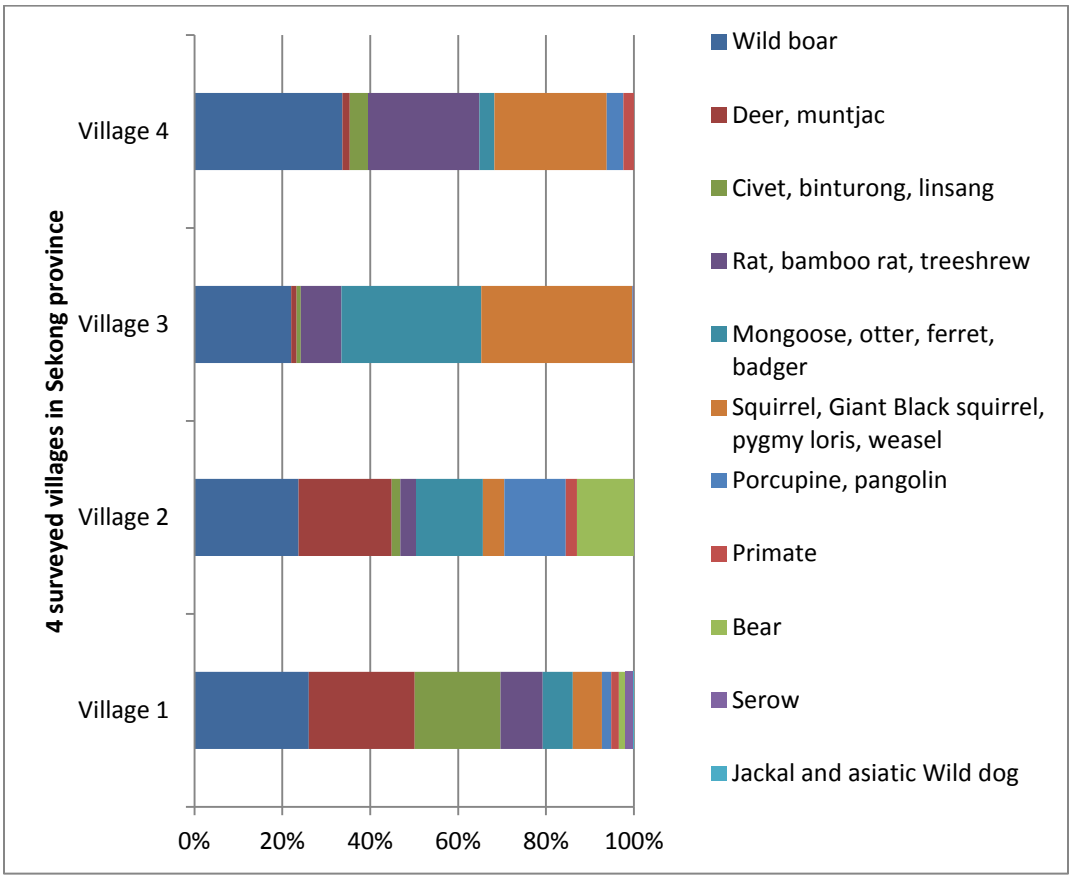
- Under-reporting due to ban on hunting since 1997
- Seasonal hunting
- Hunting is a male occupation; households without a valid male hunter do not consume wildlife
- Households with a large choice of wild food opt for food items more readily available (e.g., fish, aquatic resources)
- Declining wildlife availability
- Relationship between food acquisition and food behavior

The following paragraph summarizes excerpts of surveys mentioning volumes of wildlife consumed or harvested for consumption.

[51] 20 households
[52] 9 out of 64 plants
[53] 34 out of 64 plants
[54] Comprising three villages with Su (Mon-Khmer), Lao and Oy (Lao Theung) ethnic population

- From a panel of eight households interviewed in **Houa Phanh province**, Schlemmer (1999, p. 16) estimated that each household (average of 4.25 consuming units) consumed 141 kg of wildlife meat per year (against 132 kg of meat from domestic animals). Wildlife meat made up 37% of the total food consumption in monetary terms.
- Robinson and Webber (1998) found that inhabitants of a village visited in the previous **Khammouane Limestone NPA** in 1995 harvested two 50-kg rice sacks of bats from the *Tam Kichia* (=bat guano cave) colony.
- Krahn (2005, p. 100) estimated the per capita daily intake of usable meat and edible parts (UMEP) from wild mammals in four villages **in Sekong province**. She found large discrepancies across villages depending on their location. Overall, wild boars made up between 22% and 33.7% of the UMEP consumption. The consumption of squirrels was significant as well. They made up between 6.6% and 34.3% of the UMEP consumption.

Figure 6 -- Composition (in %) of Annual Wildlife Mammal Usable Meat and Edible Parts Consumption per Capita per Day in Katu Communities in Sekong Province



Source: Krahn (2005, p. 100).

Krahn (2005, p. 100-101) found that the estimated annual usable meat (UM) availability per capita was the highest in village one with 53.2 kg, followed by village two (14.7 kg), village three (7.6 kg) and finally village four (1.3 kg).

According to Krahn's estimations (2005, p. 102), annual wildlife kill rates in four *Katu* villages in Sekong province declined for many species and increased for others. Large discrepancies were observed across villages, depending on their location and species availability.

Species Preferences

Wildlife meat is usually preferred over meat of domestic animals (De Beer et al. 1994, p. 21-22; IUCN, 1997, p. 6). In villages of Viengthong district (Houa Phanh province), Schlemmer (1999, p. 16) observed that while six species[55] of domestic animals and fish were raised and occasionally consumed, over 100 species of wildlife, insects, and wild aquatic resources were consumed. Wild resources are favoured, as they display a large spectrum of flavors and tastes. Vongkhamheng (2002, p. 114) assumed that most species hunted for subsistence were not only more common, easier to hunt and of low value compared to the ones harvested for Chinese medicine, but also tastier.

According to Steinmetz (1998c, p. 9), wild pigs, muntjac and porcupines are often the most commonly hunted mammals in NPAs. Salter (1993a, p. 8), as well as Duckworth, Salter and Khounboline (1999, p. 13 and 16) summarized findings of village interviews conducted between 1988 and 1993 throughout Lao PDR and pertaining to wildlife consumption: out of a panel of 317 interviewees, 24.6% reported that squirrels are among the three most common wild meat eaten. Civets were mentioned by 21.8% of the interviewees, primates by 12.6%, rodents by 8.8% and porcupines by 5.7% of the interviewees. In a survey carried out in seven villages in the Nam Et-Phou Loey NPA in 2001, Vongkhamheng (2002, p. 70) revealed the following ranking in terms of most hunted animals: (1) squirrels, (2) red jungle fowl, (3) pheasants, (4) common barking deer and (5) wild pigs. The same author, however, noticed substantial differences across villages, even within the same ethnic community. Some may find badgers and leopard cats a delicacy, while others prefer squirrels and jungle fowl (Vongkhamheng, 2002, p. 86).

The long-term importance of squirrels in the diet of rural communities was confirmed by a more recent survey carried out by Johnson, Singh and Duongdala (2003, p. 200) in 26 villages in Luang Namtha province, encompassing six ethnic groups.[56] The authors found that two squirrel species (Red-cheeked and Pallas) were the most-hunted species for food. Bamboo rats were ranked at the fourth (after a bird species). The *Akha* population interviewed by the same authors reported a preference of wildlife over domestic animal species. Krahn (2005, p. 81) found the opposite results in *Katu* communities in Sekong province.

[55] Chicken, ducks, turkeys, pigs, buffaloes, cows.
[56] Akha (14 villages), Khmu (3), Mien (3), H'mong (2), Kui (1) and Tai (1).

Villagers she interviewed ranked fish as their preferred meat, followed by chicken and buffalo meat. Meat from wild mammals was as much appreciated as buffalo meat, while meat of medium- and small-sized mammals was usually less appreciated. Krahn (2005, p. 82) assumes that the high consumption of wildlife meat in the past derived from its abundance. She observed that the craving for wildlife is nowadays rather a lowland consumers' affair. Krahn (2005, p. 99) further assessed that wildlife was abundant in upper villages of Sekong province until the beginning of the war.[57]

Large-sized mammals started decreasing from the early 1980s, while small mammals were still abundant. The latter started declining in the 2000s.

WWF (2006, p. 99) carried out interviews with a panel of 65 *Phrai* households in Xayaburi province and found the following results: common palm civet was hunted by 40% of the HH, Indian civet by 9% of the HH, Pallas squirrel by 84% of the HH, mice by 26% of the HH, porcupines by 51% of the HH, and bamboo rats by 62% of the HH. In contrast to most other populations and similar to *Katu* people in Sekong province, *Phrai* people seem to prefer fish (50% of the HH) to meat of domestic animals (36%) and meat of wildlife (14%). Fish made up 50% of the protein intake and was consumed six times per week, compared to twice a week for wildlife meat.

Payne, Bernazzani and Duckworth (1995, p. 35) found that fishermen and *mai dam* collectors met during a survey in the Phou Khao Khouay NPA feasted primarily on squirrels, porcupines and birds while camping in caves or in bamboo shelters.

The following paragraphs present results disaggregated by species.

Primate order: *cercopithecidae* (monkeys), *hylobatidae* (gibbons), and *loridae* (lorises)

Duckworth, Timmins and Cozza (1993, p. 29) found that all primates were hunted in Phou Xang He conservation area, but were not always eaten, as some villages would not consume them. Ruggeri and Timmins (1996, p. 3) report that hunting pressure on primates was intense and that their only protection in the 1990s was offered by the large, intact forest tracts. Inhabitants of Taling village in the Dong Phou Vieng NPA acknowledged that their subsistence hunting practices caused a decline in the local primate population (Steinmetz and Baird, 1998, cited in WWF, 1998c, p. 50). In the same area, Steinmetz and Baird (1998, cited in WWF, 1998c, p. 57) report that "*most primates experience some level of human predation but this was reported to be highly species-specific*."

[57] Second Indochina war=Vietnam war (1959-1975), civil war in Laos (1953-1973).

Cercopithecidae (macaques, langurs)

All monkeys are virtually prone to be hunted. *H'mong* hunters reportedly hunt all monkeys (Alton and Sylavong, 1997, p. B I-7). WCS (1995a, p.28) report that **macaques** were often seen close to villages in the Nam Theun area and, as a diurnal species, were "*heavily hunted.*" Bergmans (1995, p. 290) was told by villagers in Ban Dakling (Sekong province) that they killed up to a hundred macaques per year. In Phou Hin Poun NPA, small-sized macaques were consumed, while large macaques (Assamese) were rarely hunted (Steinmetz, 1998b, p. 13). Boonratana (1997, p. 18) found a freshly killed adult male pig-tailed macaque in a hunter's backpack in the Nam Phoui NPA. The same author reports that macaques (pig-tailed and Assamese) were "*threatened by hunting for food and capture of young ones for sale*." Adult macaques are often considered as major pests in agricultural activities and are hunted for consumption (Duckworth, Salter and Khounboline, 1999, p. 179). In some villages of the Dong Phou Vieng NPA, macaques were perceived as crop raiders and were regularly eaten but their population did not decline (Steinmetz and Baird, 1998, cited in WWF, 1998c, p. 57).

Macaques are mainly hunted for food and to some extent for the live market (WCS, 1996b, p. 21). Indeed, according to Nash (1997, p. 18), macaques were often hunted for recreational purposes although their sale was illegal. Nash mentioned that juvenile macaques kept as pets were usually killed for consumption once they attained adulthood (ibid, p. 18).

Among primates, Douc langurs, identified in six NPAs throughout Lao PDR by the end of the 1990s (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 16), seem to be specifically hunted for their meat (Salter, 1993a, p. 17; Duckworth, Salter and Khounboline, 1999, p. 179; Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 16). Their meat is often considered as a delicacy (e.g., in Attapeu province (Davidson et al., 1997 p. 25)). Duckworth et al. (1994, p. 193) found a Douc langur destined for food in Ban Phonsavang in the Phou Xang He NPA. In the Dong Khanthung PPA, langurs were reported to be more easily shot than macaques and their meat was favored (Round, 1998, p. 38). In Ban Taigeu in the Dong Amphan NPA, up to 50 Douc langurs were hunted annually[58] (Davidson et al, 1997 in Timmins and Duckworth, 1999, p. 482). Douc langurs are also traded as pets to Thailand, but to a lesser extent than other monkey species (Salter, 1993a, p. 17). Other langurs (Phayre's langur) were also threatened by hunting for food (Boonratana, 1997, p. 18). In the Phou Hin Poun NPA, Francois langurs were commonly consumed, while Douc langurs were rarely eaten (Steinmetz, 1998b, p. 13).

[58] By 18 villagers involved in hunting of Douc langurs

Hylobatidae (Gibbons)

Although gibbons do not interface with people or compete with the latter's resources (MAF, 2011, p. 3), they are highly threatened by hunting (MAF, 2011, p. 12). Tobias (1997, p. 35) mention that gibbons are, along with black giant squirrels, the favored wild species for meat. Indeed, gibbons are hunted for food in the central Annamites (Duckworth, Salter and Khounboline, 1999, p. 181) (e.g., in the Phou Hin Poun NPA (Steinmetz, 1998b, p. 13)), in the Phou Xang He NPA (Duckworth et al., 1994, p. 194) and in the Nam Phoui NPA, in Xayaburi province (Boonratana, 1997, p. 18). In the latter NPA, hunting for food was still prevalent in 2010 (Phiapalath and Saisavanh, 2010, p. 20). While gibbons were only occasionally hunted in the Xe Pian NPA in the 1990s (Duckworth et al., 1994, p. 194), later reports show that gibbons were hunted in the southern provinces of Champassak and Attapeu (FMCP, 2000, p. 20). According to Davidson et al. (1997, p. 26) in Attapeu province, gibbons are highly appreciated for their meat and ranked second after meat of Douc langurs. *Akha* communities in Luang Namtha hunt gibbons for their meat and their fur (Hedemark, 2003, p. 50). Showler, Davidson, Vongkhamheng and Salivong (1998, p. 16) report that gibbons are regularly hunted for meat, bones, and infant trade.

On the other hand, hunting gibbons is shunned in some places (Salter, 1993a, p. 18; MAF, 2011, p. 13). Duckworth (2008, p. 25) summarized findings from several surveys and interviews and found that gibbons are not considered a favored food item in some areas (e.g., in the Xe Pian NPA), while they were in others (in the Dong Amphan NPA). During earlier research, the same researcher and his team, however, found that villagers in the Xe Pian NPA used to hunt gibbons for food (Duckworth et al., 1995, p. 19).

Loridae

In the Sepon Development Project Area (SDPA) in Savannakhet province,[59] villagers reported the existence of two species of lorises (a small[60] and a large one[61]), both reported to be common. However, villagers reported that they do not catch them, as they are considered inedible (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 13). In the NN-NPA, some villagers eat lorises, although they are not a favorite meat (Alton and Sylavong, 1997, p. AI-10). Investigations made by WCS-PREDICT project in Saravan, Champassak and Attapeu provinces between November 29 and December 3, 2011, however, showed that lorises are extensively[62] traded not only as pets, but for food as well (Source: WCS-PREDICT project primary data).

[59] Sepon Copper and Gold Mine by Lan Xang Minerals.
[60] Assumed by the authors to be pygmy loris.
[61] Assumed by the authors to be either slow loris or intermediate loris.
[62] 23 animals, dead or alive, recorded in total within six days at several markets.

Carnivora Order

Mustelidae (Hog Badgers, Ferret Badgers, Weasels, Otters, Martens)

According to Duckworth, Salter and Khounboline (1999, p. 184) between 10 and 13 mustelidae species were found in the Lao PDR by the end of the 1990s. Badgers seem to be eaten by specific ethnic groups in Attapeu province and around the Nam Theun basin. Indeed, hog badgers are hunted and consumed by specific Vietic populations (*Atel, Mlengbrou and Phong). Toum* people report that the flesh of this species is strong smelling but good for the health. Eating hog badgers reportedly confers a strong body odor to the consumer as well (Chamberlain, (1997, p. III-7). Hog badgers provide the main source of meat for *Atel* people (ibid, 1997, p. III-24). *Sek* people in Ban Beuk in the NN-NPA do not consume hog badgers (Alton and Sylavong, 1997, p. A V-11). Robichaud and Stuart (1999, p. 39) found smoked hog badger feet at a Vietnamese poachers' camp. Hog badgers were on the list of the most endangered species in the Xe Pian NPA (FMCP, 2000, p. 92).

In the Nam Et-Phou Loey, Johnson, Vongkhamheng and Saithongdam (2009, p. 8) found that hog badgers were recorded at only 5% of the trap places, against 16% for yellow-throated martens, the most recorded small carnivores (among 14 camera-trapped species). No evidence of hunting martens for food was found. Martens are reported to have an extremely smelly meat and thus cannot be eaten (Chamberlain, 1997, p. III-24).

Viverridae (Civets, Binturong and Linsang)

The meat of viverridae is commonly consumed in tropical and sub-tropical regions of the world, where they contribute to the protein intake of local communities (IUCN, n.d., p. 24). Hunting viverridae is common in China, Taiwan and Vietnam (IUCN, n.d. p. 26).

Some civet species are frequent in Lao PDR. From records of camera trapping made in the Nam Et-Phou Loey NPA, Johnson, Vongkhamheng and Saithongdam (2009, p. 8) found five species of civets,[63] including Owston's palm civet. A large Indian civet was recorded at the largest proportion of camera-trapped sites (9%), while the "*masked palm civet was the most widely detected viverrid, with records ranging across 89% of the altitudes surveys*." The common palm civet was detected at 7% of the sites.

[63] Common Palm Civet, Large Indian Civet, Palm Masked Civet, Small Indian Civet, Owston's Palm Civet

De Beer et al. (1994, p. 24) observed that, except for Owston's palm civet and binturong,[64] which are in the Category I list (prohibited to hunt) of the wildlife law, other small carnivores are in Category II (managed species), which "*can be harvested outside the core zone but off-take is limited by season and the type of gear allowed.*"

Salter (1993a, p. 21) mentions that common palm civet was frequent around human habitations. This species is also related to degraded habitats (Payne, Bernazzani and Duckworth, 1995, p. 30; Duckworth et al., 2010, p. 67) and seems to survive heavy hunting pressure (Duckworth et al., 2010, p. 67. Duckworth et al. (2010) observed that the common palm civet is one of the most frequently encountered small carnivores during night surveys and camera trapping in Lao PDR. Civets are frequently hunted (Duckworth, Timmins and Cozza, 1993, p. 29) and consumed in rural areas (Alton and Sylavong, 1997, p. BIV-8; WWF, 1998c, p. 14; Duckworth, Salter and Khounboline, 1999, p. 191; FMCP, 2000, p. 102) or traded as food item (Davidson et al., 1997, p. 76; FMCP, 2000, p. 102). However, according to Steinmetz (1998b, p. 6) in the Phou Hin Poun NPA, "s*mall Indian civets and masked palm civet were consistently reported to be inedible, with bad smelling and bad tasting meat."* The same author found that the most trapped civets were: (1) common palm civet, (2) small-toothed palm civet, and (3) large Indian or large-spotted civet. By 2008, the large-spotted civet was considered to be rare (ADB, 2008, p. 13). Ban Louang villagers (in the previous Khammouane Limestone NPA) hunted civets in the fruiting season (Claridge and Phanthavong, 1996, p. 17).

In the past, binturongs used to be widespread throughout Lao PDR (Salter, 1993a, p. 21) and were valued as a delicacy in some parts of the country (Duckworth, Salter and Khounboline, 1999, p. 190). According to the latter authors, binturongs had a relative proximity to humans, as they prey on fruit, are partially diurnal, and are not particularly shy. Vongkhamheng (2002, p. 85) found that binturongs are hunted for food in Ban Sakok in the Nam Et-Phou Loey NPA. Binturong bones are used in traditional medicine preparation (Robichaud and Stuart, 1999, p. 39). In Houay Tjuang village, in the previous Hongsa special zone (in Xayaburi province), people believe that binturongs cannot be killed by a knife (Bergmans, 1995, p. 294) and killing binturongs is taboo in *Kri* populations (Chamberlain, 1997, p.III-24). A few authors report that binturongs have become rare at the local level (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 16) and even at the national level (Johnson, Vongkhamheng and Saithongdam, 2009, p. 12).

No evidence of consumption of linsang was found. Villagers around the Sepon Mine Project area reported occasionally seeing spotted linsang, but confusion with spotted cats was suspected by the authors of the survey (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 13).

[64] Aside all otters, striped-backed weasel, yellow-bellied weasel, spotted linsang, leopard cat, Asian golden cat and marbled cat

Herpestidae (Mongoose)

None of the documents read provided information on the consumption of mongoose.

Small Mammals (Scandentia, Rodentia and Chiroptera Orders)

"*Mammalian diversity in tropical forests is usually composed of bats and rodents*" (IUCN, 1997, p. 14). Guillén, Francis and Salivong (1997, p. 1) stress the "*amazing diversity of bats and other mammals in Lao, including many rare and previously unknown species*." Francis, Guillén and Vongkhamheng (1997, p. 9) note that bats and small mammals represent a high proportion of the mammalian biodiversity in southeast Asia. The following anecdote illustrates this matter of fact: at a camp near a cave, Robinson and Webber (1998, p. 28) found the remains of the following small mammals caught for food by hunters: **bats** (*rousettous amplexicaudatus, Megaderma Lyra*), **squirrels** (*callioscurus erythraeus, callioscurus finlaysonii, l. Edwardsi*) and brush-tailed **porcupines** *(Atherurus macrourus).*

Scandentia Order

***Tupaiidae* (tree shrews)**

Duckworth, Timmins and Cozza (1993, p. 27) observed that tree shrews were very frequent in the Phou Xang He NPA. They were reported to be frequently traded from the Xe Pian NPA (FMCP, 2000, p. 93). Tree shrews cannot be hunted by the *Kri* population (Chamberlain, 1997, p.III-25). Tree shrews were reported to abound in the NN-NPA and to be consumed within villages (Alton and Sylavong, 1997, p. A5-11). This was also the case in villages outside the NN-NPA (Alton and Sylavong, 1997, p. BIV-8).

Rodentia Order

***Sciuridae* (Non-flying squirrels) and *Pteromyidae* (Flying Squirrels)**

Squirrels are highly appreciated as food item and thus heavily hunted, although they are protected (Vongbounthane, 1998a, p. 4). In some villages of the Dong Phou Vieng NPA, "*squirrels were identified as one of the most frequently eaten species of wildlife, especially Calliosciurus spp*" (Steinmetz and Baird, 1998, cited in WWF, 1998c, p. 57). Black giant squirrel (*Ratufa bicolor*) was reported to be heavily hunted for food (WCS, 1995a, p. 65). According to Tobias (1997, p. 13), its meat is considered a delicacy. According to Duckworth et al. (2010, p. 75), black giant squirrel is the only non-flying squirrel species specifically sensitive to hunting in Lao PDR. Inornate squirrel, on the other hand, was reported to be resistant to hunting and habitat encroachment pressure (Duckworth et al., 2010, p. 75).

Duckworth, Timmins and Cozza (1993, p. 27) observed that squirrels, like tree shrews, were very frequent in the Phou Xang He NPA. Squirrels were frequently traded from the Xe Pian NPA (FMCP, 2000, p. 93). Some squirrel species, such as inornate squirrels (*calliosciurus inornatus*) and Cambodian striped squirrels (*tamiops rodolphei*) were less hunted (WCS, 1995a, p. 65). The latter species is considered as too small and not valuable in Chinese medicine (Tobias, 1997, p. 14). *Liha* communities in Ban Suanmone showed a specific liking for common squirrels (Alton and Sylavong, 1997, p. B I-7).

Duckworth, Timmins and Cozza (1993, p. 29), observed that flying squirrels (*petaurista* spp.) were heavily hunted. According to Robichaud, Hedemark and Johnson (2002, p. 37), flying squirrels are hunted to be sold for meat. In some communities, such as the *Sek* of Ban Beuk in the NN-NPA, flying squirrels are, however, not eaten (Alton and Sylavong, 1997, p. A V-11).

Muridae Family (Rats, Bamboo Rats)

Bergmans (1995, p. 302-303) found that several rodents were trapped and consumed in villages. This includes *mus caroli*, *rattus nitidus, bandicota indica*, *niviventer langbianus*, *niviventer tenaster*, *leopoldamys edwardsi*, *leopoldamys sabanus*, *maxomys moi*, *berylmys bowersii, rhizomys sumatrensis, and cannomys badius*.

Duckworth, Salter and Khounboline (1999, p. 237) confirm that rat species are widely consumed in the country and virtually all rodent species are prone to be trapped for food (ibid, p. 239). According to Aplin et al. (2007, p. 292), besides rats, forest rodent species are "*actively hunted and trapped for consumption or sale.*" Hoary bamboo rats (*rhizomys pruinosus*) are commonly trapped and eaten in northern provinces (Duckworth, Robichaud and Eve, 2005, p. 45). Robinson and Webber (1998, p. 26) found *leopoldamys sabanus* caught by hunters. In Ban Nakham village (in the previous Khammouane Limestone NPA), rats were caught mainly during the dry season, while squirrels were hunted all year round (Claridge and Phanthavong, 1996, p. 15). Murid rodents were ranked as the 15th most important NTFP and the most important mammal (before wild pigs) by villagers in eight villages of the IEWMP in Bolikhamxay province. Fish (not comprised in NTFPs) was ranked first, and other NTFPs of animal origin were frogs (ranked 13th) (Hallam and Sisavath, 2007, p. 7-11). Krahn (2005, p. 86) demonstrated that rat meat, cooked as a stew in hollow bamboo stems (a common dish in *Katu* communities), exhibited a very high calcium content, owing to the mix of meat and mashed bones and cartilage. Alton and Sylavong (1997, p. B II-5) report that villagers in Ban Phon Keo in Khamkeut district cleared the vegetation from the slope near their rat infested paddy fields, with the intention to trap rats with a channel and weight-kill trap, eat them, and possibly sell some. In some communities, however, such as the *Sek* in Ban Beuk in the NN-NPA, only few people reported eating rats (Alton and Sylavong, 1997, p. A V-12). Vongkhamheng (2002, p. 74) report that the blood of bamboo rats is considered to be healthy in villages of the Nam Et-Phou Loey NPA.

In the same NPA, in Ban Xai, Vongkhamheng (2002, p. 87) observed that most wildlife has been extirpated and the "*most common species are rats.*"

Hystricidae Family (Porcupines)

Salter (1993a, p. 34), as well as Duckworth, Salter and Khounboline (1999, p. 219) mention that porcupines are commonly eaten in the Lao PDR. Their quills are used in weaving in Sekong province (Bergmans, 1995, p. 304). Robinson and Webber (1998, p. 27) found quills near a meat drying rack in the forest, as well as a specimen shot by a villager with a crossbow in the Khammouane Limestone NBCA. Claridge and Phanthavong (1996, p. 2) found evidence of over harvesting of porcupines in several villages of the Khammouane Limestone NBCA. *Tai*-speaking populations attach great importance to porcupine meat from the *atherurus macrourus* species as medicine; hence, this species is widely hunted (Chamberlain, 1997, p. III-22).

Chiroptera Order

Some authors consider that <u>some</u> bat species are consumed (Salter, 1993a, p. 16; Francis and Salivong, 1998b, p. 5). Francis, Kock and Habersetzer (1999, p. 269), on the other hand, consider that '*<u>all species</u> are exploited for food, regardless of their size.*"

In the Dong Amphan NPA, Francis, Guillén and Vongkhamheng (1997, p. 9) observed that "*bats, like many other wildlife in Lao, are readily eaten by many Laotians.*" In the Dong Houa Sao NPA, Francis and Salivong (1998c, p. 3) observed that "*as with most other areas that we visited in the Lao PDR, the village people clearly will eat bats if they have an opportunity.*" Indeed, bats are considered by several local communities as a delicacy (Davidson, 1999, p. 3; Robinson and Webber, 1998, p. 27). More rarely, villagers said that they dislike bats as a food item (Robinson, 1997 in Francis, Guillén and Vongkhamheng, 1997, p. 9; Robinson, 1998, p. 167; Alton and Sylavong, 1997, p. AV-11). A cave exploration team found a cave (Tham Quaie) containing "*large numbers of long-eared bats which are used as a food source*" (Gregory, Openshaw, Senior and Papard, 1996, p. 19) and another one (Tham Sompoy) "*has been regularly entered by locals who take bats form cave for food*" (ibid, p. 17). Indeed, bats roosting in large colonies in caves are commonly hunted (Davidson, 1999, p. 3; Duckworth, Salter and Khounboline, 1999, p. 225) to such an extent that a colony can be wiped out in a single hunting action (Guillén, Francis and Salivong, 1997, p. 8). Fruit bats are also consumed, such as large flying foxes (*pteropus vampyrus*). *Molossidae* (free-tailed bats) and wrinkle-lipped bats, which were sold in large scale (thousands per day) in the Luang Namtha market, are also eaten (Duckworth, Salter and Khounboline, 1999, p. 234). Several authors recognized their use as food as the main threat to bats in Lao PDR (Guillen, Francis and Salivong, 1997, p. 8; Francis and Salivong, 1998c, p. 3; Duckworth, Salter and Khounboline, 1999, p. 234). Davidson (1999, p. 2).

They listed hunting of bats for consumption as the second main threat to their survival after human pressure on their habitat.

Social and Spiritual Aspects of Wildlife Consumption (Bonds and Taboos)

Rituals

According to Nash (1997, p. 10), wildlife is often part of animist rituals. Animals can be offered to spirits or some body parts can be used as amulets. On the other hand, some species, such as gibbons, are believed to be incarnate spirits of deceased people. This belief is encountered among several ethnic populations throughout the country (e.g., *Akha* communities in Luang Namtha province),[65] *H'mong* populations in Bokeo province,[66] and *Ta Oy* in Sekong province (MAF, 2011, p. 16-17), as well as *Khmu* people (Simana and Preisig, 1997, p. 13).

In the *Mlengbrou* culture, future brides and grooms go together to hunt for bamboo rats which will be sacrificed for the wedding feast (Chamberlain, 1997, p. II-5).

Taboos

The most frequently encountered food taboos in the country are found with pregnant and lactating mothers. According to the MoH (2008, p. 7), "*after delivery, 81% mothers follow cultural-specific food taboos (restricting the consumption of meat, egg, fat, etc.).*"

Post-delivery food taboos found in Attapeu province include red meat and blood from wild and other animals (Meusch, Yhoung-Aree, Friend and Funge-Smith, 2003, p. 15).

Bezuijen, Johnson, Johnston and Robichaud (2005, p. 3) were told that Buddhists in Ban Makfeuang[67] could not eat meat from cats, snakes, dogs, monkeys, Douc langurs, gibbons, and tigers. *Atel*, *Mlengbrou* and *M'labri* 'hunter-gatherer" populations are not allowed to mix domesticated and wild foods, for fear that poison will result (Chamberlain, 1997, p. III-5).

Social Bonds

Clendon (2001, p. 28-290) highlighted the value of NTFPs in barter or sale transactions, as well as gifts for community members. Old villagers she interviewed recalled how forest resources used to be shared among community members when they were abundant (Clendon, 2001, p. 30). Steinmetz (1988a in WWF, 1998c, p. 50) report similar cultural practices of sharing game meat in villages of the Dong Phou Vieng NPA (*Katang* and *Makang* ethnic communities). Schlemmer

[65] Ban Thonglath
[66] Near Nam Kan NPA
[67] A predominantly animist village of Makong ethnic population

(1999, p. 8) was told that villagers usually share game meat with kin or sell the surplus, as they cannot consume the whole animal because it is too large.

Schlemmer (2001, p. 105) observed that the long-lasting tradition of sharing large-sized game became compulsory after 1975. In Viengthong district (in Houa Phanh province), villagers must hand over a part of a large-sized catch to the village chief. The latter will then resell it to other community members and the money becomes part of the village fund (Schlemmer, 1999, p. 8).

Krahn (2005) showed that hunting of wildlife, mainly large-sized mammals, and the sharing of meat contributed to social cohesion in *Katu* communities. She postulates that with the decreasing abundance of wildlife and individualization of hunting and consumption, such social bonds would become loser (ibid, p. 129). Her fear is corroborated by findings from Ban Khonthao in Viengthong district in Bolikhamxay province. There, hunting and consumption taboos became less strictly enforced by the younger generation (MAF, 2011, p. 16-17).

Handling/Feeding/Caring of Live Wild Animals

Very few sources specifically mention handling of live animals. Showler, Davidson, Salivong and Khounboline (1998, p. 66) found live bamboo rats for sale at Xam Neua market in Houa Phanh province with their teeth removed to prevent biting. In the Dong Houa Sao NPA, Francis and Salivong (1998c, p. 3) saw children carrying two bats.

Butchering Methods and Place

Timmins and Duckworth (1999, p. 478) compiled an inventory of Douc langur remains (e.g., skulls, tail) found by themselves and by other researchers in central and southern NPAs between 1993 and 1999. Most remains were found at used or empty forest camps and occasionally at villages. On such occasions, live Douc langurs destined to be slaughtered and eaten were encountered as well. Robinson and Webber (1998, p. 23) found remains of squirrels[68] next to a meat drying rack and fire camp in the previous Khammouane Limestone NPA and "*thought animals had been caught by villagers for food*." At another village they found another species[69] killed for food by a crossbow.

Handling of Dead Animals

Duckworth, Robichaud and Eve (2005, p. 45) found a dead hoary bamboo rat being pulled on a string along the main road in Phongsaly town. Chamberlain (1997, p. II-2) writes how *Atel*, a Vietic population with strong hunter-gatherer background, relied on meat of muntjac and sambar killed by dholes (wild dogs). "*If they come upon the meat within two days, the flesh remains edible, longer than that it rots and becomes infested with maggots*." Putrefaction replaces

[68] Callosciurus erythreaus, callosciurus Gray and hylopetes spadiceus
[69] Dremomys rufigenis

cooking by allowing fermentation to transform meat from a raw to a pre-digested state (Chamberlain, 1997, p. II-6).

Meat Preparation (Cooking or Preserving, such as Drying or Smoking)

Round (1998, p. 37) reports how "*a skinned, dried carcass with the tail removed, but thought to be this species* [silver langur] *was seen hanging on a gibbet at a villager's house at Nong Soumhoung"* (Dong Khanthung PPA).

In Houa Phanh province, Schlemmer (1999, p. 8) did not find any other wildlife meat preparation than smoking and drying. Aplin et al. (2007, p. 304) observed that "*captured animals* [rodents] *are often eaten or the meat smoked and sold in local markets.*" WWF (1998a, p. 15) mentions monkeys poached in the Hin Nam No NPA[70]-Phong Nha[71] NPA being dried over a fire. They noted that before 1991, being a "monkey dryer" was a popular occupation, providing local populations with substantial income. Poacher groups of two to three persons would harvest between 25 and 30 kg of dried monkey meat, while staying seven to 10 days in the forest. Dried meat was sold for 2 USD/kg.[72] Despite a gun confiscation campaign carried out since 1991, "monkey drying" continued, although at a lower scale. Timmins and Duckworth (1999, p. 478) found a "*long-tailed monkey*," reported by the cook to be a Douc langur, being cooked at a hunters' camp in the Nam Kading NPA in 1995. Vietnamese poachers were said to target specifically diurnal primate species (e.g., macaques and Douc langurs). The latter were favored over macaque for their tastier meat (Timmins and Duckworth, 1999, p. 483). Boonratana (1997, p.23) found meat smoking racks at camps in the Nam Phoui NPA. Krahn (2005, p. 86) found that in the past, *Katu* communities used to conserve soft bones (e.g., leg, chest, neck) of big mammals. Bones and cartilage were crushed, cooked in a bamboo container, and ultimately left fermenting for a month. Meat and skins could also be fermented, but not longer than three days in the case of meat. This method mostly applied to trapped animals showing an advanced stage of decomposition. Drying and smoking of wild meat was also practiced in the past. Such meat was cooked again (grilled or boiled) before being consumed.

Bergmans (1995, p. 303) found two specimens of *leopoldamys edwardsi* rats trapped and "*being dried over an open in-house cooking fire. Their tails were lacking, their pelage was scorched and their bodies were rotting.*" Squirrels were reported to be eaten whole (Vongbounthane, 1998a). Douangboupha et al. (2009, p. 52) report that meat of *kha-nyou*, the rodent species recently "discovered" in Khammouane province and considered as a delicacy, is highly appreciated "*fast-grilled on an improvised barbecue.*" Fast-grilling of (often un-gutted) wildlife is considered to be a main health threat, as inner parts are often insufficiently cooked, if not raw (Brey, 2011, personal communication). *Atel, Mlengbrou* and *M'labri* 'hunter-gatherer"

[70] Boualapha district, Khammouane province, Lao PDR
[71] Minh Hoa and Bo Trach districts in Quang Binh province, Vietnam
[72] In 1998

populations usually roast rather than boil meat (Chamberlain, 1997, p. III-5). Traditionally, pre-digested meat taken from prey killed by dholes is consumed in this way. It is considered inedible after two days lying in the forest, when maggots start appearing (Chamberlain, 1997, p. III-7). Sengyasith (1993, p. 12) mentions how *Katu* populations preferably eat raw blood and meat (*laab*).

Skins

Schlemmer (1999, p. 27) observed that skins of wildlife are not prepared or commercialized and he imputed this to the fact that wildlife trade is illegal. *Akha* communities in Luang Namtha hunt gibbons for their **fur** in addition to their meat (Hedemark, 2003, p. 50). Davidson (1999) reported that skins of otters from the Nam Et-Phou Loey NPA in Houa Phanh province were sold to Vietnamese traders at a price of 35,000 to 50,000 LAK per pelt (20 cm long).

Other Household Uses of Wildlife

Recreational

Most wildlife destined for recreational use is sold (see Chapter 3.7) and few sources mention wildlife kept as pets at the village level, although it is widespread. Duckworth (1996, p. 229) saw an infant rhesus macaque kept by a villager in Sangthong district and Round (1998, p. 36) saw an infant pig-tailed macaque kept in a cage at a shop in Ban Kong Phan in the Dong Khanthung PPA. A captive red-cheeked squirrel was seen at Ban Samlian in the Sepon Mine Project area (Crome, F., Richards, S., Phengsintham, P. and C. Somvongsa, 2001, p. 18).

Mongooses are kept as pets in various parts of the world, as they are "*very affectionate and lively*" (IUCN, n.d.). A caged live mongoose was seen by the author of this report on January 22, 2012 at a temple in Sangthong district in Vientiane province.

Traditional Medicine

Wildlife is extensively used in traditional medicine by local communities. Krahn (2005, p. 125) found that "*any medicine that the Katu have is mainly based on wildlife*." The same author assessed the different applications of selected wildlife species for domestic medicinal purposes by *Katu* villagers in Sekong province (ibid, p. 124). *Katu* communities used bones and cartilage of primates (transformed into gelatin) and gallbladder of binturong (dried and then soaked in hot water) as a post-natal tonic. Porcupine quills (only the black part, ground and dissolved in water) and grilled stomach mouth were both used for stomach aches. Krahn (2005, p. 125) found that the use of wildlife in *Katu* traditional medicine concerned fewer species in the past than at present. The inclusion of new species and "traditional" treatments seems to derive from the contact with other cultures. Selected species of rats were reported to be among the main species

harvested by *Phrai* communities for medicinal purposes. Similarly, porcupines are among the main species harvested by this community for medicinal purposes (WWF, 2006, p. 101).

Schlemmer (1999, p. 20) gives a list of home-made remedies concocted from wild animal body parts. Use can vary across villages. Porcupine and bamboo rat intestines macerated in alcohol are used against fever, fatigue, stomach aches and back-ache. Dried monkey bile soaked in alcohol is used for headache, insulation and weakness, while powdered dry bile is used for red eyes. Dried monkey appendix and bladder soaked in alcohol is used for backache and boiled monkey bones against bloating. Dry and powdered porcupines and bamboo rats are used for post-partum nutrition. Civet bile is used for falls and hemorrhages.

IUCN (n.d., p. 21) links the ferocious aspect of viverrids and mustelids to the attribution of their magical powers and the extensive use of their internal organs, fat and other body parts in traditional medicine. TRAFFIC (1999, p. 52) found that stomachs of different species soaked in *lao lao* are believed to contain the properties of the buds/leaves/fruit/roots ingested by the animal prior to its death. Such properties are believed to be passed to the consumer of medicinal *lao lao.*

Religious

Mongooses play an important role in the Buddhist mythology, as they do or did in other religions, such as Hinduism, Middle Eastern and Egyptian cults. Jhambala, the god of wealth (the avatar of Kubera in Hinduism) is represented with a mongoose in the left hand (IUCN, n.d., p. 21). A live mongoose was seen in a cage in January 2012 at a Buddhist temple in Sangthong district [personal observation, 22 January 2012].

Summary Chapter 3.6: Subsistence Consumption

Several surveys and studies have highlighted and demonstrated the crucial nutritional and economic importance of NTFPs in general -- and wildlife in particular -- in subsistence-oriented communities nationwide. For many communities, especially the ones not relying on aquatic resources as main source of protein, wildlife still represents an important source of protein, iron, fat, and other indispensable nutrients. Basically all wildlife species are susceptible to be eaten, depending on individual and community tastes, preferences, and taboos. Most species belonging to the four animal orders of focus are commonly eaten on a subsistence basis.

While little information was found on handling of live and dead animals, some information was gleaned on preparation and consumption habits. Basically all kinds of preparation modes are encountered: skinning, gutting, mashing, crushing, smoking, drying, grilling, boiling, fermenting, rotting, and eating raw. As such, all manipulations bear substantial risks of disease contamination. However, the very frequent habit of eating raw blood and meat, or insufficiently

cooked meat including internal organs, is likely to bear the most significant risk of disease contamination.

3.7 Domestic Trade and Sale of Wildlife

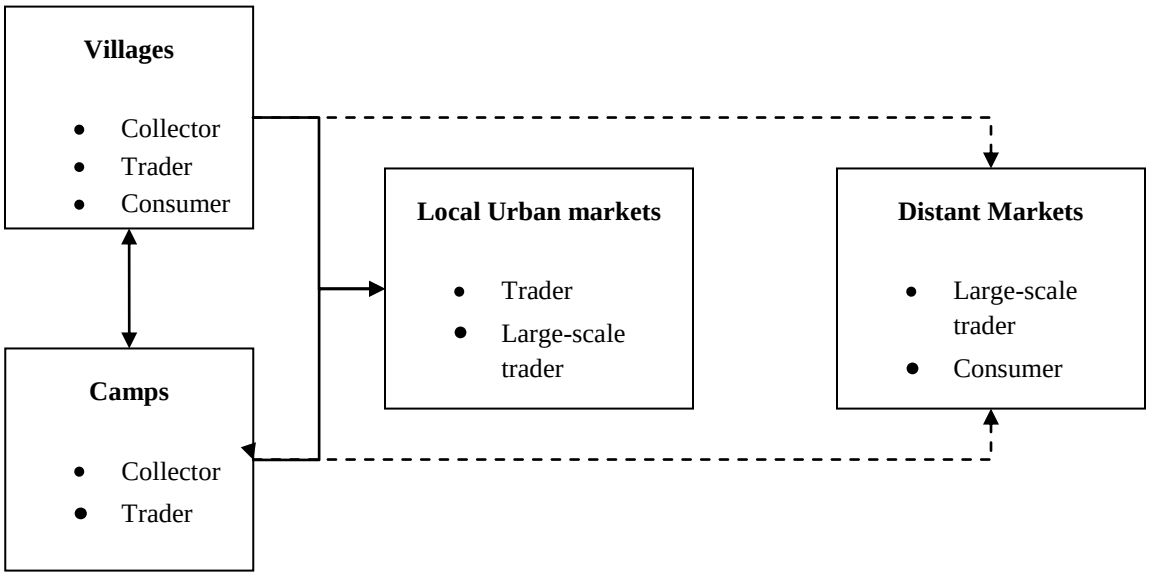
Typology of Domestic Trade

The sale of wildlife is illegal (Johnson, Singh and Duongdala, 2003 p. 195), as per decree No. 1074 (Vongkhamheng, 2002, p.30) and MAF regulation No. 0524/2001 (WWF, 2008). In the past, wildlife trade required a permit in the Lao PDR (FMCP, 2000, p. 103). Nowadays, the 2007 Law does not clearly mention trade of wildlife harvested from the wild. Article 11 of the 2007 Law mentions that "the *utilisation of these animals* [in the prohibited category] *shall be permitted by the government.*" It implicitly means that (harvest) and trade is otherwise prohibited. For animals falling under Categories II and III, there is no explicit regulation on trade. Article 40 of the 2007 Law pertains to trade of farmed wild animals (GoL, 2007, p. 10).

However, wildlife is sold at most district or provincial markets, as well as from the roadside (Vongkhamheng, 2002, p. 115; Hansen and Jeppesen, 2004, p. 51). Villagers usually consume directly what they hunt (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 30). However, in two NPAs of Savannakhet province, villagers admitted that they traded wildlife on a small scale, but they were reluctant to speak about the practice, as it is illegal (Hansen and Jeppesen, 2004, p. 61). Schlemmer (1999, p. 26) encountered similar issues in Houa Phanh province, where only 22% of the villagers interviewed (11 out of 50) acknowledged they sell wildlife. Indeed, Duckworth, Salter and Khounboline (1999, p. 16) noted that "*although many wild animals are harvested for family or village consumption, many enter the cash economy through markets*." According to Vongkhamheng (2002, p. 29) "*the proportion of harvested wildlife which is sold depends on a complexity of factors including the area and its accessibility to markets, the ethnic group, the season, the success of hunting that day, the prevailing local economic situation and others.*" For these reasons, it is difficult to make a clear-cut distinction between subsistence- and trade-oriented hunting (Vongkhamheng, 2002, p. 115), especially because wild meat is often sold or bartered among people within the village (Schlemmer, 2001, p. 75).

Round (1998, p. 127) notes that "*capture or hunting of wildlife for commercial purposes is not always easily discernible from hunting for subsistence or sport.*" For Claridge et al. (1998, p. 74), wildlife trade "*extends from the village level barter and sale for local use to organized international trade.*" Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 12) sketched a general structure of wildlife trade as follows.

Figure 7 -- Domestic Stakeholders and Pathways of Wildlife Trade



Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 15) differentiate market demand between:

- Local market demand: Markets and restaurants within the province
- Domestic market demand: In other provincial towns and Vientiane capital
- International market demand

The same authors (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 15) state that "*the distinctions among local, domestic and international trade are not always clearly demarcated.*" Robichaud and Stuart (1999, p. 44), however, make a clear distinction between wildlife trade and trans-boundary poaching. The former is described as "*the selling of wildlife collected by local people, either to other Lao or to foreign traders,*" while the latter involves "*trans-border incursionists*" and is "*strongly driven by trade.*" It is described in Chapter 3.9. According to ICEM (2003, p. 13), "*while domestic trade and use of wildlife is probably significant, the cross-border wildlife trade is far more serious in its impact on natural systems and their long-term development potential.*"

Historical Development and Latest Trends

In 1992, Srikosamatara, Siripholdej and Suteethorn (1992, p. 42) observed that trade in Lao PDR is tolerated for hunting at the subsistence level. They, however, observed that the level of trade has passed subsistence levels already, and the country was in the same situation as Thailand was at the beginning of the 1980s: resources are being depleted while conservation measures are not in place. They encouraged Lao authorities to take measures to avoid the situation found in Thailand.

Duckworth et al. (1994, p. 203) did not find evidence of commercial hunting in the Xe Pian, Dong Houa Sao, and Phou Xang He NPAs, but were told that "*commercial hunting is apparently rife in at least Phou Xang He.*"

Ruggeri, and Timmins (1996, p. 3) noticed that "*surrounding these* [forested] *areas there is a country that is turning to a consumer economy, including expanding markets for wildlife products.*" Selling wildlife at wet markets started in the early 1980s and gained momentum after 1986 and the inception of the New Economic Mechanism (NEM) (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 7). Chamberlain, Alton, Silavong and Philavong (1996, p. 43) noticed that with the economic opening of the country following the NEM in 1986, wildlife became increasingly tradable. In the early 1990s, wildlife trade was largely destined to the domestic market and wildlife was sold as food items and, to a lesser extent, as curios and traditional medicine ingredients (Nash and Broad, 1993, p.2). Fresh wildlife meat used to be widely available at various markets and at the few best hotels in Vientiane Capital (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 3). However, for Nash (1997, p. 2), "classical" wildlife trade was still in its infancy in Lao PDR. He nevertheless acknowledged that the bulk of wildlife trade from Lao PDR responded to domestic and regional (China, Thailand, Vietnam) demand and remained largely unrecorded. He observed that the sale of wildlife served nutritional (food), medicinal (traditional medicine), and social (display) purposes (Nash, 1997, p. 3; Nooren and Claridge, 2001, p. 31). Nowadays, wildlife is still *"traded for food, traditional medicine, ornaments, pets, and for merit release at religious ceremonies. Trade is open and in many markets and restaurants*" (Stenhouse, 2006, p. 16).

In the course of time, "*the economic value of wildlife to villagers pales into insignificance beside the profits to be made from wildlife trade*" (Nooren and Claridge, 2001, p. 15; Hedemark, 2003, p. 41).

A survey carried out in 1998 in Ban Makfuang (NN-NPA) showed that 13% of the villagers[73] sought to sell wildlife in exchange for cash to cope with the rice shortage (IUCN, 1999). Hedemark (2003, p. 41) observed that the trade-off between short-term profits from wildlife trade and long-term food security issues was not an issue for villagers in Luang Namtha, as long as resources were abundant or sufficient. "*Wildlife sales have become a means of obtaining not only rice, but also other household goods and medicine*" (Hedemark, 2003, p. 41). Nationwide, wildlife is considered as an important NTFP used for trade, along with other forest products.[74]

[73] Brou people.

[74]Cardamom (*amomum spp.*), malva nuts (*sterculia lychnophora/scapium macropodum*), *bong* bark (*persea kurzii/nothaphoebe umbelliflora*), agarwood (*aquilaria spp.*), damar resin (*shorea/parashorea spp.*), sapan (*boemeria malabarica*), bamboo (*bambusa spp.*), rattan (*calamus spp.*), paper mulberry (*broussonetia papyrifera*), bitter bamboo shoots (*Indosasa sinica*), sugar palm fruit (*arenga spp.*), dried mushrooms, and aquatic animals.

Chamberlain, Alton, Silavong and Philavong (1996, p. 49) report how villagers on the Nakai Plateau became caught in a vicious circle fuelled by the need for cash and how the less wildlife is available, the more hunted it becomes.

According to Courchamp et al. (2006, p. 1), "*rarity itself fuels the disproportionate exploitation of rare species, and renders them even rarer and thus more desirable,"* a "spiral" called Anthropogenic Allee Effect. Hansen and Jeppesen (2004, p. 71) observed how "*demand can become destructively strong*," as illustrated by the example of "*wildlife which is strongly demanded and in shorter and shorter supplies both on local, district and provincial level*." In the Phou Xang He and Dong Phou Vieng NPAs, villagers and other stakeholders agreed that a switch from destructive hunting methods towards regulated ones (e.g., hunting seasons) would help prevent wildlife resources from declining further and could regenerate stocks within one to two years (Hansen and Jeppesen, 2004, p. 81).

TRAFFIC (2008, p. 30) noted a strong rise in domestic and regional demand for wildlife and sketched out the following drivers of changes: consumer income, laws and regulations, wildlife availability/abundance, price, medicine/beliefs, fashion/tastes, and others. The same study also assessed the drivers influencing the supply of wildlife (e.g., the growing accessibility of wildlife resources resulting from improved market connectivity (roads, infrastructure and communications) and opening of sources due to logging and other activities (TRAFFIC, 2008, p.31)).

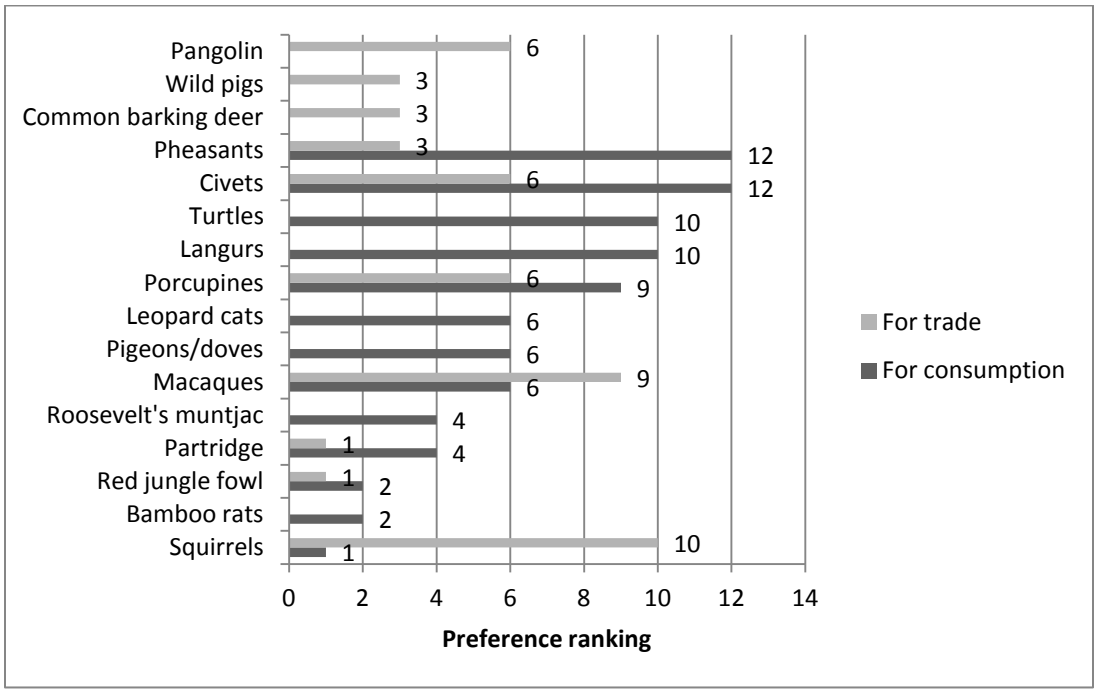
Seasonality of Domestic Wildlife Trade

Duckworth, Salter and Khounboline (1999, p. 17) mention peaks in wildlife trade corresponding to species-related hunting seasons. The same authors, however, suggest that hunting does not only follow a seasonal pattern, but an economic pattern as well, with trade increasing in times of poor harvest and general economic stress. This finding is in line with observations made by Nash (1997, p. 20) on Thai markets. There, higher volumes of wildlife traded from Lao PDR were sold during the dry season, between March and May.

Animals and Products Traded Domestically

In ranking exercises carried out in the Nam Et-Phou Loey NPA, Vongkhamheng (2002, p. 72) found that species favored for sale by local communities were not necessarily the same as the ones kept for home consumption, as shown by the following figure.

Figure 8 -- Ranking of Wildlife Species for Home Consumption or for Trade



Source: Vongkhamheng (2002, p. 72).

Johnson, Singh, Duongdala and Vongsa (2003, p. 5) observed different trends in the Nam Ha NPA. There, species consumed for subsistence were also the ones most frequently sold locally. FMCP (2000, p. 94) notes that "*the high value species generally do not appear in local markets unless somehow unfit for international trade.*" Several authors episodically recorded species sold at wet markets. Timmins and Evans (1996, p. 18 and 28) surveyed the Lak Xao market 24 times in 1994 and eight times in 1995, and found mainly birds, rats and squirrels for sale (see Annex 14). Srikosamatara, Siripholdej and Suteethorn (1992, p. 10) recorded the five most common mammals sold at the That Luang wet market (Vientiane Municipality) in 1991, as shown in Table 11.

Table 11 -- Five Most Common Mammals Recorded at That Luang Market in 1991

Dry Season	Wet Season
1. Variable squirrel	1. Great bandicoot rat
2. Red bellied tree squirrel	2. Lesser mouse-deer
3. Lesser-mouse deer	3. Siamese hare
4. Common barking deer	4. Variable squirrel
5. Black-giant squirrel	5. Pangolin

Source: Srikosamatara, Siripholdej and Suteethorn (1992, p. 100) (see Annex 15).

Primates

Very little evidence of domestic trade of primates for food was found. A hind and a fore limb of a primate, assumingly a rhesus macaque, were found for sale at the Muang Kaleum[75] market (province) in the southern border of the Xe Sap NPA (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 14). Most evidence of primate trade pertains to recreational or medicinal purposes and is presented later in this report.

Carnivores

De Beer et al. (1994, p. 24) were told that viverrid carnivores were commonly sold in markets in Sekong province. Civets, hog badgers and ferret badgers were regularly sold from Ban Navang within the NN-NPA (Alton and Sylavong, 1997, p. 1-10). Civets were commonly sold from Ban Phon Keo in Khamkeut district (ibid, 1997, p. B II-13). Common palm civets were commonly found at wet markets, mainly at Ban Lak 52 and Ban Lak Xao (Duckworth, 1997, p. 10) and to a lesser extent small-toothed palm civets as well (Duckworth, 1997, p. 8).

According to Duckworth (1997, p. 19), the most frequent small carnivores species seen at villages and markets were common palm civet, small-toothed palm civet, and large Indian civet. He assumed that in Ban Lak Xao and Ban Lak 52, small carnivores were sold weekly at times of low agricultural activities. Civets (common palm civet, *paradoxurus hermaphroditus*) were commonly observed for sale at wet markets in the Attapeu provincial town (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 30). Such animals came from open or degraded areas where interface with humans was high.

Bergmans (1995, p. 294) reports about a smoked common palm civet offered for sale in Hongsa special zone in 1994.

Rodents

Rat and bamboo rat meat was commonly found at domestic wet markets across the country (Salter, 1993a, p.33-34; Salter, 1993b). Villagers in Xaythany district (Vientiane Municipality) reported that they consume rats and sell the surplus (Vongbounthane, 1998a, p. 6 and 1998b).

Large bamboo rats were sold near the Sepon Mine Project area (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 18). Bamboo rats were said to be sought for markets and restaurants (Vongbounthane, 1998a, p. 45).

[75] 15˚43.81'N 106˚45.00'E

Salter (1993a, p. 34) and Duckworth, Salter and Khounboline (1999, p. 219) mention that porcupine meat was commonly found at domestic wet markets. Brush-tailed porcupines were commonly sold from Ban Phon Keo in Khamkeut district (Alton and Sylavong, 1997, 1997, p. B II-13). Remains and quills of east Asian porcupines were found throughout surveys carried out by Evans, Duckworth and Timmins (2000, p. 90). Porcupines were sold along with wild pig meat at a village market in the Nam Phoui NPA (Boonratana, 1997, p. 25). Porcupines were regularly sold from Ban Navang within the NN-NPA (Alton and Sylavong, 1997, p. 1-10). Porcupines used to be traded from the previous Xaisomboun special zone[76] (east of Vientiane province) to Vientiane Capital (Nooren and Claridge, 2001, p. 128).

Squirrels have commonly been traded as a food item (Davidson et al., 1997, p.76); this concerns all squirrels (*ratufa bicolor*, *callioscurus spp.*, *tamiops spp.*, *dremomys rufigenis*, *menetes berdmorei*, *petaurista philippensis*) (Bergmans, 1995, p. 300-301). Variable squirrels were seen for sale at villages and along Route No. 9 south of the Phou Xang He (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 18). In Xaythany district (VTEM), people come to buy squirrels (*kanai*) at villages although it is forbidden to sell them (Vongbounthane, 1998a, p. 5). Duckworth et al. (1994, p. 198) report a "*widespread trade in squirrels"* in Vientiane markets." According to Duckworth, Salter and Khounboline (1999, p. 213) black-giant squirrels used to be the most frequently encountered mammal sold at wet markets in Vientiane. Indeed, flying squirrel species of small size used to be often encountered at wet markets (Duckworth, Salter and Khounboline (1999, p. 218) but their occurrence declined. Squirrels were less encountered at wet markets during the wet season. Caged live striped tree squirrels were observed at the Xe Kong market in November 1997 (Showler, Davidson, Vongkhamheng and Salivong, 1998). In Luang Namtha markets, most wildlife sold at markets in 2004 were squirrels (Syhalath, 2004).

Scandentia

Dead tree shrews on sale as food items were found in markets investigated by the WCS-PREDICT project between 29 November and 3 December 2011 in Champassak, Saravan and Attapeu provinces[77] and between 7 and 9 January 2012[78] in Vientiane province (Source: unpublished raw data from PREDICT project).

Chiropters

According to Vongbounthane (1998b, p. 9), bats are usually consumed at the village level and are rarely sold in Vientiane, as they approach extinction on the Vientiane Plateau.

[76] Region now attributed to Xieng Khouang, Vientiane and Bolikhamxay provinces
[77] 13 live individuals sold as food item
[78] 40 individuals recorded in three days in various markets

Bats are sold seasonally in Nakai, while they are sold the whole year in northern provinces (Brey, 2011, personal communication). Francis, Khounboline and Aspey (1996, p. 7) found *Hipposideros armiger* and *Hipposideros lylei* bats for sale at the Lak Xao market. Fruit bats were seen at markets in Oudomxay (Duckworth, Robichaud and Eve, 2005, p. 47). Flying foxes sold at markets are found mainly in the southern part of the Indochinese peninsula (Cambodia and southern Vietnam) (Brey, 2011, personal communication).

Commercial Harvesters

For Timmins and Evans (1996, p. 7), in the past, commercial hunting was done by Lao or Vietnamese hunters and concerned mainly large-sized mammals (e.g., tigers, elephants), an observation corroborated by IUCN (1997, p. 44), which stated that "*commercial exploitation of wildlife is undertaken by local residents in Lao from outlying regions and Vietnamese intruders.*" Tobias (1997, p. 36) confirmed that "*economically valuable species were targeted by some hunters, particularly H'mong and Vietnamese.*" Krahn (2005, p. 131) observed an increasing shift from subsistence hunting in *Katu* communities in Sekong province towards trade to outsiders or even hunting for outsiders. Some *Katu* hunters were commissioned by outsiders to hunt specific species (e.g., four bullets for a hornbill). Hansen and Jeppesen (2004, p. 77) observed that wildlife harvesting for commercial purposes is done by men. The following box illustrates an example of commercial hunting targeted to a valuable species.

Primate Hunters

WCS carried out a survey pertaining to hunting of primates in the Nam Ha NPA in 2003, comprising a panel of hunters (N=64), all male, aged between 17 and 70 years and (Johnson et al., 2003).

All hunters had encountered at least one of the eight target primate species.[79] A vast majority of hunters (86%) hunted all year round, on an average of 3.2 times a week. A majority (88%) of hunters of all ethnic groups (*Akha*, *Khui*, *Khmu*), except for *Mien* people, stated that they observed local taboos relating to gibbons. The latter are believed to be spirits of ancestors and killing a gibbon would bring bad luck to hunters and their communities. Nevertheless, gibbon populations declined due to shifting cultivation and hunting, which meant that taboos are not respected anymore.

[79] Black-crested gibbon/white-cheeked crested gibbon/Assamese macaque/bear macaque/rhesus macaque/slow loris/pygmy loris/Phayre's langur

TRAFFIC (2008, p. 26-27) found that wildlife harvesters operate mostly independently. A large proportion of harvesters belong to the poorest wealth group. For them, "*wildlife trade represents an accessible, attractive, lucrative livelihood option [...] because of its characteristically low technical and financial entry requirements, ability to provide quick short-term gains and cash payments, and because of the relatively freely accessible nature of the resource itself*" (TRAFFIC, 2008, p. 58).

TRAFFIC (2008, p. 29) found that successful poverty reduction interventions had not resulted in a significant reduction of wildlife harvesting for trade. Nevertheless, profitability is not mentioned by harvesters as the main driver behind their involvement in this activity (TRAFFIC, 2008, p. 31). The same study revealed the complexity of drivers pushing or pulling people into wildlife harvesting and trade, and suggested caution in targeting population groups for interventions (TRAFFIC, 2008, p. 59).

Middlemen

Duckworth (1997, p. 4) reminds that "*animals frequently change hands several times between capturer and seller."* TRAFFIC (2008, p. 26-27) found that while wildlife harvesters operate mostly independently, some also engaged under informal contracts with buyers. Commercial sale of wildlife was reported to follow an established circuit. Sales are mostly made to traders, either by harvesters going to traders' places or by traders coming to harvesters' premises. Direct sale to consumers concerned only 15% of the cases. TRAFFIC (2008, p. 26) observed that wildlife harvesters are mostly paid in cash at the time of sale. However, about one-third of harvesters reported being paid in advance and approximately 10% reported being engaged in a bartering mechanism. Local harvesters reported that wildlife harvesting is also practiced by outsiders working independently or under informal contracts.

In Attapeu province, one large fish trader provided villagers with rice and was later repaid by villagers with wildlife, a system which kept villagers in a continuous debt. In another village, wildlife was sold against alcohol (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 25). The number of wildlife traders was reported to increase from the district to the provincial level in the Phou Xang He and Dong Phou Vieng NPAs in Savannakhet province (Hansen and Jeppesen, 2004, p. 69). In Attapeu province, Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 42) were told that women became increasingly involved in wildlife trade, possibly because law enforcement is weaker for women than for men.

Location of Commercial Harvest

Commercial harvesting of wildlife was reported to be high in nine of the 20 NPAs that the country counted in 2004.[80] Dong Amphan and Phou Hin Poun NPAs showed the highest pressures from commercial wildlife harvesting (WWF, 2004, p. 97-98).

In a study pertaining to wildlife sold at wet markets[81] in five districts of Vientiane Capital, Youyabouth and Bouapoaher (2006) found that 30% of the market retailers were not able to assess the primary source of the wildlife they retailed. Eleven percent of the retailers gave Dong Mark Khay forest as the primary source of wildlife; another 11% mentioned the Phou Khao Khouay NPA and 2% indicated rice fields. No information could be found for the remaining 46%. Duckworth (1997, p. 4) reminds that "*the seller usually has little knowledge and less interest in a specimen's origin."* Nooren and Claridge (2001, p. 151) assessed that the Phou Khao Khoay NPA was a major source of wildlife for restaurants and wet markets in Vientiane Municipality, the Ban Lak 52 market, and possibly Thailand and Vietnam foreign markets.

Preparation for Trade

Small-sized animals are usually sold alive, while large-sized ones are butchered and their meat is sold (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 28). Small-sized animals are usually sold alive at village or district markets, while the meat of larger ones is dried or stored in freezers at middlemen' premises (Hansen and Jeppesen, 2004, p. 74). Robinson (1994, p. 117), however, reports that animals sold at Chiang Khan market were usually dead; rats and bats were seen alive only 14 times out of 66 observations. Raw data obtained from WCS-PREDICT collected at markets in various locations in the country show that small mammals sold at wet markets for food are mostly dead except for bamboo rats, which are often sold alive (Annex 16, 17 and 18).

Francis, Guillén and Vongkhamheng (1997, p. 9) were told by Rob Tizard, a fellow researcher, that he occasionally came across fermented bats for sale as food at markets north of Vientiane. In his investigation at the Chiang Khan wet market (in Loei province, in north-western Thailand), Robinson (1994, p. 117) reports that "*on two occasions several live bats were seen impaled through their wing membranes on a single vertical stick to prevent escape.*" The same author further observed that fur of dead mammals had been already removed and that all wildlife was sold for food. Small mammals sold are often not gutted and the way to prepare bats usually depends on the species (Brey, 2011, personal communication). Dried wildlife meat (*sin heng*) used to be sold from villages of the Dong Phou Vieng NPA to local markets (Steinmetz and Baird, 1998, cited in WWF, 1998c, p. 65).

[80] 24 in 2011, Phanthavong, personal communication
[81] 17 markets investigated (n=not assessed)

Pathways and Means of Transport of Domestic Trade

Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 13) identified road and river as the main pathways to trade wildlife, fish and NTFPs in Attapeu province. Roads were used to transport products to more distant markets, while rivers were used for local transport. Material investments (e.g., motor boats, trucks) and operating costs (e.g., fuel) of transportation were found to be key factors shaping trade routes and patterns. The same authors observed that the domestic trade of wildlife followed the same pattern as the one for fish, as both commodities were often traded by the same stakeholders (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 29). The same authors observed that high-value species follow different pathways than formal trade of lower-value species (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 31). Nooren and Claridge (2001, p. 15) observed that domestic trade of wildlife has gone underground since the 1990s. In Attapeu, wildlife meat was reported to be occasionally transported in ice boxes containing fish to circumvent controls at road checkpoints (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 13). A "private public transport" operator with a monopoly on Route No. 18A from Attapeu province to Pakse town was caught transporting wildlife along with passengers (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 14).

To and From Wildlife Trade Hubs/Nodes

Some locations were identified as historical major hubs or nodal points for domestic and/or international wildlife trade.

- Ban Mai in Sanamxay district in Attapeu province, (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 12-14) is such an example. It is situated on Road No. 18 to Vietnam and has all-year road and river access. Fish (and other) trade from Ban Mai was incepted in 1989 when the road became passable for vehicles and it gained momentum in 2003, after a portion of the road was upgraded (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 15). In 2005, Ban Mai was still reported as a wildlife trade post with people "*often visiting to purchase wildlife*" (Bezuijen et al., 2007, p. 227).
- Ban Mai south to the Phou Xieng Thong NPA in Champassak province was reported to be a major hub for wildlife trade from all over Lao PDR (Southammakoth, 1998, p. 34).
- Ban Lak Xao (Lak 20) in Bolikhamxay province is a major domestic hub for wildlife trade (Timmins and Evans, 1996; Nooren and Claridge, 2001, p. 165), especially for small mammals (WCS, 1996a, p. 9).
- Ban Nong Kok in Khamkeut district, Bolikhamxay province on Road No. 8 (at the junction with the secondary road which leads to Ban Keng Bid and Theun Hin Boun dam). The village is located 100 km away from Lak Xao (Hedemark et al., 2006, p. 20).

- Ban Nam Thone (Thorn)[82] wet market, along Road No. 13 in the far south of Bolikhamxay (a few kilometers south of the junction between Road No. 8 and Road No. 13) is reported to be the best-known market for wildlife trade in Lao PDR (Philakone, 2009, p. 6). Ban Nam Thone was described in 2001 as a "*thriving wildlife food market operating for at least seven years*" (Nooren and Claridge, 2001, p. 172).
- Ban Thong Namy along Road No. 13, in Bolikhamxay province, is another well-known wildlife market (Inthavong, 2011, personal communication).
- Ban Lak Ha Sip Song (Lak 52) in Vientiane province has been recognized as an important domestic market for wildlife collected from a large area, ranging from Sangthong district in Vientiane province (Evans, Duckworth and Timmins, 2000, p. 88) to Xieng Khouang province (Nooren and Claridge, 2001, p. 147). In the 2000s, the border along Xieng Khouang province (Route No. 7)-Ban Lak 52-Lax Xao (Route No. 13) was recognized as a main axis for domestic and international wildlife trade from Lao PDR, and was under control of *H'mong* traders (Nooren and Claridge, 2001, p. 147).
- To date the Dong Mark Khay market in Xaythany district (Vientiane Municipality) has been identified as the wet market selling the highest volumes of wildlife (Bounnak, 2012, personal communication).
- Oudomxay province, as an important crossroad between all northern provinces (Luang Prabang, Phongsaly, Luang Namtha, Bokeo, and Xayaburi) as well as China has been considered as the node in northern Lao PDR for domestic and international trade of wildlife to Vietnam, China, and Thailand (Nooren and Claridge, 2001, p. 124).

Recent domestic trade nodes were identified, but will not be disclosed in the present report, as requested by the WCS-PREDICT team, so that they do not serve as "yellow page" for wildlife supply.

At High-Passage Routes (e.g., Roadside Stalls)

Several authors report about wildlife being sold at roadside stalls. Bergmans (1995, p. 300-304) found several rodent and squirrels species for sale at road stalls. Nash (1997, p. 10) observed that wildlife was previously sold at locations with high passage: grilled tree shrews (*Tupaia spp*.) were, for instance, commonly sold at roadside stalls as snacks for bus passengers.[83] Evans, Duckworth and Timmins (2000, p. 90) made a similar observation in Ban Nam Thone,[84] the important wildlife market in Bolikhamxay province previously described, where a lesser giant flying squirrel was seen for sale.

[82] 18˚27'N 104˚18'E
[83] For 300 LAK/head=0.42 USD at that time
[84] 18˚27'N 104˚18'E

Nooren and Claridge (2001, p. 119) mention wildlife being sold along the road in Luang Namtha, ranging from "*low-value products such as civets to pangolin scales.*" The same authors made similar observations in Oudomxay province, where "*sambar and wild pig meat, porcupines, bamboo rats, squirrels, pheasants and small birds*" are sold along the road (Nooren and Claridge, 2001, p. 127).

Vongkhamheng (2002, p. 115) observed that wildlife is commonly sold in villages situated along "Highway No. 1" in Viengthong district in Hua Phan province. Secondary roads are concerned as well, such as in Ban Nadi[85] in Viengthong district, Bolikhamxay province (Hedemark et al., 2006, p. 30). Hedemark and Vongsak (2002, p. 21) found a common palm civet offered for sale along the road on April 5, 2002 in Luang Namtha for 30,000 LAK. Jenkins, Kilpatrick, Robinson and Timmins (2005) saw a boy selling a specimen of *kha-nyou* (*laonastes aenigmamus*) together with squirrels along Road No. 12 from Thakhek. Douangboupha et al. (2009, p. 50) report that *kha-nyou* are commonly sold at roadside stalls retailing wild animals, vegetables, and fish. Panthavong, Sisomphane and Poulsen (2005) report how along Road No. 9 from Ta-Oy to Saravan, they were offered, among others, *"black giant squirrels, tens of other squirrels, several palm civets [...] and flying squirrels."* Out of a panel of 349 wildlife consumers interviewed at the Dong Mark Khay market in Xaythany district (VTEM), Sinthammavong (2009) found that 46% of buyers buy wildlife from road stalls, 45% from wet markets, and 9% receive home deliveries.

At Airports

In the 1990s, wildlife was commonly sold at nearby provincial airports, such as in Xam Neua town in Houa Phanh province (Showler, Davidson, Salivong and Khounboline, 1998, p. 66). Hedemark (2003, p. 41) observed how Lao pilots would transport wildlife to sell to restaurants in Vientiane. Nooren and Claridge (2001, p. 119) mention that air travellers bound for Vientiane occasionally buy wildlife at the airport in Luang Namtha. Singlormant (2004) investigated wildlife trade at Luang Namtha airport 24 times and slightly than half of the times (46%) wildlife was present. Syhalath (2004) conducted similar investigations and found wildlife in 29% of the cases.

Village Markets and Urban Wet Markets

Wildlife is sold at local markets (Boonratana, 1997, p. 25) and urban wet markets (Boonratana, 1998, p. 66). Fresh food markets were allowed to operate on a larger scale from 1986 onwards, since the country's economic opening (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 234). In the late 1980s, Chazée (1990, p. 18) observed that wildlife was commonly sold at wet markets in Vientiane and in provincial towns.

[85] (Q48 0450151; 2026420)

He hoped that trade would lessen after a law was published on December 18, 1989. Salter (1993a, p. 6) and Duckworth, Salter and Khounboline (1999, p. 16), however, observed that wild meat or live wild animals were still openly sold at wet markets in most provincial and district towns in the early 1990s. That Luang market in Xaysetha district (in Vientiane Municipality) used to be the most famous market for wildlife at that time (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 7). Schaller (1995, p. 2) noticed that wet markets were a better "*post of observation*" for wildlife than their natural habitat. Duckworth (1997, p. 4) confirms that wet markets and villages are useful sources of information about the occurrence of small carnivores. Duckworth, Salter and Khounboline (1999, p. 17) mention that, in the late 1990s, sale of wildlife tended to shift from wet markets to specialized wildlife markets, or even to private grounds. Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 32) confirmed this trend. In Attapeu province, wildlife trade moved from wet markets to temporary, open-air stalls located outside the town near the bridge. Syhalath (2004) found that 68% of the markets investigated in Luang Namtha exhibited wildlife, but less than 10% of the food retailers sold wildlife.

The Case of Vientiane Capital

Wildlife trade in Vientiane Capital has been under scrutiny since the late 1980s. Several authors have investigated species, volumes, prices, and uses of wildlife traded from various wet markets in Vientiane, among others Chazée (1990), Srikosamatara, Siripholdej and Suteethorn (1992), Salter (1993b), Nash (1997), Nooren and Claridge (2001) and TRAFFIC (2008). Srikosamatara, Siripholdej and Suteethorn (1992) estimated the annual volume of wild meat sold in Vientiane at 33 metric tons (Mt.), comprising over 23 species of mammals, eight species of reptiles, and 33 species of volatiles. In the middle of the 2000s, a series of surveys were undertaken by students of various faculties of the National University of Laos (NUOL), and by Inthilath and Hanmaha (2004), Xamounty (2005), Youyabouth and Bouapoaher (2006), Onsyma (2009), Khammavong (2008), Sinthammavong (2009), Onsyma (2009), and Khonsavanh (2009) within the Vientiane Wildlife Trade Control Project carried out by WCS and Vientiane PAFO in five districts of the Capital.

In 2009, Onsyma (2009) found that, out of 17 markets investigated in Vientiane Municipality, only two did not sell wildlife on the days surveyed. Dong Mark Khay was the market with the highest volumes of fresh wildlife (10%), while the stalls near the central post office exhibited the highest volume (30%) of dried ingredients for Chinese medicine. The same author observed that the sale of wildlife tended to increase compared to previous years as the effect of campaigns disappeared. Patrol members tended to collude with market vendors, and the latter also knew how and when to hide products (Onsyma, 2009).

In 2009, a notice issued by the Governor of Vientiane Capital made the trade of any form of wildlife in the capital city illegal (Lao Wildlife Trade Working Group, n.d.).

At Restaurants

According to MAF regulation No. 0360, it is forbidden to sell wildlife at restaurants (Hedemark and Phetmixay, 2004, p. 19). Restaurants displaying wildlife on their menu have, however, been encountered throughout the country, as reported by several authors. In the 1990s, TRAFFIC (1999, p. 52) mentioned a famous restaurant selling wildlife in the town of Pakse in Champassak province. Meat of several species was served regularly or could be ordered in advance and *lao lao*, the local alcohol distilled from rice or other grains, containing body parts of several species, including flying squirrels, was available as well. In this town, civet meat was regularly found in restaurants (FMCP, 2000, p. 102). Panthavong, Sisomphane and Poulsen (2005) report seeing road restaurants preparing and selling wildlife meat (squirrels, birds and civets) along Road No. 9 in Saravan province. Boonratana (1998, p. 66) observed that a few restaurants in Phin and Phalanxai districts (in Savannakhet province) specialized in wildlife. Nooren and Claridge (2001, p. 127) observed that "*Chinese restaurants and hotels apparently formed the core of wildlife trade*" in Oudomxay town.

Duckworth, Salter and Khounboline (1999) report that wild meat available in restaurants fetched a higher price than common meat. Between 2004 and 2009, students of the NUOL recorded prices of wildlife sold at various restaurants in Vientiane Capital, as well as in Luang Namtha province. Inthilath and Hanmaha (2004) found that out of 19 restaurants selected in five districts of Vientiane Capital, 17 served wildlife. The most common wildlife served wase flying squirrels, followed by bamboo rats, porcupines, bats, squirrels, and civets. In a similar survey carried out in Vientiane Municipality in 2009, Khonsavanh (2009) found that 13 out of 29 restaurants sold wildlife. They served 14 species, including flying squirrels, porcupines, civets, squirrels, bats, and bamboo rats. Prices ranged from 30,000 LAK to 300,000 LAK per plate. Details can be accessed in Annex 19.

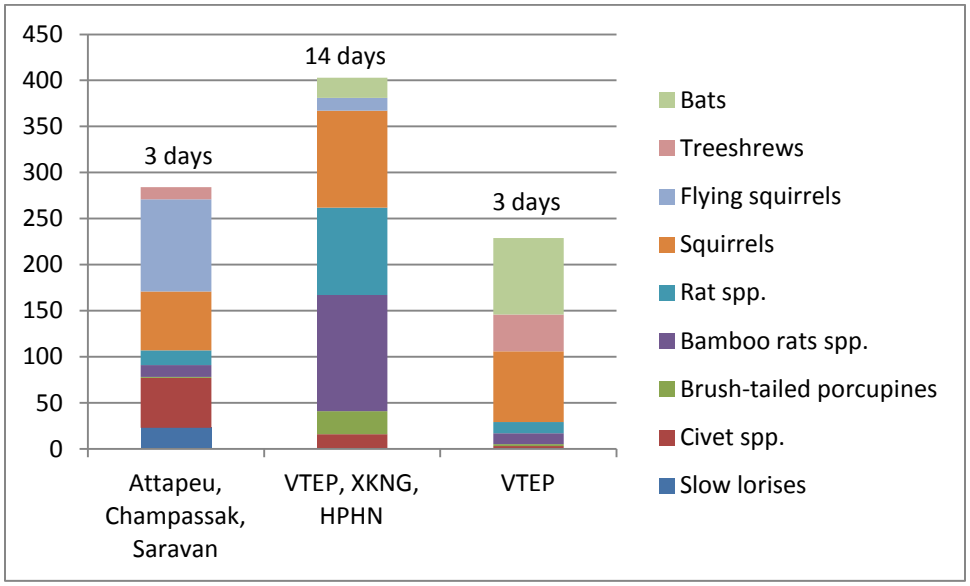
Volume

Nooren and Claridge (2001, p. 15) remind that although international wildlife trade attracts much attention, domestic trade of wildlife for food, display, and Chinese traditional medicine is likely to represent considerable volumes as well.

In 1992, Srikosamatara, Siripholdej and Suteethorn (1992) estimated the domestic volume of wildlife trade at 33,000 kg (33 Mt.), comprising 10,000 mammals (23 species), 7,000 birds (>33 species) and 4,000 reptiles (>eight species) for Vientiane Capital alone. Tobias (1997, p. 36) estimated that 30% to 40% of wildlife hunted in the Lak Xao region was traded within Lao PDR, while the remaining 60% to 70% was traded across the border. In a survey carried out in Xayaburi province, WWF (2006, p. 103) found that only 28 households out of 65 interviewed reported selling wildlife meat. It was felt that volumes were largely under-reported, as it is illegal to sell wildlife.

Trade was local, to Xayabury town (57%) or to the vicinity (42%) (in the same village or neighbor villages). The most recent market investigations made in different locations of Lao PDR by WCS yielded the following results:

Figure 9 -- Volume (In Individuals) of Selected Wildlife Recorded and Sampled at Various Markets in Six Provinces



Source: WCS-PREDICT raw data. For more details, refer to Annex 16, 17 and 18.

Prices for Wildlife Sold Domestically

Over the years, several authors collected price information for wildlife sold at wet markets throughout the country (Srikosamatara, Siripholdej and Suteethorn, 1992; Salter, 1993a and 1993b; Vongkhamheng, 2002; Krahn, 2005; Schlemmer, 1999 and 2001; Hedemark and Vongsak, 2002; WWF, 2006). However, large discrepancies among and even within the same variables (e.g., the location (north, central, south, urban-rural), the position along the market chain (sale to middlemen or end consumers), the species, the preparation (live, fresh meat, roasted, dried), the measurement unit (per head, per kg), and the end use (pets, food, medicine, ornaments)), render any comparison hazardous. Srikosamatara, Siripholdej and Suteethorn (1992, p. 11-12) for instance, expressed prices recorded at That Luang market in Vientiane Capital in USD and per kg meat. Prices for civets, squirrels, and bamboo rats ranged between 1.45 USD/kg to 5.96 USD/kg (Annex 20). Other authors (WWF, 2006; WCS, 2012) usually recorded prices in LAK per individual sold for most species. However, some species, such as porcupines and occasionally civets, are often sold per kg meat. The following Table shows examples of prices recorded by two different teams at different times and locations, and the variations which arise.

Table 12 -- Selection of Prices Collected for the Same Species by Two Different Organizations, at Different Times and Locations

		Location (Provinces)			
		XBRY	ATTP CPSK SRVN	VTEP XKNG HPNH	VTEP
		Timing			
Source of Information		WWF	WCS-PREDICT		
Species	Measuring unit	2006	December 2011	December 2011	January 2012
Porcupine	LAK/kg	15,000	130,000		40,000-120,000
	LAK/head			50,000-500,000	
Bamboo rat	LAK/head	21,000	20,000-120,000	50,000-300,000	25,000-150,000
Pallas squirrel	LAK/head	5,000	15,000-30,000	Not found	Not found
Bats	LAK/head	Not found	Not found	home consumption	5,000-12,500
Civets	LAK/head	-	15,000-130,000	70,000-350,000	-
	LAK/kg				50,000

Sources: WWF, 2006; WCS-PREDICT primary data (Annex 17, 18 and 19).

Due to the methodological constraints mentioned above, it makes hardly any sense to present, compare and discuss prices found in the literature. Most authors, however, noticed general trends pertaining to wildlife prices. In 1992, Srikosamatara, Siripholdej and Suteethorn (1992, p. 1) observed that wild meat (e.g., deer, wild boar, sambar) prices were higher than prices of "common meat" and therefore suggested that wildlife trade in Lao PDR is not targeted towards subsistence. Salter (1993a, p. 7) found similar trends, with higher prices paid for meat of wildlife than for meat of domestic animals. Meat of wildlife was sold as special (luxury) food (Salter, 1993a, p. 7) or as ingredient for medicinal preparations (Duckworth, Salter and Khounboline, 1999, p. 17). Some authors, however, found opposite trends. Krahn (2005, p. 132) recorded prices[86] paid for wildlife at Sekong province's wet market and found that they were lower than domestic meat prices. According to her, this situation was rather unique, as in other regions of the country, wildlife prices often exceed prices of domestic animal meat.

A few authors had previously found results in line with the trend observed by Krahn. Foppes, Saypaseuth, Sengkeo and Chantilat (1997, p. 17) found that prices paid for wildlife were equal to or even lower than prices of domestic meat.

[86] 10,000-13,000 LAK per kg for a small civet in 2002 and 2003

Average wildlife prices amounted to 2,000 LAK/kg. Vongkhamheng (2002, p. 74) made similar observations in Houa Phanh province, where prices for wildlife meat were lower or equivalent to prices paid for meat of domestic animals. According to him, prices depend on local consumption preferences and animal size. Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 26-27) recorded prices and volumes of wildlife sold in September 2005 from Ban Mai and Ban Sompoy project demonstration site in Attapeu province and also concluded that prices varied according to species and consumers' preferences. Variable squirrels fetched lower prices than other squirrel species and were thus consumed more locally and traded less. Valuable species that are difficult to find, such as giant flying squirrels, fetched higher prices. Animals not matching "*market standards*" are usually sold locally or consumed within the family (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 28). Similarly, animals of lower value for food remain on the local market (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 30). Chamberlain, Alton and Silavong (1996, p. V-4) found that, while basically all species were hunted for subsistence and trade, only the cash value of squirrels[87] was disclosed by villagers in Nakai.

Common rats, bats, squirrels, tree shrews and birds have traditionally been the cheapest wildlife (not more than 2 USD/head) and this trend has remained throughout the years. Nooren and Claridge (2001, p. 127) observed that Oudomxay food market, which used to be a major market for wildlife in the early 1990s, displayed only '*low value wildlife such as squirrels, bats and birds*" in the end of the 1990s. In 1999, squirrels were valued 3,000 LAK each (ibid, p. 127). Onsyma (2009) observed that bats and squirrels were considered the most popular wildlife item sold for food in Vientiane Capital in 2009.

In a survey carried out in 2005 in Xayaburi province, WWF (2006, p. 101-102) found higher prices for wildlife intended for medicinal use than for wildlife meat. Foppes, Saypaseuth, Sengkeo and Chantilat (1997, p. 17) had made similar observations, with average prices of 2,000 LAK/kg for standard wildlife meat and an average price of 20,000 LAK/kg for more valuable species (such as pangolins). In Viengthong district in Houa Phanh province, Schlemmer (2001, p. 77) noted that illegal goods such as wildlife and opium were the only goods traded on favorable terms.

Prices also vary according to the point of transaction along the value chain, from harvesters to consumers. The further away from the collection point, the higher prices become. Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 28) observed that prices quoted by villagers were systematically lower than prices quoted by officials, thus showing how prices become more steep the higher they go up the supply chain. Chamberlain, Alton, Silavong and Philavong (1996) assessed cash income from wildlife sale in villages on the Nakai Plateau.

[87] 1,200 heads per year at a value of 800 LAK/head

Results differed greatly across ethnic populations and villages. The average annual income amounted to 18,027 LAK/HH, the lowest was 11,957 LAK/HH (*Bo* population), and the highest was 48,029 LAK/HH (*Ahoe*, a Vietic population).

Summary Chapter 3.7: Domestic Trade and Sale of Wildlife

Trading wildlife is illegal. Nevertheless, domestic trade of wildlife is widespread. The proportion of harvested wildlife which is sold depends on a wide array of factors, the main ones being the location of harvest and its accessibility to markets, the ethnic group, the season, the success of hunting that day, and the prevailing local economic situation.

Attributing species to specific categories for consumption or for domestic trade is not possible. For these reasons, it is difficult to make a clear-cut distinction between subsistence and trade. In some cases, species consumed for subsistence differ from the ones sold, while in other cases the same species are both locally consumed and sold. The reasons for trading species relate to local consumption habits (e.g., preferences, taboos, tradition), local livelihood (e.g., need for cash and sale of surplus meat), market demand for some species, and seasonal factors. It is therefore difficult to target interventions pertaining to species on a differentiated basis at the subsistence and trade levels. Tracing the origin of wildlife (i.e., the point of harvest) has been identified as a bottleneck, either because vendors do not know the origin of their products or possibly because they do not want to disclose it. Systematic and specific wildlife market surveys were not encountered.

WCS, under the PREDICT component of the USAID-EPT program, started recording market information in 2010, along with sampling and recording of wild animals sold at market and roadside retail stalls. Until then, prices for wildlife were usually collected ad hoc and in an erratic way in larger surveys. Prices disclosed for wildlife vary according to the following factors: species, status (i.e., alive or dead), preparation (e.g., skinned, gutted, dried, roasted, fried), geographic locations, distance between point of harvest and point of sales, and currency (e.g., U.S. dollar, Lao kip, Thai Baht). Exchange rates between LAK and USD are not always mentioned and inflation is not taken into account.

Given these shortcomings, it is difficult to compare prices. However, the following trends can be sketched out: animal products that are destined to become medicine or luxury foods (e.g., pangolins) tend to fetch higher prices than animals consumed locally. High prices mirror the demand and the rarity of the species. Prices of species traded domestically (e.g., squirrels, bats, and rats) remain 'affordable" and tend to increase less than prices paid for species traded internationally. This is also because most of these species have high reproduction rates (except for bats) and can be harvested relatively easily. Wildlife sold domestically can be found at village, district, or provincial wet markets, some of which are more specialized in wildlife than

others. It can be purchased at stalls along the road, as well as at bus stations. Specialized restaurants offering wildlife on their menus are widely reported, especially in Vientiane Municipality.

3.8 Commercial Consumption and Use of Wildlife

Food

Clendon (2001, p. 33) observed that "*increasingly, the exotic appeal of wild foods means that they are favoured by urban dwellers, who have become a growing market for them.*" Hedemark (2003, p. 41) observed that wealthy Lao people were main customers of wildlife, together with traditional medicine merchants. Indeed, in Attapeu province, Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 30) observed that local consumption of wildlife was rather low, owing to the low purchasing power of locals. Most wildlife destined for food, especially high-value species such as Phayre's squirrel, giant flying squirrel, and other squirrel species harvested in the province was sold to larger towns such as Pakse. However, in the same province, Robichaud, Hedemark and Johnson (2002, p. 31) found that consumers of wildlife at restaurants comprised mainly government officials. Similarly, customers buying wildlife at wet markets were mainly family members of government officials. In Saravan province, the same authors witnessed how forestry officials ordered flying squirrels at a restaurant.

Sinthammavong (2009) carried out a survey between April and May 2009 in the Dong Mark Khay market in Xaythany district (Vientiane Municipality) with a panel of 349 people. His findings are in slight contradiction with observations made by other authors. He concluded that farmers were the highest consumers of wildlife, as they are close to the source. However, the same author simultaneously observed that wildlife was bought as medicine, jewels, food, pets, gifts, and as a health enhancer. The reasons evoked by respondents for eating wildlife were habits, palatability, and belief that it is good for the health and strength (Sinthammavong, 2009).

Traditional Medicine Use

Although Lao traditional medicine is herbal-based, it also encompasses a non-negligible proportion of wild animal parts, a proportion which increases in Chinese traditional medicine (Baird, 1993, p.26; Duckworth, Salter and Khounboline, 1999, p. 17). Baird (1995a, p. 21) found that animal-based components of traditional remedies were often "by-products" collected from animals killed for other purposes or from dead animals. In other words, wildlife was usually not killed for the sole purpose of harvesting selected body parts intended for traditional medicine. The main markets for traditional medicine are Vietnam, Thailand and China (Baird, 1993, p. 26). TRAFFIC (1999) found that traders selling traditional medicine domestically are mostly *H'mong* women, who source raw material from *H'mong* living in the northern regions (e.g., Phongsaly) and the (previous) Xaisomboun special zone. Prices for traditional medicine in Lao PDR were said to be lower than in Thailand.

Primates: The case of gibbons illustrates the multi-purpose nature of hunting. While gibbons are hunted mostly opportunistically (MAF, 2011, p. 13), a specific market exists for their body parts, mainly bones, traded to Vietnam as ingredients for traditional medicine (MAF, 2011, p. 14), a fact already mentioned by Davidson et al. (1997, p. 26). Other primate species, such as Douc langurs, are hunted for the medicinal properties of their bones, which are sold to Vietnam (Davidson et al., 1997, p. 25), as well as for their excrement, organs, and other body parts (Duckworth, Salter and Khounboline, 1999, p. 179). Johnson, Singh and Duongdala (2003, p. 200) mention that pig-tailed macaques are used in medicine as well. Macaque skeletons enter in the composition of "*gao,*" a paste made from cooked bones and used for rheumatism. "*Gao*" is concocted according to the following "recipe": four skeletons of macaques, one bear skeleton and one tiger skeleton (TRAFFIC, 1999, p. 40). According to Nooren and Claridge (2001, p. 53), "*gao*" can be made of different hard body parts, such as bones and horns, from different animals.

Small carnivores: Johnson, Singh and Duongdala (2003, p. 200) mention that **civets** are used in traditional medicine as well. According to Compton and Le Hai Quang (1998, p. 4), perineal scent glands in civets are used as ingredients in different potions used in traditional medicine to induce abortions and to treat mental diseases, among other uses. Hunting civets to extract their perineal glands was recognized as a main threat to this species in certain areas of Lao PDR (Duckworth, 1994, p. 3). Similarly, badgers and otters are prone to be hunted for the medicinal properties of their body parts (Duckworth, Salter and Khounboline, 1999, p. 188).

Rodents: Johnson, Singh and Duongdala (2003, p. 200) observed that squirrels are used in traditional medicine as well. Flying squirrels were on a "shopping" list made by *H'mong* traders of Chinese medicine (TRAFFIC, 1999, p. 32). Duckworth, Salter and Khounboline, 1999, p. 219) mention that selected body parts of porcupines, such as their stomach and quills, are used in traditional medicine. This is confirmed by Johnson, Singh and Duongdala (2003, p. 200), who found that porcupines were ranked as the fourth most widely used wildlife source of "ingredients" in traditional medicine.

Chiropters: Salter (1993a, p. 16) mentions that **bat** skeletons are used in traditional medicine preparations and, according to Nash (1997, p. 10), they are highly valued.

Johnson, Singh and Duongdala (2003, p. 203) assessed that wildlife sold for medicinal purposes by villagers in Luang Namtha province fetched higher prices than wildlife sold for food. Wildlife destined for use in traditional medicine is, however, not necessarily traded, but also used within the hunters' community. Indeed, in the late 1990s, Nash (1997) observed a low occurrence of organized wildlife trade destined for traditional medicine. Onsyma (2009) recorded prices of wildlife sold at various shops selling Chinese medicine in Vientiane Municipality. Out of 12 shops investigated, three sold ingredients of animal origin.

Trophies, Curios, Skins and Furs

Duckworth (1997, p. 4) notes that villagers often keep parts of hunted animals (e.g., teeth, antlers, horns, feet and tails) as trophies. This mainly concerns large mammals of interest, and to a lesser extent, small carnivores. Nooren and Claridge (2001, p. 39) observed that "*people living in subsistence situations in rural villages commonly display the horns and antlers of animals they have killed on the posts in their houses*." The same authors (ibid, p. 39) also observed that "*the display of wildlife trophies is popular with urban Lao families and businesses*." Trophies are symbols of status and wealth and reflect the importance of the owner. Trophies were also seen at restaurants, hotels, or petrol stations, and beside private houses in villages or towns. Nooren and Claridge (2001, p. 39) found the following species displayed as trophies: horns/antlers of Sambar, Eld's deer, muntjac, kouprey, gaur, banteng and serow; skins of pythons, pangolins, civets, binturong, leopard cats and hog badgers; stuffed small cats and otters; carapaces of turtles; and feathers of peacocks and pheasants. Skins of binturong are sold domestically (Duckworth, Salter and Khounboline, 1999, p. 190). Besides being used for food, gibbons are hunted by *Akha* populations for their fur (Hedemark and Vongsak, 2002, p. 23).

Recreational

Nooren and Claridge (2001, p. 39) observed that "*keeping wildlife as pets is not uncommon in Laos and occurs among residents of both villages and urban areas*." Several authors had previously reported wildlife kept or traded as pets: Salter (1993a, p. 6), Baird (1993), Duckworth, Salter and Khounboline (1999, p. 20). Nooren and Claridge (2001, p. 39) found a preference shown for primates, including macaques and Douc langurs, with the latter being highly valued. They, however, also encountered other primates such as gibbons and slow lorises, and other species such as tigers, bears, civets, binturong, squirrels, dholes and different bird species. Nooren and Claridge (2001, p. 40) observed that pets were usually traded by circumventing markets and were "*sold on the streets, door-to-door or by directly approaching people known to be potential buyers*."

According to Baird (1993, p. 22), back in the 1990s, macaques could be legally hunted to be kept as pets, as long as they were not sold. In southern provinces, it was common to see crab-eating, rhesus or pig-tailed macaques kept as pets. They were (illegally) bought from hunters at prices ranging between 4.7 to 8.4 USD. More recently, Phiapalath and Saisavanh (2010, p. 29) found a juvenile macaque held captive in the Dong Khanthung PPA and Boonratana, Sengsavanh and Chounlamounty (2000, p. 18) showed photographs of young pig-tailed and rhesus macaques held captive in the Dong Sithouane Protection Forest in Savannakhet province. Macaques are appreciated as long as they are infants (Baird, 1993, p. 22; Tizard, 1996, p. 29) and female macaques may even be killed purposely to capture their infants (Duckworth, Salter and Khounboline, 1999, p. 175). Once they have attained adulthood, macaques are often killed and eaten, as they became dangerous (Baird, 1993, p. 22).

Gibbons are also extensively hunted for the pet trade (Salter, 1993a, p. 18; Nash, 1997, p. 18; Duckworth et al., 1995, p. 19; Duckworth, Salter and Khounboline, 1999, p. 181). Similar to macaques, female gibbons may be occasionally purposely be shot to retrieve their infant for sale in Lao PDR or in Thailand (Salter, 1993a, p. 18). This practice seems to have remained until today (MAF, 2011, p. 14). A survey carried out in the Nam Phoui NPA and Dong Khanthung PPA showed that hunting of gibbons still exists and is targeted towards the pet trade (Phiapalath and Saisavanh, 2010, p. 8). Two captive juvenile gibbons, worth 3,000 to 5,000 THB each, were seen in Ban Mai and Ban Nong Nga in the Dong Khanthung PPA (ibid, p. 25-26). In one case, the infant was discovered, clinging to its mother's fur once the mother was shot, indicating that the mother was shot opportunistically (ibid, p. 26). Besides consumption as a food item, their use in the pet trade was the major threat to gibbons in the Xe Pian NPA (FMCP, 2000, p. 20). The trade of gibbons as pets peaked in the late 1980s to early 1990s and has declined since then -- either because their population declined or because they sought refuge in remote places. Steinmetz (1998b, p. 13) was told by villagers of Ban Nakhu (Phou Hin Poun NPA) that gibbons were sold as pets in the past, but the market was almost extinct by the end of the 1990s. Duckworth (2008, p. 26-30) reviewed literature on the trade of gibbons and found that while there was a market in Thailand for such animals in the 1980s and 1990s, it collapsed in 1992, after the new law on wildlife was passed in this country. According to MAF (2011, p. 14), the market for infant gibbons is not well established.

Besides primates, carnivores are also hunted and caged for display. Salter (1993b) observed civets for display at several locations across the country. Tobias (1997, p. 56) found that there was a demand for captive display of civets in Lak Xao town. Duckworth (1997, p. 19) observed that *"small carnivores (particularly young ones) were popular mammalian exhibits in local menageries,"* mainly at up-market restaurants in Vientiane and at most provincial towns. A caged small-toothed palm civet was spotted at a fish restaurant near Vientiane (Duckworth, 1997, p. 8). Captive common palm civets were found in Vientiane, Thakhek and Ban Lak Xao (Duckworth, 1997, p. 10). Small Indian civets were spotted in cages in Ban Lak Xao (Duckworth, 1997, p. 14). Masked palm civets were found captive at various places in Vang Vieng, Vientiane, and Ban Lak Xao (Duckworth, 1997, p. 15). Owston's palm civets were found at Ban Lak Xao as well (Duckworth, 1997, p. 15). Small-toothed ferret badgers were seen in cages in Ban Lak Xao (Duckworth, 1997, p. 12). Duckworth, Salter and Khounboline (1999, p.190) report that among carnivores, binturong used to be the most frequently encountered caged carnivores in the Lao PDR. Duckworth (1997, p. 15) report several caged specimen of binturong found in various places (Luang Prabang, Vientiane, Ban Lak Xao).

Among rodents, flying squirrels are hunted to be sold as pets (Robichaud, Hedemark and Johnson, 2002, p. 37).

In spite of the widespread occurrence of wildlife kept as pets, Duckworth, Salter and Khounboline (1999, p. 20) stated that the volume of wildlife traded for food and for medicinal purposes outweighs the volume of animals traded for recreational purposes.

Religious Merits

Bounnak (2012, personal communication) highlighted the problem posed by birds commonly sold at temples to be released for religious merit. This concerns mainly passerine birds, munia, and swallows (Duckworth, Salter and Khounboline, 1999, p. 20)

Summary Chapter 3.8: Commercial Use of Wildlife

Wildlife is traded for food consumption, traditional medicine, display (e.g., curios, trophies), recreational purposes (e.g., pets), and religious merits. Most species of interest to this report are traded for commercial food consumption, except primates, which are either consumed locally or exported to other countries. Low-value species are traded for local consumption, while higher-value species are traded to markets with more affluent customers (e.g., domestic urban markets or the international market).

Trade for traditional medicine concerns all animal orders of interest in the present report, but may pertain to specific species within each order. All primates, including lorises, are hunted for the value of their bones. Civets, badgers, and otters are also used by commercial trade for traditional medicine. Squirrels and porcupines are the main rodents sold for traditional medicine. Bat skeletons are highly prized in traditional medicine as well.

Trade of curios and trophies (e.g., fur, horns, antlers, teeth) concerns mainly rare large mammals such as deer, large cats, and bovines. Small carnivores such as civets, binturongs, and otters are also valued by the trade for curios (e.g., stuffed animals, skins). Primates, including lorises, squirrels, and birds, are largely used by the pet trade. Birds comprise the bulk of animals used for religious purposes.

3.9 International Trade of Hunted Animals and/or Their Products

Global Significance of Illegal Wildlife Trade

Internationally, in monetary terms, illegal trade of wildlife ranks second after drug smuggling (Brezosky, 2005 cited in Stenhouse, 2006, p. 5). In 1997, it was ranked third after drugs and weapons (Bois, 1997, cited in Nguyen Van Song, 2003, p. 2).

In Lao PDR, according to Nooren and Claridge (2001, p. 41), "*the vast majority of wildlife trade is driven by the demand for wildlife products from outside the country, from destinations such as China, Vietnam, Thailand, Japan, Korea, and the overseas Chinese population scattered throughout the world*."

History of Cross-border Wildlife Trade in Lao PDR

Cross-border trade of wildlife between Lao PDR and neighboring countries has a long history. Indian and Chinese merchants, settled in the Mekong Delta, are believed to be among the first wildlife traders in the region (Nooren and Claridge, 2001, p. 17). Chazée (1990, p. 20) found 150 year-old guns in northern Lao PDR -- evidence of a long-term relationship with Chinese merchants who equipped local hunters with weapons and ammunition in exchange for the supply of wildlife products destined for use in traditional medicine.

According to Nooren and Claridge (2001, p. 18-19), opportunistic as well as organized trade with China and Vietnam probably continued throughout the post-Indochina war years in the 1970s and 1980s. In the 1980s, cross-border trade of wildlife, both legal and illegal, was carried out by government officials, State companies, or private companies granted special licenses (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 34). Nooren and Claridge (2001, p. 20) view the NEM (decentralization, deregulation and trade opening) adopted in Lao PDR in 1986, as well as similar economic reforms occurring in Vietnam and China, as crucial factors behind the momentum gained by wildlife trade.

Market Demand and Supply Mechanisms

Wildlife trade follows standard market mechanisms of demand and supply (Duckworth, Salter and Khounboline, 1999, p. 21; World Bank, 2005, p. 2) and thrives "*because of the high prices fetched by wildlife products*" (Southammakoth, 1998, p. 35).

In 1992, Srikosamatara, Siripholdej and Suteethorn (1992, p. 37) viewed the demand from Thailand and China as major threats to wildlife conservation, while they considered Myanmar, Vietnam and Cambodia as negligible players in regional demand. At that time, wildlife species traded in Ho Chi Minh City (HCMC) were domestically sourced (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 38).

Several authors noted an increasing regional demand, inducing an intensification of domestic hunting (Showler et al., 1998, p. 43; Duckworth, Salter and Khounboline, 1999, p. 21; World Bank, 2005, p. 2-3; Anon., n.d.). The demand from Thailand was viewed as the main threat for wildlife hunted in central and southern Lao PDR, while the demand from China was seen as the main threat for wildlife hunted in northern Lao PDR (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 38). Duckworth, Salter and Khounboline (1999, p. 21) could not, however, ascertain if domestic suppliers responded opportunistically to the demand or sustained an established market.

For Nguyen Van Long (2003, p. 7), "*activities and functions involved in the movement of live wildlife and dry products from suppliers (hunters, middlemen, retail traders and others) to the ultimate consumers include the exchange, the physical and the facilitating functions*." The functions are detailed as follows:

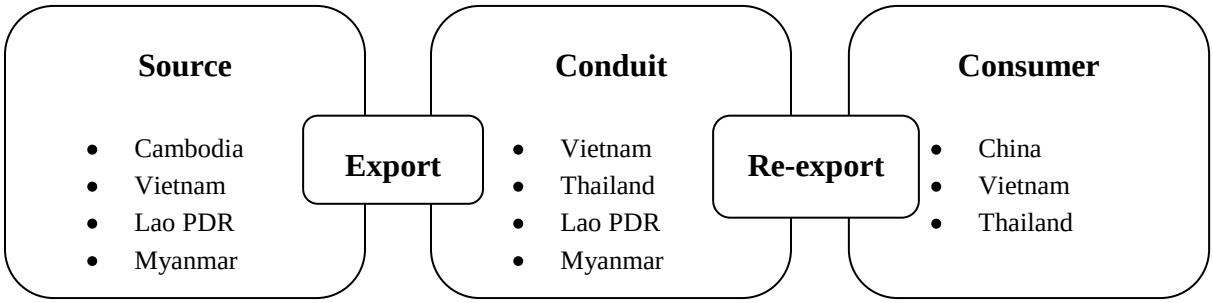
- **Exchange functions**: Buying, selling and pricing;
- **Physical functions**: Trafficking, hiding, breeding, collecting, processing and grading; and
- **Facilitating functions**: Financing, risk bearing and marketing communication.

Nguyen Van Long (2003, p. 7) further observed that pricing is the signal passed on to suppliers and reflects domestic and international demand. TRAFFIC (2008, p. 61) observed that harvesters and traders show a remarkable spatial flexibility and adapt quickly to market signals, such as an increasing demand, a decreasing supply, and subsequently rising prices. Suppliers change harvest location in response to dwindling stocks. The imbalance created by the rarefaction of supply and the increasing demand resulted in sharp competition among established networks. Southammakoth (1998, p. 35) notes that "*the demand for rare wildlife and animal products is an autocatalytic process that feeds on itself,"* a process by which "*the rarer the animal species, the higher the price it commands.*"

Stakeholders

Countries of the region play various roles in the trade of wildlife. They can be a source, exporters, channellers (conduit), re-exporters, importers, and consumers (World Bank, 2005, p. 3), as shown by the following figure.

Figure 10 -- Role Played by Countries of the Region in Wildlife Trade



Source: World Bank (2005, p. 3).

According to Duckworth, Salter and Khounboline (1999, p. 17), cross-border wildlife trade involves numerous actors and pathways and has occurred for decades. Wild animals and products are purchased from hunters and villagers by itinerant collectors who travel around villages by motorbike. National and non-national stakeholders are involved in the trans-boundary movement of wildlife. Trans-border incursions by Vietnamese traders date back to the late 1980s/early 1990s and the economic opening of both countries[88] (IUCN, 1997, p. 46; Showler, Davidson, Salivong and Khounboline, 1998, p. 45).

Duckworth, Salter and Khounboline (1999, p. 20) mention procurement orders passed on by foreign wildlife buyers to their suppliers' network in Lao PDR. Robichaud (2005, p. 18) observed extensive hunting by Vietnamese poachers or by villagers selling to Vietnamese traders. Similar observations were made earlier in Attapeu province (Davidson et al., 1997, p. 79), in Sekong and Saravan provinces (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 42), in Houa Phanh province (Showler, Davidson, Salivong and Khounboline, 1998, p. xxiv), in Phongsaly Province (Kjoller, 1999, cited in Nooren and Claridge, 2001, p. 116), and in Xieng Khouang, Bolikhamxay and Khammouane provinces (TRAFFIC, 1999, p. 10). While WCS (1996, p. 10) indiscriminately mentions commercial hunting and poaching by the Vietnamese, Tobias (1997, p. 47) makes a clear distinction between Vietnamese traders who buy or barter wildlife in exchange for goods and Vietnamese extractors of wildlife and other forest products. Robichaud and Stuart (1999, p. 51) make the same distinction between two types of what they call "*cross-border incursionists*":

1. **Traders** who enter Lao PDR legally though border posts or illegally through the forest and trade daily-consumption goods (e.g., cigarettes, laundry detergent, clothes, and other items). They buy wildlife with cash or barter it against such goods.

[88] New Economic Mechanism in Laos and "Doi Moi" incepted in 1986 in Vietnam

2. **Poachers** (for wildlife or other NTFPs):
   Unarmed poachers who collect several types of NTFPs. While camping in the forest (up to a few weeks in a row) they collect *mai dam* wood and trap or hunt (sometimes with dogs) small wildlife, such as civets, for their own consumption and for trade back to Vietnam.
   Armed poachers who camp in remote forest areas to specifically hunt for large game, including primates used for their meat, bones, and infants, and smaller wildlife, such as civets.

Robichaud and Stuart (1999, p. 51), however, concede that these two types of people are often combined into one person. Indeed, Showler, Davidson, Vongkhamheng and Salivong (1998, p. 40) came across Vietnamese traders, equipped with automatic weapons in the Xe Sap NPA. In some border areas, itinerant traders regularly come to villages to enquire about wildlife availability (Robichaud and Stuart, 1999, p. 47; Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 41; TRAFFIC, 1999, p. 10; Bezuijen, Johnson, Johnston and Robichaud, 2005, p. 7). For instance, Vietnamese traders from Nghe An, Ha Tinh, and Quang Binh provinces (in central Vietnam) make frequent trips to Lao PDR through forest trails or by road to enquire about wildlife (Nguyen Van Song, 2003, p. 28).

To the two categories of border incursionists, Alton and Sylavong (1997, p. IV-3) add a **third category**, namely **specialized (trained) individuals** working for companies "*on clandestine missions to identify rare (and subsequently expensive) species of NTFPs and wildlife to exploit in Lao PDR, which are illegal back home.*"

Cross-border Traders

In the mid-1990s, Chamberlain, Alton, Silavong and Philavong (1996, p. 23) observed that Vietnamese traders[89] regularly came to villages on the Nakai Plateau to sell goods and buy (or barter against) wildlife. For some local Lao communities, cross-border trade of wildlife with Vietnam represents the main cash income opportunity (Chape, 1996, p. 24; Tobias, 1997, p. 37; Robichaud and Stuart, 1999, p. 45; IUCN, 1999, p. 15). These communities often engage in a barter system by exchanging wildlife for consumption goods, such as monosodium glutamate (MSG), salt, clothes, hammocks, batteries, crockery, and machetes (Tobias, 1997, p. 37; Showler, Davidson, Salivong and Khounboline, 1998, p. 43; Robichaud and Stuart, 1999, p. 47; IUCN, 1999 p. 10).

This system is encountered in various provinces sharing a border with Vietnam (e.g., in Attapeu province), where itinerant traders from Vietnam, travelling by motorbike, bicycles, or on foot sell household wares and buy wildlife (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 31).

[89] Reportedly up to 30 people, thrice a month during the dry season.

IUCN (1999, p. 59) made an assessment of trade occurring between Lao villages and Vietnamese traders in the Nakai-Nam Theun catchment area: over a year Lao villages[90] sold honey, buffaloes, pigs, and chickens to Vietnamese traders worth 2,300,000 LAK,[91] while they purchased consumption goods (e.g., MSG, salt, clothes, medicine, etc.) worth 5,300,000 LAK. IUCN (1999, p. 59) further estimated the un-reported cash sale of wildlife by villagers to traders as 3,000,000 LAK.

Alton and Sylavong (1997, p. III-15) estimated the revenues from wildlife trade for five villages in the NN-NPA and seven villages outside the NPA (Annex 21). Overall revenues were thought to be largely underestimated as three villages (one within and two outside the NPA) did not declare any revenue from wildlife trade. Chamberlain, Alton, Silavong and Philavong (1996, p. 23) observed that lowland villagers migrated to the Nakai Plateau in Khammouane province to profit from the lucrative trade in NTFPs, including wildlife. Exchange of wildlife and goods blurs the boundary between subsistence hunting and hunting for trade, as some products (e.g., dry meat) may be used on both sides of the border (MoC and IUCN, 2000, p. 27).

In the Nam Xam NPA in Houa Phanh province, Lao communities exchanged wildlife, rice, and dogs with Vietnamese in exchange for consumption goods (Showler, Davidson, Salivong and Khounboline, 1998, p. 43). In Nam Et-Phou Loey in the same province, Vietnamese traders were reported to travel around villages on the Lao side of the border an average of once a week and hunters were reported to regularly enter the area as well (Nooren and Claridge, 2001, p. 145). The same trade pattern was observed in Nam Xam, the second NPA that Houa Phanh counts (Nooren and Claridge, 2001, p. 147).

A similar cross-border trade/barter system was encountered between Cambodia and Lao PDR, but in the opposite way. Cambodian traders used to travel by boat to Ban Nakasang in Champassak province to buy consumption goods and to sell wildlife (TRAFFIC, 1999, p. 45).

Nooren and Claridge (2001, p. 126) mention a thriving cross-border trade between Lao PDR and China in the northern provinces. Trade is facilitated by the important Chinese population living in the northern provinces (e.g., Oudomxay) and the fact that languages on both sides of the border (Dai and Lao) are "*mutually comprehensible.*"

IUCN (1997, p. 10) warned against "*any form of dependence on services originating across the border*, [...] *a threat both to Conservation Area and national sovereignty.*"

Cross-border Poachers

[90] 3 villages totalling 188 inhabitants.
[91] 1997 prices.

Vietnamese poachers either come to Lao PDR to hunt (within a radius of 15km) or to purchase wildlife from villagers (MoC and IUCN, 2000, p. 28). TRAFFIC (1999, p. 10) mentions that Lao people living in areas where Vietnamese hunt "*are very afraid of them and cannot do anything to stop the poaching*" and IUCN (1999, p. 67) mentions that hunting and trapping by Vietnamese poachers represent "*physical safety hazards*" to villagers. Similar fears were expressed by trainees of a conservation program in the Phou Xang He NPA (Boonratana, 1998, p. 55). There, Vietnamese poachers were said to be war veterans with a good knowledge of the Lao terrain. Their incursions were mainly targeted at *mai dam* (Boonratana, 1998, p. 66). TRAFFIC (1999, p. 10) mentions that Vietnamese poachers "*often camp in a particular area for weeks while hunting*." Vietnamese *H'mong* poachers were reported to hunt on Lao grounds in the Phou Dendin NPA in the northeast (Duckworth, Robichaud and Eve, 2005, p. 47). The same authors felt that the Phou Dendin NPA "*served as an open-access hunting ground*." In the Nakai-Nam Theun NPA, the VCMU found evidence of Vietnamese poaching camps with snaring and "*timber stealing"* at Ban Navang. Poaching was said to occur in the wet season when the VCMU does not patrol (Bezuijen, Johnson, Johnston and Robichaud, 2005, p. 8).

Cross-border incursions resulted in occasional armed conflicts between foreign collectors and local communities (IUCN, 1997, p. 26), with occasional fatal consequences on both sides (Tobias, 1997, p. 33). Alton and Sylavong (1997, p. A IV-12) report that in the NN-NPA, "*many of these Vietnamese come in heavily armed with war weapons and intimidate under armed local village militias, who are far away from official military support systems.*"

In the mid-1990s, clashes arose between villagers in the Ban Phon Keo in Khamkeut district (in Bolikhamxay province) and "*foreign*" rattan and *mai dam* collectors, which resulted in the eviction of 80 collectors. Some "*foreign*" collectors returned later and injured a villager. The village organized patrols and two collectors were killed during such patrols (Alton and Sylavong, 1997, p. BII-9). More recently, some villagers from the NN-NPA still complained about Vietnamese poachers reported to be dangerous (Bezuijen, Johnson, Johnston and Robichaud, 2005, p. 7).

Trans-boundary incursions were also reported with Cambodian or Thai hunters looking for specific targets (e.g., tigers, elephants, wild cattle). Thai hunters were reported to be specialized in tiger hunting and were operating in Cambodia, Lao PDR, and Burma upon orders (TRAFFIC, 1999, p. 10). TRAFFIC (1999, p. 11) observed that incursions by Chinese traders in the North have not been as widely documented as for Vietnamese traders in the East.

Nooren and Claridge (2001) report about the extensive trade carried out between China and tje northern provinces, Phongsaly (ibid, p. 113-116), Luang Namtha (ibid, p. 116-122), Bokeo (ibid, p. 122-124), and Oudomxay (ibid, p. 124-134). Poaching by Chinese incursionists in Phongsaly

province was reported by a researcher in the late 1990s (DoF, 2000, cited in Nooren and Claridge, 2001, p. 116).

Domestic Poachers

A few authors identified another poaching issue related to trespassing of domestic (village) boundaries by *H'mong* hunters, who are reportedly active hunters (IUCN, 1997, p. 42). This was mainly Lao *H'mong* coming from other districts and more rarely Vietnamese *H'mong*, who encroached on the local populations' hunting grounds (Chamberlain, Alton, Silavong and Philavong, 1996, p. 23; IUCN, 1997, p. 42; Tobias, 1997, p. 35; Hedemark et al., 2006, p. 31). In Ban Pak Katan (NN-NPA), villagers reported encroachment on their hunting grounds by *H'mong* hunters coming from other villages (Alton and Sylavong, 1997, p. BIII-8) and similar complaints were expressed by *Toum* villagers in Ban Nam One. Villagers complained that *H'mong* hunters chase away wildlife with their dogs (ibid, 1997, p. BIV-7). At the same time, the *H'mong* seemed to some extent to deter Vietnamese *mai dam* collectors from poaching in the NN-NBCA (Tobias, 1997, p. 35). In Ban Nadi (Viengthong district, Bolikhamxay province), *H'mong* hunters are incriminated for hunting on village grounds. They purportedly camp in caves and hunt for weeks in the Nam Kading NPA (Hedemark et al., 2006, p. 31).

Cross-border Trade by Domestic Poachers

Tobias (1997, p. 36) mentions an additional dimension to cross-border poaching and trade issues. According to him, while *Lao Theung* prefer to wait for Vietnamese traders to enter Lao PDR, *Lao Sung* (*H'mong*) hunters proactively trade wildlife across the border and enter Vietnam in order to obtain higher prices for their wildlife.

Trans-boundary Hunting by Lao

According to Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 25), in a few cases, Lao hunters make cross-border incursions to neighboring countries, such as villagers from Ban Sompoy and Ban Hat Oudomxay downstream along the Xe Kong river. Such incursions into foreign territories are rendered possible by the absence of any villages on Cambodian side and the resulting relative abundance of wildlife.

Middlemen

Middlemen collect wildlife from their network of suppliers and supply both Lao and non-Lao customers. Middlemen are ready to transport their "goods" over long distances to make a higher profit than they would achieve by selling locally (TRAFFIC, 1999, p. 12).

Middlemen operating in Lao PDR can be Lao, ethnic Chinese, or ethnic Vietnamese. Ethnic Chinese middlemen were reported to sell wildlife to Thai customers, as they would pay higher prices than Vietnamese customers (TRAFFIC, 1999, p. 39).

Crome, Richards, Phengsintham and Somvongsa (2001, p. 42) mentioned that Vietnamese traders process orders for specific species from local people in the Sepon mine area. TRAFFIC (1999, p. 23) mentions two Chinese traders originally from the Sichuan province who resided in Oudomxay and organized wildlife smuggling to China with the help of Chinese cars bearing "expert" number plates or through the green border. Another Chinese trader, a woman belonging to the *Dai* ethnic population and living in Mengla across the Lao border, was reported as paying frequent visits to Pakbeng and Oudomxay (Su Yongge, 2000, cited in TRAFFIC, 1999, p. 23).

According to Nguyen Van Song (2003, p. 28), *H'mong* porters bring wildlife across the Khammouane-Quang Binh border, obtain a receipt from middlemen/traders upon successful delivery on Vietnamese side, and get paid by the Vietnamese representative in Lao PDR upon his return. Domestic (TRAFFIC, 1999, p. 44) and cross-border trade of wildlife was also reported to encompass government officials and/or their relatives, as well as government vehicles. Such stakeholders were said to be beyond the control of local law enforcement authorities (TRAFFIC, 1999, p. 48; IUCN, 1999, p. 78). Duckworth, Robichaud and Eve (2005, p. 46) observed that "*control of trade-driven hunting is much more challenging than control of subsistence level hunting because the rewards are higher. Many of the people are businessmen and also have interests in illicit trade in drugs, arms and women rather than being regular citizens enjoying a varied diet."*

Species and Products

"*No animal group is exempted from the demands of international trade*" (Nooren and Claridge, 2001). However, as observed by TRAFFIC (1999, p. 10), "*most in demand are the species which the Vietnamese can sell on to China for their medicinal properties*." Nguyen Van Song (2003, p. 2) observed that the species with the fastest decline in Vietnam (because of the high demand) were tigers and turtles. Vongkhamheng (2002, p. 75) listed gaur, banteng, bear, pangolin, turtles, and large cats (e.g., tigers) as being the favorite species for poaching and commercial trade from Houa Phanh province. All species belong to Category I of the Lao law. Pangolins were the most traded species confiscated by Viengthong district (in Houa Phanh province) customs in 1998 and 1999.

In Attapeu province, high-value species, such as king cobra, pangolins, and Hill Myna (a bird species) are traded directly to Vietnam and thus do not appear in local markets (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 30). According to Timmins and Duckworth (1999, p. 483), "*Vietnamese traders seek firstly turtles and pangolins, with Douc langurs, gibbons and otters forming the next level of desirability*." Steinmetz and Baird (1988, cited in WWF, 1998c, p. 50) reported that the extensive trade of wildlife from the Dong Phou Vieng NPA to Vietnam pertained mainly to specific reptiles and pangolins. Alton and Sylavong (1997, p. A5-8) mention similar results for Ban Beuk, a village of the NN-NPA from which only cobras, pythons and turtles were "*sold to the Vietnamese merchants who frequently trade along the Nam Phaeo*." According to IUCN (1999, p. 76-77), wildlife seized at Lak Xao[92] in 1998 comprised pangolins, turtles (soft-shell and big-headed species), pythons, bear cubs, muntjac/sambar meat and civets. In the NN-NPA, besides the aforementioned reptiles, amphibians and pangolins, primates were considered important commercial species targeted for cross-border trade (IUCN, 1999, p. 90).

Primates: Nash (1997, p. 18-19) mentions that live macaques, langurs and gibbons were regularly sold to clients in Thailand and Vietnam upon order. Monkey bones were reported to be sold by villagers of Ban Beuk in the NN-NPA to Vietnamese merchants (Alton and Sylavong, 1997, p. A5-11).

Baird (1993, p. 22) found the extensive export of primates to Thailand through Chong Mek town. Phanthavong and Tobias (1993, cited in Duckworth, Salter and Khounboline, 1999, p. 20) identified the Ban Phalan market in Savannakhet province as the main hub for trade of "recreational wildlife" to Thailand and Vietnam. Macaques were also included in cross-border trade for recreational purposes in foreign countries (Baird, 1993, p. 22; Nash, 1997 p. 18; Duckworth, Salter and Khounboline, 1999, p. 179). Young pig-tailed macaques from Lao PDR were sold for 16 USD in Khong Chiam village in Ubon Ratchathani in 1991 (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 29).

[92] Khamkeut district, Bolikhamxay province.

According to Davidson et al. (1997, p. 25-26), infant gibbons were often sold to Vietnam. In the Nam Xam NPA, Vietnamese traders paid 50,000 LAK per gibbon infant in 1998 (Showler, Davidson, Salivong and Khounboline, 1998, p. 15). Salter (1993b) mentioned a trade of gibbons from Bokeo and Xayaburi provinces to Thailand for captive display. In Vientiane, white-cheeked gibbons from the Phou Khao Khouay were sold to Thai businessmen (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 23). The same authors found that gibbons featured on posters could be ordered at the Chong Mek border crossing (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 29).

According to Davidson et al. (1997, p. 25-26) infant Douc langurs were often sold to Vietnam. Srikosamatara, Siripholdej and Suteethorn (1992, p. 29) found that Douc langurs could be ordered from posters at Chong Mek border crossing between Champassak and Thailand. In 1988, 30 Douc langurs originating from Lao PDR were found in Bangkok (Salter, 1993b). In Savannakhet, villagers used to sell Douc langurs to Thai businessmen (Salter, 1993b). Douc langurs were sold for 120 to 160 USD per head in 1991 in Amphoe Muang in Mukdahan Province (opposite Savannakhet) (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 26).

Salter (1993b) mentioned that slow lorises were traded from Bokeo and Xayaburi provinces to Thailand for captive display. Nguyen Van Song (2003, p. 18) noticed that large volumes of lorises were sold at Cau Mong[93] wildlife market in southern Vietnam and originated from Lao PDR, Cambodia, and the Tay Nguyen Plateau (central highlands in Vietnam). Lorises were said to be among the favorite wildlife dishes in southern Vietnam (Nguyen Van Song, 2003, p. 22). Besides snakes, birds, turtles and pangolins, macaques were smuggled into central Vietnam (Nguyen Van Song, 2003, p. 28). Starr, Streicher, Nekaris and Leung (2008, p. 43) found that lorises were in high demand for food, captive display, and traditional medicine throughout their distribution range. They also noticed that the value of lorises in Chinese medicine was the highest in Cambodia. Nooren and Claridge (2001, p. 133) report how slow lorises and rhesus macaques were kept (together with other wildlife such as bear cubs, a leopard cub, and turtles) by a Chinese merchant in Oudomxay in 1995 (Su Yongge, 2000, cited in Nooren and Claridge, 2001, p. 133). Nooren and Claridge (2001, p. 147) also report that white-cheeked gibbons are extracted from the Nam Xam NPA in Houa Phanh province to be sold as pets to Vietnamese traders.

According to Baird (1993, p. 25), small mammals such as civets, weasels, rats, and squirrels were rarely traded internationally, but largely domestically. Nevertheless, evidence of international trade of small carnivores and other small mammals was found as well.

[93] Could not be located more specifically

Small carnivores: Duckworth, Salter and Khounboline (1999, p. 190) found that binturong were sold to Vietnam. Meat and skins of small carnivores were encountered at domestic urban markets and were reported to be sold to Vietnam and Thailand.

Furs of civets are traded internationally (Salter, 1993b), to some extent to Thailand (Salter, 1993a, p. 22) and to a larger extent to Vietnam and possibly China (Duckworth, Salter and Khounboline, 1999, p. 191). Duckworth, Salter and Khounboline (1999, p. 20) report that apart from tiger, primates (gibbons and Douc langurs) and some turtles, carnivores (civets and otters) are major wildlife species destined for the Chinese market. Civets traded from Lao PDR were found at the Nikom 2 market across from Chong Mek town in Thailand. They were sold alive as pets and dead as food for 200 THB per head[94] (Baird, 1993, p. 24). Similarly, hog badgers were found dead or alive and sold for 150 THB/head as pets, food, or decoration. Nguyen Van Long (2003, p. 21) observed that restaurants in Le Mat, a village in the Hanoi suburbs famous for its restaurants serving snakes and other special food items, served wildlife meat originating from Cambodia, Lao PDR, and southern Vietnam. Civets were among the most-served dishes, together with wild pigs, birds, and snakes. Other species that were served included porcupines and monkeys. In southern Vietnam, civets were also cited among the favorite wildlife dishes. In Hanoi and HCMC, wildlife was said to originate from Lao PDR, Cambodia, and Vietnam (Nguyen Van Song, 2003, p. 22). Squirrels were sold at the Nikom 2 market across from Chong Mek town in Thailand as well (Baird, 1993, p. 24). Duckworth, Salter and Khounboline (1999, p. 219) mention that porcupine meat is traded to Thailand. This corroborates observations made by Nash (1997, p. 19-20) at the Nikom 2 market[95] in Thailand. Besides porcupine, civets and squirrels were sold as well. According to Compton and Le Hai Quang (1998, p. 16) brush-tailed porcupines are sold from Lao PDR to Vietnam.

Bats: Live bats are usually destined for local consumption and domestic trade. Some cross-border trade to northern Thailand was, however, reported by Duckworth, Salter and Khounboline (1999, p. 235) and Robinson (1994, p. 120).

Flying lemurs, aka colugo (*dermoptera* order) were found at the Nikom 2 market across from Chong Mek town in Thailand, and were sold for 90 THB/head.

Wildlife Preparation

Tobias (1997, p. 32) mentions that Vietnamese poachers dry wildlife meat on bamboo racks in jungle camps. Anon. (n.d.) mentions more elaborate processing techniques used in Lao PDR to smuggle wildlife body parts (e.g., for *gao* making). Chinese and Vietnamese processing bones into *gao* was reported in Oudomxay province (TRAFFIC, 1999, p. 11). TRAFFIC (1999, p. 11) and Nooren and Claridge (2001, p. 132) observed that this technique enabled people to export

[94] 1 USD = 25 THB
[95] App. 10 km from Chong Mek, across Champassak province

wildlife “anonymously” and in the form of low-volume, high-value products. *Gao* making uses hard body parts, such as antlers, horns, bones, carapaces, shells and scales, and includes species such as serows, sambars, tigers and other *felidae*, primates, turtles, pangolins, pythons, and other snakes (Nooren and Claridge, 2001, p. 132).

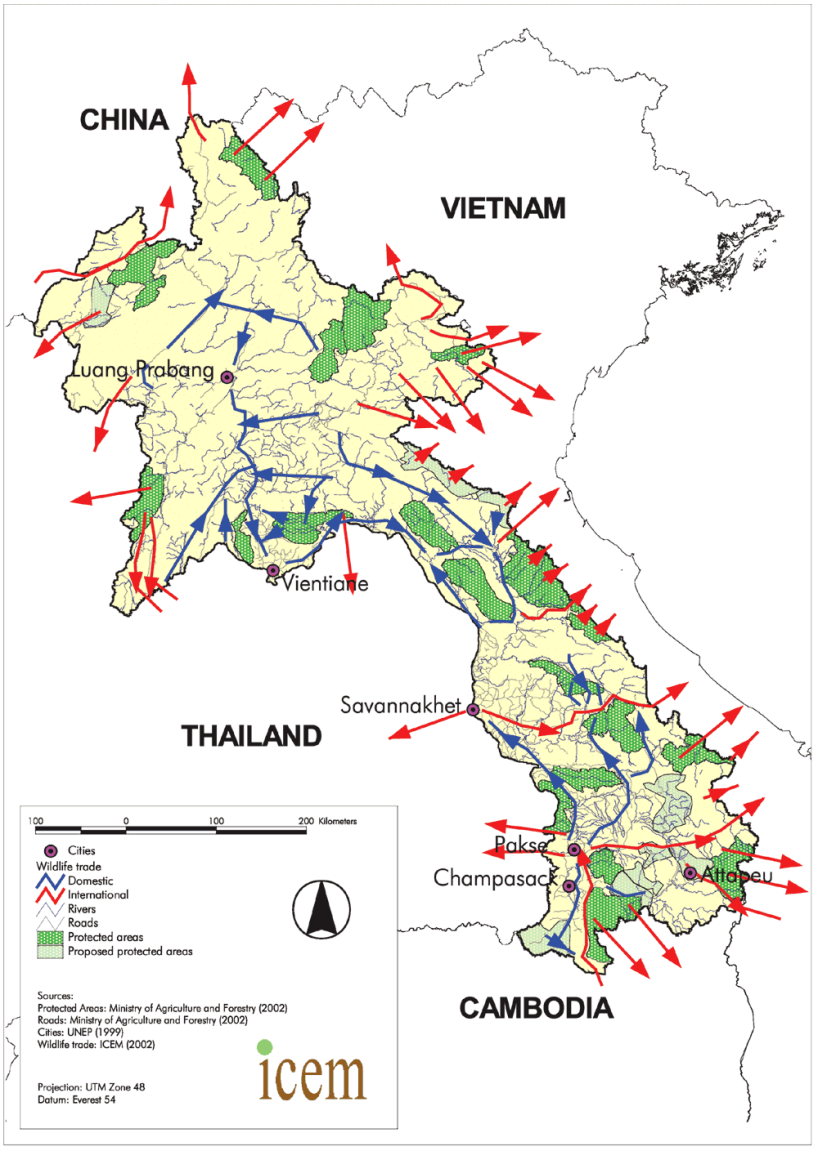
Seasonality

According to IUCN (1997, p. 26), cross-border trade (consumption goods sold or exchange for wildlife) by itinerant Vietnamese traders occurred mainly in the dry season. In Phongsaly province, Duckworth, Robichaud and Eve (2005, p. 47) observed increased cross-border hunting by Vietnamese poachers before *Tet* (Vietnamese New Year). Nguyen Van Song (2003, p. 2) confirms that the critical period of wildlife trade in Vietnam, both for domestic consumption and cross-border trade, extends between September and March. On the other hand, Tobias (1997, p. 36) reports that commercial wildlife harvesters hunted in the rainy season, when *Lao Theung* avoid going to the forest.

Pathways and Means of Transport

Cross-border trade of wildlife has a long history and is facilitated by the extensive borders with the country’s five neighboring countries. However, the country was simultaneously partially secluded from its neighbors by natural (e.g., Mekong river, absence of road network) or manmade obstacles (e.g., landmines between Cambodia and the Lao PDR and closure of the border with Thailand until 1989). This relative seclusion is thought to have delayed the exploitation of wildlife resources (Nash, 1997). This seems to have been specifically the case in areas bordering Cambodia and Thailand (Baird, 1993, p. 2; Round, 1998, p. 123). Indeed, Robichaud, Hedemark and Johnson (2002, p. 49) noticed that wildlife trade was less intensive in areas bordering Cambodia and Thailand, than in areas sharing borders with Vietnam and China. The following figure shows domestic and international trade pathways for wildlife in 2002.

Figure 11 -- Wildlife Trade Pathways in Lao PDR and from Lao PDR to Other Countries



Source: ICEM, 2003.

Road Network

The expansion of the domestic and regional road network accelerated the plundering of wildlife resources (Robichaud, Hedemark and Johnson, 2002, p. 8; Krahn and Johnson, 2007, p. 21). Nooren and Claridge (2001, p. 113-216) minutely describe domestic as well as cross-border road networks province by province. Networks are so extensive that they can hardly be reported in the present report.

The same authors identified Road No. 13 running from northern provinces through Ban Hin Heub and Ban Lak 52, two major trade nodes in Vientiane province, as well as Road No. 8 to Ban Lak Xao, as a major axis for domestic and cross-border trade of wildlife to Vietnam (Nooren and Claridge, 2001, p. 152). The main trade nodes, or "hotspots," defined by Nguyen Van Song (2003, p. 8) as "*critical centres of wildlife trade, a destination of domestic trading and a place for repackaging wildlife shipments before trafficking*" are highlighted in the following text.

Northern Provinces

Cross-border trade of wildlife from northern provinces is directed towards their immediate neighbors, as shown by the following sources:

China: For Luang Namtha, Oudomxay and Phongsaly provinces (Chazée, 1990, p. 18; Nooren and Claridge, 2001, p. 126). For Nooren and Claridge (2001, p. 127), Oudomxay province "*appears to be the northern Lao equivalent of Lak Xao in the central part of the country. As with Lak Xao sources of traded wildlife in Oudomxay town are both local forest areas and distant provinces.*"

Thailand (and China): For Luang Namtha province (through Bokeo province) (Hedemark, 2003, p. 41) and for Bokeo province through Houay Xay (Nooren and Claridge, 2001, p. 122). Thai tourists used to cross the border (the Mekong) from Chiang Khong town in Thailand to Houay Xay in Bokeo province to purchase wildlife, mainly trophies and curios. Wildlife traded from Houay Xay used to be sold in Tachilek, a town situated in the Golden Triangle in Thailand (ibid, p. 123). Substantial amounts of wildlife poached in the Nam Ha NPA in Luang Namtha province were believed to be channelled through Bokeo province (ibid, p. 124).

Vietnam: For Houa Phanh (Showler, Davidson, Salivong and Khounboline, 1998, p. 43; Nguyen Van Song, 2003, p. 8; Nooren and Claridge, 2001, p. 147), Phongsaly (Nooren and Claridge, 2001, p. 113) and Xieng Khouang provinces (Compton and Le Hai Quang, 1998, p. 16; Nooren and Claridge, 2001, p. 149; Nguyen Van Song, 2003, p. 28). Nooren and Claridge (2001, p. 147) report that Vietnamese traders purchase wildlife sold at markets on the road between Xam Neua (Houa Phanh province) and the Vietnamese border. In Phongsaly province, cross-border wildlife trade was said to involve more Chinese than Vietnamese traders (Duckworth, Robichaud and Eve, 2005, p. 47). According to Nguyen Van Song (2003, p. 28) the largest amounts of wildlife traded from northern Lao PDR into central Vietnam and confiscated (on Vietnamese grounds) were in Nghe An province (opposite from Xieng Khouang province).

Central Provinces

Cross-border trade of wildlife from central provinces is directed mainly to:

Vietnam: Robichaud, Hedemark and Johnson (2002, p. 22, 25 and 36) report four major pathways for wildlife trade in central Lao PDR: (1) the extensive green border with Vietnam allowing trans-boundary poaching, (2) Thakhek town in Khammouane province, (3) Road No. 9 in Savannakhet province, and (4) Road No. 16 in Saravan province. At that time, Road No. 9 was considered to be the main axis for wildlife trade to Vietnam.

Lax Xao at the junction between Road No. 8 and Road No. 8B in Bolikhamxay province has been recognized by several authors, as one of the main exit points[96] for wildlife traded from Lao PDR to Vietnam (IUCN, 1999, p. 78; Nooren and Claridge, 2001, p. 165; Compton and Le Hai Quang, 1998; Nguyen Van Song, 2003, p. 8). Along Road No. 8 to Lak Xao, Ban Tongpe was mentioned by Tobias (1997, p. 56) as the main hub for wildlife export to Vietnam. Opposite from Ban Tongpe, on Road No. 8B (leading to the Nakai Plateau), Ban Nape was identified as another node of international wildlife trade (MoC and IUCN, 2000, p. 44; Nooren and Claridge, 2011, p. 165). Roads No. 8 and 8B channel mainly upmarket products such as tigers, saola, pangolins, ivory, golden turtles, gibbons, and otters (Compton and Le Hai Quang, 2003, p. 16-17).

According to Nguyen Van Song (2003, p. 28) the largest amounts of wildlife traded from central Lao PDR into central Vietnam and confiscated (on Vietnamese grounds) were in Quang Binh province (opposite from Khammouane province). This confirmed findings from Compton and Le Hai Quang (1998, p. 2) that Khammouane province was one of three major axis for export of wildlife to Vietnam at that time, together with Bolikhamxay and Savannakhet provinces.

Road No. 9 in Savannakhet province[97] was identified as one of the three main axes of wildlife trade from central provinces by several authors (Nguyen Van Song, 2003; Compton and Le Hai Quang, 2003, p. 8). Compton and Le Hai Quang (1998, p. 2) found that this axis was directly leading to China (Guanxi province) through Hanoi, Bac Ninh, and Lang Son provinces. Route No. 9 concerns mainly upmarket products such as tigers, saola, pangolins, ivory, golden turtles, gibbons and otters (Compton and Le Hai Quang, 2003, p. 16-17). This confirmed earlier findings from Boonratana (1998, p. 66), who had identified Sepon district in Savannakhet as being the major trade axis for pangolin export to Vietnam and destined for the Chinese market.

[96] Exit point in Lak Xao (Bolikhamxay province)-entry point in Cau Treo (Ha Tinh province)
[97] Exit point in Densavanh (Savannakhet province)-entry point in Lao Bao (Quang Tri province)

Saravan province, situated south of Savannakhet province and north of Champassak province, has been identified as another pathway for wildlife to Vietnam through A Luoi in Thua Tien Hue province (Nguyen Van Song, 2003, p. 8). Nooren and Claridge (2001, p. 193-194) identified Saravan more as a conduit between southern provinces and Savannakhet, but acknowledged some direct export through Ta'Oy and Sam'Oy on Route No. 15 and the province's border with Vietnam. Wildlife is commonly sold by villagers along Road No. 15 between Saravan and Ta'Oy and between Ta'Oy and the border with Vietnam (ibid, p. 195). This trade concerned porcupines and other species including birds, deers, lizards, and snakes.

Southern Provinces

Due to the poor road network existing at that time, international wildlife trade between southern Lao provinces and the three neighboring countries occurred on a low scale in the 1980s (Baird, 1993, p. 30). In the 1990s, Duckworth, Salter and Khounboline (1999, p. 20) identified Champassak province as a major route for trade to Thailand. Nowadays, cross-border trade of wildlife from southern provinces is directed mainly to Thailand and Vietnam.

Thailand**:** Ban Mai[98] in Champassak province was established in 1989 after the Thai-Lao relationship improved and soon became a nodal point for wildlife trade to Khong Chiam in Ubon Ratchathani province in Thailand (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 29), mainly for trophies (TRAFFIC, 1999, p. 50). Trade of wildlife from this village was said to have decreased since the Chong Mek border crossing opened (TRAFFIC, 1999, p. 50).[99] Chong Mek,[100] the main border gate between Champassak province and Thailand, was opened in April 1989 (Baird, 1993, p. 2). In June 1989, wildlife was sold at the gate. Among others, infant monkeys were sold there for 32 USD per head. Two years later, while wildlife was not displayed anymore on the Lao side, it was still sold on the Thai side of the Mekong (TRAFFIC, 2008, p. 3). Chong Mek was said to drain a vaster area than Ban Mai, with the Dong Houa Sao and Xe Pian NPAs, as well as the Dong Khanthung PPA in its vicinity. Chong Mek also was said to be more accessible than Ban Mai, as the latter could be reached by boat only (TRAFFIC, 1999, p. 50). Both locations registered much less trade at the end of the 1990s due to stricter enforcement by Thai authorities (TRAFFIC, 1999, p. 44-45).

Vietnam: Compton and Le Hai Quang (1998, p. 20) identified extensive traffic between Attapeu province and Kon Tum province in Vietnam. Wildlife was said to originate from the Dong

[98] Aka Ban Sisamphan, is located within Phou Xieng Thong NPA (TRAFFIC, 1999, p. 50).
[99] Both posts opened the same year, however.
[100] 42 km west of Pakse and 87 km east of Muang district, Ubon Ratchathani province.

Amphan NPA. Among the usual upmarket species, Douc langurs and otters were cited. Nguyen Van Song (2003, p. 29) confirmed this observation.

Kon Tum is located "at the convergence between Route No. 18B from Lao PDR and Route No. 14 to Gia Lai and Dak Lak provinces in Vietnam.

Cambodia: Ban Nakasang in Champassak province was reported to be a turnover place for wildlife imported by boat from Cambodia. Boatmen act as middlemen and transport by bus to Pakse (TRAFFIC, 1999, p. 46). Ban Veunkham, situated where Road No. 13 ends at the Cambodian border, has been channelling wildlife harvested in Cambodia and sold or exchanged in Lao PDR by Cambodian traders who purchase daily consumption goods (Nooren and Claridge, 2001, p. 206) in a similar pattern as the Vietnamese traders operate across the border in the central provinces.

"Green Border" Pathways and Forest Trails

According to Duckworth, Salter and Khounboline (1999, p. 20), although the road network is widely used for the domestic and international transport of wildlife, direct movement over the "green border" is common. Tobias (1997, p. 47) notes that the border with Vietnam is "*long and porous.*" The use of informal pathways and alternative means of transport, such as porting, increases when road controls become stricter. The numerous short mountain trails from Lao PDR to Route No. 1A in Vietnam were found to facilitate cross-border trade (Nguyen Van Song, 2003, p. 8). Krahn (2005, p. 134) reports that the former Ho Chi Minh trail in Sekong province is used by Vietnamese poachers and illegal loggers. Timmins and Evans (1996, p. 15) observed a dense network of mountain trails used by Vietnamese hunters and loggers. This resulted in a high intensity of cross-border incursions in the mountain range between Lao PDR and Vietnam (Chape, 1996, p. 24). Robichaud and Stuart (1999, p. 50) observed that cross-border trading routes between Lao PDR and Vietnam have probably been used for hundreds of years. Compton and Le Hai Quang (1998, p. 2) found that transport by road and by foot were the most common ways to bring wildlife across the Lao border to Vietnam. They observed that *Hmong* porters are hired to transport wildlife across the green border near Route No. 8. Porters deliver their load on the Vietnamese side of the border, for which they receive a voucher issued by middlemen. The voucher is cashed by a Vietnamese "representative of the network" upon the porters' return to Lak Xao (Compton and Le Hai Quang, 1998, p. 16). Nooren and Claridge (2001, p. 142) mention forest trails as one of the pathways to trade wildlife across the border between Houa Phanh province and Vietnam, as well as between Xieng Khouang and Vietnam (ibid, p. 128).

IUCN (1999, p. 76) reports that the cross-border wildlife trade is "*well-organised and quick in its response to interdiction efforts.*" In Lak Xao, in response to more drastic border control measures, smugglers changed their strategies by changing pathways (e.g., remoter routes), timing

(e.g., later at night), and vehicles (e.g., use of government vehicles) (IUCN, 1999, p. 79). The network seemed to follow high levels of communication and organization.

For Nooren and Claridge (2001, p. 236), the fact that populations with the same ethnic background straddle the border enables cross-border trade of wildlife.

"Green Border" Rivers

In Attapeu province, the Xe Kong and Xe Pian Rivers are reported to have played a long-lasting role in cross-border trade between Lao PDR and Cambodia (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 13).

International and Provincial Border (Customs) Posts

In the early years of the 2000s, Lao PDR counted 12 international border posts, as well as numerous "domestic" border gates with four of its five neighbors[101] (Nooren and Claridge, 2001, p. 235). Nooren and Claridge (2001, p. 126) mention how "*Chinese company cars, jeeps and trucks are usually searched carelessly or not at all by Lao customs officials, and are often used to move wildlife products across the border.*" Nooren and Claridge (2001, p. 149) assessed that in Xieng Khouang province, Vietnamese tankers and trucks, as well as motorbike taxis passed wildlife from Lao PDR to Vietnam through Nam Kan border gate in the following way: "*a fee is often paid to charter space on a vehicle, with wildlife being hidden in tool boxes and under tarpaulins.*" Besides official international and provincial border crossings, numerous unofficial points are used to carry out activities involving parties on both sides of the border, such as family visits and smuggling (ibid, p. 236).

End Market Destination

Baird (1993, p. 30) viewed the demand emerging from Vietnam and Thailand as the main threat to wildlife in Lao PDR and "*high prices paid for wildlife products in neighbouring countries makes them* [southern Lao People] *very susceptible to the temptation of trading in wildlife for quick and easy profit.*"

Duckworth, Salter and Khounboline (1999, p. 23) mention an increase in long-distance domestic and international trade of wildlife, both live animals, and their products. According to these authors, the use of wild animal body parts in Chinese medicine plays a significant role in the regional illicit trade (ibid, 1999, p. 20).

Thailand

[101] There was no international border gate with Myanmar.

Chazée (1990, p. 18) mentions that Thailand became a player in international trade of wildlife from the Lao PDR at the beginning of the 1990s.

Nooren and Claridge (2001, p. 22) found that in the early 1990s, Thai companies used to control wildlife export from Lao PDR. Chazée (1990, p. 18) observed the cross-border trade of wildlife to Thailand from Attapeu, Champassak, Vientiane, and Bokeo. Robinson (1994, p. 117-118) investigated the Chiang Khan wet market in Loei province between November 1993 and November 1994, and found that wildlife was sold during 66 of 112 investigated days. All wildlife was said to originate from Lao PDR. Nash (1997) identified the increasing demand emanating from neighboring countries, mainly Thailand and Vietnam, as the main driver behind wildlife trade from the Lao PDR, an observation shared by Davidson et al. (1997, p. 75). According to Duckworth, Salter and Khounboline (1999, p. 20), Thailand remained the main market for wildlife meat in the 1990s. Srikosamatara, Siripholdej and Suteethorn (1992, p. 21-30) mentioned a widespread trade of trophies, mainly antlers, horns, tusks, and skins to Thailand in the early 1990s. More recently, a demand for trophies (and pets), mainly birds and primates, was reported by Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 30) in Attapeu province.

However, according to the World Bank (2005, p. 4), Thailand changed from being a major source of wildlife to being an important consumer of wildlife, mainly for recreational, display, and food purposes. It also became a major regional and global conduit of wildlife. Thailand was also used as a corridor to channel some species originating from the Lao PDR for export to other countries, such as Japan. Ultimately, the direction of wildlife trade increasingly switched from Thailand, its initial destination, to Vietnam (Anon, n.d.).

Vietnam

Trade with Vietnam intensified from 1984 onwards (Robichaud and Stuart, 1999). Vietnam has been the main market for wildlife hunted in Attapeu province (WWF, 1998b, p. 3), in the Xe Sap NPA (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. 41), on the Nakai Plateau (Chamberlain, Alton, Silavong and Philavong, 1996, p. 54) and in Houa Phanh province (Showler, Davidson, Salivong and Khounboline, 1998, p. 43). Tobias (1997) estimated that 60-70% of wildlife harvested from Viengthong district (Bolikhamxay province) was traded to Vietnam. A survey carried out in Phu Mat National Park in Vietnam showed that between 50% and 90% of wildlife traded through Con Cuong district (Nghe An province, opposite from Xieng Khouang province) originated from Lao PDR. According to rangers, mostly high-value species (e.g., pangolin and bears) originated from Lao PDR, while low-value species originated from the national park itself (Roberton, Tran Chi Trung and Momberg, 2003, p. 68).

IUCN (1997, p. 44) estimated that the main destination for wildlife commercially extracted from Lao PDR was Vietnam and ultimately China. Duckworth, Salter and Khounboline (1999, p. 17) confirmed this assumption.

According to them, "*a well-organized network in Vietnam takes wildlife, mostly alive, to China and much of this comes from Lao PDR.*" Compton and Le Hai Quang (1998, p. 10) viewed Vietnam, as both a consumer of wildlife and a supplier of wildlife to China. According to Nguyen Van Song (2003, p. 3), "*Vietnam has become an important crossroad of illegal wildlife trade from Myanmar, Thailand, Laos and Cambodia to China, Taiwan, Korea and Singapore.*" The World Bank (2005, p. 3) views Vietnam as a unique case in the region, combining all identities -- as a source, an importer, a conduit, an exporter, a re-exporter, and a consumer of domestic and imported sources of wildlife. Compton and Le Hai Quang (1998, p. 1) report that Vietnam has provided China with wildlife products destined for use in traditional medicine for over 1,000 years. Robichaud (2005, p. 18) mentions that in Vietnam, there is "*an underground, but well organized network, with many of the animals ultimately reaching China.*" In his research paper on wildlife trade in Vietnam, Nguyen Van Song (2003) extensively describes the whole value chain for domestic as well as imported wildlife, with its stakeholders, networks, pathways, volumes, and prices. He observed that Lao PDR (together with Cambodia and Vietnam) supplied wildlife to all three regions investigated in Vietnam (north, central and south).

Nguyen Van Long (2003, p. 31) identified nine distinct channels for wildlife trade in Vietnam, among which two are distinct channels for cross-border trade with Lao PDR. The latter are described as follows:

1. Foreign hunters/traders (1st tier)→Vietnamese middlemen→live wildlife markets→foreign intermediaries (3rd tier)→kingpins of illegal export

2. Foreign hunters/traders (1st tier)→Foreign middlemen (3rd tier)

Restaurants investigated in Vietnam (n=316) were estimated as supplying roughly 2,000 kg (2 Mt.) of wildlife meat per day (Nguyen Van Song, 2003, p. 23). Average profit per restaurant was estimated to range between 30 USD per day in the South and 50 USD per day in the North. A restaurant owner interviewed in Vinh City (Nghe An province, central Vietnam) stored, among other meats, 150 kg of porcupine meat, and stated that wildlife meat came from Lao PDR and the central highlands of Vietnam. His customers were northern Vietnamese and Chinese. Overall the author estimated that over 3,000 Mt. of wildlife (live weight and meat) were traded in Vietnam every year (ibid, p. 39).

Nguyen Van Song (2003, p. 25) reports that demand for stuffed wild animals is developing in Hanoi, Hai Phong and HCMC in Vietnam and some of them (unspecified species) originate from

Lao PDR. However, the demand for these products did not seem to be as established as the demand for meat or live wild animals.

China

Chazée (1990, p. 18) noticed that China has been a traditional customer of products from selected wildlife species, mainly rhinoceroses, tigers and other *felidae*, bears, and pangolins. Nguyen Van Song (2003, p. 42) observed that China became the largest customer of wildlife products in Asia since its economic opening at the end of the 1980s.

The border with China was officially opened in 1990 and from then on, trade of NTFPs, including wildlife from Lao PDR in exchange for industrial goods from China, was allowed on a barter basis (TRAFFIC, 1999, p. 25). Official trade on a barter basis (wildlife form Lao PDR for consumer goods, textiles, and small agricultural implements from China) was incepted after China and Lao PDR signed a bilateral trade agreement in 1988 (Nooren and Claridge, 2001, p. 25). In the 1990s, China was the main end market for wildlife and products destined for traditional medicinal purposes (Duckworth, Salter and Khounboline, 1999, p. 20; Robichaud and Stuart, 1999, p. 45) and remained so until now (World Bank, 2005, p. 3). Tobias (1997, p. 36) observed that Vietnamese traders attach more importance to species destined for the Chinese market (such as Douc langurs and gibbons). The demand for medicinal parts and exotic food in China is reported to be "huge and increasing" (Anon., n.d.). Duckworth (2008, p. 1) recognized that "*commercially driven hunting of wild mammals in the area reflects the rising affluence of China and neighbouring countries coupled with a propensity in the region to view wild meat as a luxury, health giving dietary item.*" Nooren and Claridge (2001, p. 41) suggested that "*China is by far the most important destination for smuggled Lao wildlife.*"

Cambodia

Trade between Lao PDR and Cambodia resumed at the beginning of the 1980s after the Khmer Rouge were removed from power in 1979 (Nash, 1993, p. 4). Trade of wildlife between both countries seems to be bi-directional as shown by the following findings: Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 29) mention that some wildlife found in Attapeu province originates from Cambodia. On the other hand, Cambodia, mainly Phnom Penh, was reported by Singh, Boonratana, Bezuijen and Phonvisay (2006, p. 43) as a destination market for some wildlife traded from Attapeu province.

Overseas End Markets

Nooren and Claridge (2001, p. 67) identified South Korea, Taiwan and Japan as additional important traditional end-market destinations for wildlife traded from the Indochinese peninsula.

Compton and Le Hai Quang (1998, p. 2) add Hong Kong and Singapore to the list and some evidence showed that Russia and countries of the European Union (EU) were recipients of wildlife transiting through Vietnam and China.

The U.S., Japan, and some European countries were reported as the destination for live animals, such as primates, originating from the Lao PDR (Duckworth, Salter and Khounboline, 1999, p. 20). From CITES records dating from 1983 to 1990, Nash and Broad (1993, p. 4) showed that primates imported by Japan, the U.S., Sweden, the previous Union of Soviet Socialist Republics (USSR), and the United Kingdom (UK) were listed as exported or originating from the Lao PDR.[102] Similarly, between 1983 and 1990, through CITES, Japan and the U.S. imported 50 black giant squirrels (*ratufa bicolour*) indicated as originating from Lao PDR.

Lao PDR

Duckworth, Salter and Khounboline (1999, p. 20) mention Lao PDR as a destination market for some foreign wildlife species traded from other countries. Generally, Lao PDR, however, is one of the main regional sources of wildlife, along with Cambodia and Myanmar.

Prices

Robichaud and Stuart (1999, p. 46) compiled prices of several wildlife species. Prices for primates were recorded as follows:

Table 13 -- Prices of Primate Bones and Primate Infants Destined to Cross-Border Trade

	1997[103]		**1998[104]**	
	Bones	**Infants**	**Bones**	**Infants**
	USD/kg	**USD/head**	**USD/kg**	**USD/head**
Macaques	1.5	5	0.8-2	6-15
Douc langurs	1.5	n.a.	0.8-2	40-60
Gibbons	1.5	6	0.8	24

Source: Robichaud and Stuart (1999, p. 46).

Prices are in line with prices recorded in 1997 by Tobias (1997, p. 56). Timmins and Duckworth (1999, p. 483) recorded prices of one USD per infant Douc langur and 20 cents per kg of bones. The wholesale price paid for primate bones at Ban Dou in Khammouane province (Hin Nam No reserve) at the border with Vietnam increased from one USD/kg in 2004 to seven USD/kg in 2008 (MAF, 2011, p. 14). According to IUCN (1999, p. 79), controlling wildlife cannot stop

[102] Which was not signatory of CITES at that time.
[103] USD equivalents: 1997: 1USD=1,000 LAK.
[104] USD equivalents: 1998: 1USD=2,500 LAK.

market forces such as demand and supply, but it can impact profit by increasing supply costs. However, the organization recognized that higher supply costs may just be passed on to wildlife consumers with little results in volumes. Indeed, TRAFFIC (2008, p. 61) observed that increasing prices paid for wildlife in the region did not result in lower harvest activities.

On the demand side, high prices did not prevent consumers from buying wildlife, and on the supply side they incited new actors to step in and existing ones to strengthen their position. As a matter of fact, it was observed that increasing urban affluence is a main driver behind the trade of "luxury species." For some species, high prices exclude the local consumer segments to the profit of regional consumers (TRAFFIC, 2008, p. 63). TRAFFIC (1999, p. 11) observed that wildlife is often exported in the form of low-volume, high-value products, such as '*gao,*' paste made of processed bones. Nooren and Claridge (2001, p. 15) estimated that over 10,000 USD worth of wildlife, mainly pangolins and lizards, were traded daily from Savannakhet across the border to Vietnam. Nguyen Van Song (2003, p. 20) found higher financial returns for wildlife meat than for live wild animals. He estimated the following annual profits (in USD/year) from wildlife trade in Vietnam:

Table 14 -- Estimated Annual Profit (in USD per year) from Wildlife Trade in the Study Area in Vietnam

	Estimated total profit in USD per year
Meat	4,200,000
Dry products	740,000
Live animals	227,000
Stuffed animals	10,130
Total	5,300,000

Source: Nguyen Van Song (2003, p. 26).

Trends for Wildlife Trade

Overharvesting due to population increase, and thriving commercial and international trade, rather than subsistence hunting, were incriminated for the increasing scarcity of wildlife in Attapeu province (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 31). The same authors could not ascertain if the reported decline in trade of high-value species was caused by the scarcity of these species, or by trade moving to underground channels (Singh, Boonratana, Bezuijen and Phonvisay, p. 31).

Summary Chapter 3.9: International Trade

In the course of time, Vietnam has emerged as a major player in the wildlife trade from Lao PDR, both as an end market and as a conduit to China and overseas countries. Thailand has remained a major player, however, in a less obvious way than it used to be in the 1990s. China

has remained by far the largest regional player by being the main end market for valuable animal products intended for food or traditional medicine purposes. Pathways for cross-border trade are multiple and methods by which to trade wildlife have become more sophisticated.

3.10 Recreational Hunting

Recreational hunting was traditionally practiced by the Lao aristocracy on the Nakai Plateau, (Chamberlain, Alton, Silavong and Philavong, 1996, p. 12), an occupation which peaked in the 1940s (WCS, 1995a, p.10). Salter (1993a, p. 6).

More recently, Duckworth, Salter and Khounboline (1999, p. 16) reported occasional recreational hunting by elites around urban centers in Vientiane, Thakhek, Savannakhet, and Pakse. The authors acknowledged that the scope of such activities is unknown. The same authors also mention "*enquiries made by foreign agents to arrange big-game hunts for tigers, wild cattle and other species,*" which did not receive any reply from the GoL. Claridge and Phanthavong (1996, p. 2) report sport hunting as one of the four forces exerted by humans on wildlife. They noticed evidence of sport hunting near the Phontiou tin mines in the previous Khammouane Limestone NPA (ibid, p. 2). TRAFFIC (1999, p. 10) reported that a demand for large-game hunting parties emanating from "*foreign agents*" had been expressed, but the Lao government did not respond to such enquiries. Nooren and Claridge (2001, p. 152) mention "*increased sport hunting by government officials, including police and military*" in the Phou Khao Khoay NPA.

Summary Chapter 3.10: Recreational Hunting

Recreational hunting has not been documented in Lao PDR in recent years. If this practice still exists, it probably operates on a "confidential" scale.

3.11 Menageries, Zoos and Rescue Centers

Menageries

Private menageries, kept by restaurants, State enterprises, and resorts used to be frequent in the 1990s (TRAFFIC, 1999, p. 8). In Vientiane, it was "*not uncommon for people to keep wild animals (such as bears, monkeys, binturongs, porcupines, and civets) in cages in their house or yard"* (TRAFFIC, 1999, p. 9). A Vientiane resident, who previously worked in Lak Xao, used to keep several species of wildlife, including binturongs (TRAFFIC, 1999, p. 19). Duckworth, Salter and Khounboline (1999, p. 22) mention that in Lao PDR, menageries were "*usually associated with hotels, resorts, up-market restaurants or State enterprises*" and were characterized by poor management and sanitary conditions resulting in high mortality of animals.

The most famous menagerie was set-up in Ban Lak Xao in Bolikhamxay province. Accounts of the historical development of this menagerie vary according to different sources. According to Nooren and Claridge (2001, p. 175-178), this private menagerie was set up by the Carnivore Preservation Trust (CPT), an organization founded in 1981 in North Carolina, U.S.

The aim of this organization was to set up breeding facilities on different continents to preserve endangered carnivore species, such as tigers. The CPT started its investigation to find a suitable place in Lao PDR in 1992. After approaching a few potential partner organizations, the CPT finally contacted General Cheng Sayavong, a General of the Lao Army and the owner of the *Bolisat Pattana Khet Pudoi* (BPKP) (Mountainous Area Development Company) in Ban Lak Xao, Bolikhamxay province. The General "provided" 160 km^2 of forest land to establish the center.

Other accounts (TRAFFIC, 1999, p. 9; IUCN, 1999, p. 79) mention that the menagerie was first set up by the owner of the BPKP, who started collecting animals in 1987, and later requested the support of the CPT to run his wildlife center (TRAFFIC, 1999, p. 9). According to Salter (1993b), the MAF shut down wildlife trading operations carried out by BPKP upon a diplomatic note sent by the U.S. embassy to the GoL. Another source states that the CPT started running its own facilities in 1995 (TRAFFIC, 1999, p. 9) and later moved to a larger ground granted by the General. The center was stocked by animals brought by villagers who thought that they could sell wildlife (TRAFFIC, 1999, p. 9). According to IUCN (1997, p. 45), this center generated a demand for civets, which are "*otherwise non-target species.*" The CPT's goal was to start a breeding program of carnivores (e.g., cats, bears, tigers, and civets) (TRAFFIC, 1999, p. 9). Duckworth (1997, p. 8) mentioned that several large Indian civets were spotted at menageries in Ban Lak Xao.

A small menagerie set up near the Tam En cave in the vicinity of Thakhek town in Khammouane province was mentioned by Gregory, Openshaw, Senior and Papard (1996, p. 52-53). Nowadays, the facility is run down and does not host wild animals anymore (personal observations, September 2011).

Ban Keun Zoo

Ban Keun Zoo, situated in Ban Keun, 70 km from Vientiane Capital, is the only official zoo in Lao PDR. It was set up in the early 1990s, as a joint venture between a private Thai investor and the Ministry of Defense. At its early stage, the zoo was run by a Thai manager, who left in 1999. The zoo was stocked with animals donated by high-ranking officials or confiscated by forestry officials (TRAFFIC, 1999, p. 8). It is still operating and occasionally receives live and healthy animals rescued from wet markets by the Vientiane Capital Wildlife Trade Control Project (Bounnak, 2012, personal communication).

Permission to hold wildlife in captivity is currently defined by Article 36 of the Law No. 07/NA, 2007, according to which permits shall be obtained from the following (GoL, 2007, p. 9):

- Central government for wildlife from the prohibited category list;
- MAF for wildlife falling within the management category list;
- Provincial and capital city agricultural and forestry offices (PAFOs) for wildlife from the common or general category list.

Wildlife Rescue and Education Center

A wildlife rescue center, supported by the Animal Concerns Research and Education Society (ACRES), based in Singapore, as well as the Love Wildlife Foundation, based in Thailand, is expected to be set up in Bolikhamxay province during 2012. The primary aim of the center is to offer a place for wildlife, mainly bears rescued from illegal trade, as well as to provide an education platform on wildlife conservation aspects for the Lao population (Sundara, 2011, personal information). However, according to an article in the *Asian Scientist* dated 28 March 2012 and published on the internet (Asian Scientist, 2012), the facility will be set up at the Lao Zoo in Vientiane province. The center will also provide technical assistance to the zoo.

Summary Chapter 3.11: Rescue Centers and Zoos

Lao PDR counts one official zoo. Private menageries, which used to be -- and to some extent still are -- kept at private places open to the public, such as restaurants and hotels, are often poorly managed in sanitary terms, and may represent a significant risk of disease transmission. A wildlife rescue and education center will be established at the Lao Zoo in Vientiane province in 2012. The center, supported by ACRES, a Singapore-based wildlife conservation society, and Love Wildlife Foundation, based in Thailand, shall provide shelter for wildlife rescued from illegal trade.

3.12 Wildlife Farming

Subsistence Farming

Very little evidence of small-scale wildlife farming could be found. In the Viengthong district of Houa Phanh province, Schlemmer (1999, p. 43) enquired about domestication or farming of wildlife and was told by a majority (82%) of villagers that this would be hardly feasible. Villagers, however, mentioned three cases of "wildlife production": snails in Pouviang village, bamboo rats (*toun)* in Tenghim village, and wild chickens in Namo village. In all three cases, villagers harvested juvenile wild animals and fed them until they could be consumed. With the exception of the wild chickens, which were crossed with domestic ones (resulting in smaller but

more resistant progenies), other species were not farmed further. Some villagers expressed doubts about the farming of civets, porcupines, and bamboo rats (Schlemmer, 1999, p. 43).

Krahn (2005, p. 141) suggested that "mini-livestock," such as bamboo rats, could be farmed by *Katu* communities to curb the decreasing meat intake caused by lower wildlife availability.

Commercial Farming

In the Lao PDR, a permit is needed to operate businesses pertaining to wildlife. The Wildlife Law No. 07/Na, 2007 stipulates the following (GoL, 2007, p. 9), as illustrated in the Table below.

Table 15 -- Selected Legal Aspects of Wildlife Farming and Business Operation

Article No. 33	Use for business	The government allows wildlife and aquatic animals for business purposes, such as zoos, farming, import, export, re-export, shipment, and tourism in the conservation areas and in accordance with the regulations.
Article No. 35	Permission to operate businesses from wildlife and aquatic animals	Permits shall be obtained from the following levels: • **Central government** for wildlife from the prohibited category list; • **MAF** for wildlife falling within the management category list; and • **Provincial and capital city agricultural and forestry divisions (PAFOs)** for wildlife from the common or general category list.
Article No. 38	Establishment of wildlife farms	Authorization shall be obtained from the following levels: • **MAF** for wildlife from the prohibited category list; and • **Provincial and capital city agricultural and forestry divisions (PAFOs)** for wildlife falling within the management category list or the common/general category from the list.
Article No. 49	Rights of users and operators of businesses	
Article No. 50	Obligations of businesses users	Point 8: To **regularly check animal health** and take precautions in the monitoring of **an outbreak of disease** as advised by the concerned authorities. In such cases, animals infected with a disease shall receive treatment immediately.
Article No. 52	Prohibition	Point 9: It is prohibited to import, export, re-export, ship or transport wildlife and aquatic life with **infected**

		disease or that endangers animal health, or import animals in a period of restriction or prohibition confined to the permission granted and laws and regulations.

The Lao PDR counts three officially recognized wildlife farms -- one each in Vientiane Municipality, Bolikhamxay, and Champassak provinces – that produce wildlife, including primates, for export to China (Phanthavong, 2011, personal communication). The farms -- Vannaseng Company, Saysavang Company, and Vinashkone Company -- operate as joint ventures with Chinese or Thai investors (DoF, 2008, p. 3). In 2011, the three farms comprised 22,800 primates (DoF, 2011, p. 7). According to BUAV (2010), these farms raise long-tailed and rhesus macaques for export to Vietnam and China and possibly re-export to European countries and the U.S. This information has been confirmed by Sundara (2011, personal communication).

The largest primate farm was established in 2005 in Ban Som Saath, in Tha Phabath district in Bolikhamxay province.[105] It belongs to Vannaseng Trading Limited Company and farms pythons, turtles, and primates. The company operates on a sub-contracting basis with farmers to transfer technology on python and primate breeding. The company and the farmers are registered with the DoF under MAF,[106] which provides farm operating licenses, as well as with the CITES management authority of the Lao PDR for export (Sundara, 2011, personal communication). Currently, Vannaseng Company's farm hosts 10,000 macaques for export to China and re-export to laboratories in the U.S. Primates are sold for 50 USD/head from the Lao PDR and 500 USD/head from China to the U.S.. In the future, Lao PDR aims at establishing direct export links to the U.S. to reap the benefits from primate sales. Primates are transported in consignments by plane to China (Sundara, 2011, personal communication). Although primates farmed in Lao PDR are said to be used for pharmaceutical purposes, a source which wants to remain anonymous assumes that monkeys may be used for food consumption in Vietnam as well.

As farmed primates are found on the CITES category list No. 2 of managed species, export requires the approval of the GoL[107] (GoL, 2007, p. 10). Trade (Article No. 40 of the Law) and transport (Article No. 41 of the Law) of farmed wildlife are subject to differentiated regulations depending on the categories they belong to (e.g., prohibited, management, and general) and the purpose of trade and transport (e.g., use for public benefit, recreational purposes, customs, or business purposes) (GoL, 2007, p. 10). Disease prevention and veterinary care of private primate farms fall under the responsibility of the farm management and the supervision of the concerned PAFOs. The latter are responsible for visiting farms four times per year; the CITES managing authority visits once each year. At Vannaseng Company, the owner's son, who graduated from

[105] Breeding farm No.0110/MAF/05 dated April 4, 2005.
[106] Now under DFRC, MONRE.
[107] "Category 1 species" such as elephants, tigers, etc. require the approval of the assembly (Sundara, 2011, personal communication).

an Australian university, is reported to be in charge of veterinary aspects. For the two other farms, animal health aspects were recognized to be an area of "some concern" (Sundara, 2011, personal communication). Primates are identified by a removable collar with individual identification numbers.

They are, however, not identified with an electronic device. Collection from the wild is reported to be forbidden under CITES management; parental stock is, however, reported to be from the wild. The following box shows the opacity of farming and trade of farmed species in the region.

Monkey Imports by Vietnam from Lao PDR

Source: Hoang Quoc Dung, n.d.

In 2003, 5,000 long-tailed macaques, allegedly caught from the wild, were imported into Vietnam from Lao PDR by the Sino-Viet Border Trading Joint Stock Company (aka, Trung-Viet Company) with approval from the Ministry of Agriculture and Rural Development (MARD). According to the owner of Trung Viet Company, primates were sourced from Lao enterprises in Bolikhamxay,[1] Champassak,[1] Sekong, and Vientiane provinces (Hoang Quoc Dung, n.d. p. 5). Macaques were exported at the Lak Xao border post in Bolikhamxay province -- without any formal export certificate from the GoL, however. Macaques imported from Lao PDR were later sold to Trung Viet's main competitor in the laboratory primate business, NAFOVANNY, a joint venture between VANNY, a Hong-Kong company, and a Vietnamese Company.[1] In 2007, NAFOVANNY, aka, Primate Breeding and Development Joint Venture, was reported to be the largest long-tailed macaque exporter in the world in its 14-year history (ibid, p. 2).

Import into Vietnam was conducted according to CITES regulations (ibid, p. 7), while export from Lao PDR was not, as the latter country joined CITES on May 30, 2004 (ibid, p. 5). Trung Viet Company later changed its sourcing location to Kampong Cham in Cambodia (ibid, p. 1-3). It was estimated that Vietnamese companies importing macaques from Lao PDR or Cambodia and re-exporting them to China could make a profit of 500 USD per animal, even before the latter reached the U.S., their final destination (ibid, p. 8). In 2005, Vietnam allegedly imported 2,200 macaques from Lao PDR, while official export figures from Lao PDR showed only 2,000 heads exported to Vietnam. These discrepancies show the unreliability of figures officially reported to CITES. Between 2000 and 2007, Vietnam officially imported 14,985 macaques from Laos and Cambodia. Actual data were suspected to be much higher (ibid, p. 9). After a long and detailed investigation conducted by Vietnamese journalists in Vietnam, Cambodia, and Lao PDR, it turned out that official export form Lao PDRwas granted for 200 macaques to China. Ultimately the investigation showed that an original permit for transit of wildlife from Malaysia to Lao PDR was falsified by concerned Vietnamese authorities into an export permit from Lao PDR. Monkeys imported by Vietnam actually originated from Cambodia and Malaysia (ibid, p. 19).

Summary Chapter 3.12: Wildlife Farming

Three companies, located in Vientiane Municipality, Bolikhamxay province, and Champassak province, have been officially allowed to operate wildlife farms in Lao PDR since 2005. All three farms produce monkeys, mainly macaques, destined for export to China and ultimately to the U.S. for pharmaceutical laboratories. At present, over 10,000 primates are farmed in Lao PDR.

Since 2004, exports are operated within the CITES convention. As per the Law No. 07/NA, 2007, sanitary inspection is ensured by respective PAFOs and by veterinarians operating at farms. Wildlife farming is a sensitive issue in Lao PDR; however, the recognition at a high level that sanitary issues in wildlife farms "are of concern" requires deeper investigation.

3.13 Wildlife By-Products Collection

Bat Guano

Davidson (1999, p. 4) mentions the opportunity represented by bat guano collection for rural communities. According to Robinson (1998, p. 157), guano collection had a major negative impact on bat colonies in southeast Asia. Robinson and Smith (1997, p. 13) note that "*in Thailand, there is a long-established tradition of collecting bat guano to use as fertilizer. In the past, whole villages have derived all their income from the sale of guano.*" In Lao PDR, Robinson and Webber (1998, p. 27) found evidence of guano collection at two locations within the previous Khammouane Limestone NPA, at *Tam En* (=swift cave)[108] and at *Tam Kichia* (=bat guano cave). While the "swift cave" was still used by swifts and the bird guano was fresh, the "bat cave" was abandoned and guano was from older colonies. Swift guano was sold for 100 THB/sack;[109] the price for bat guano was not disclosed. Nowadays, bat guano is still extracted from caves in Khammouane province, where bats have been extirpated (Keatts, 2011, personal communication). A Thai-Japanese partnership company was granted a concession by the GoL to harvest bat guano in Lao PDR to produce organic fertilizer in Thailand.[110] According to Phanthavong (2001, personal communication), this agreement might have been undertaken at the provincial level, between a Lao provincial government and a Thai company. As already mentioned under Chapter 3.5, bat guano (*kichia*) is also used as a component of ammunition for local guns.

[108] Three km northeast from Tonglom village, Hinboun District (Jenkins et al., 2005, p. 434).
[109] This information indicates that guano was sold to Thailand.
[110] http://www.alibaba.com/product-free/106198143/100_Bat_Guano.html

Summary Chapter 3.13: By-Products Collection

The collection of by-products from wildlife (excluding body parts and skins destined for use in traditional medicine or in the fur industry) was found only in connection with bat (and bird) guano used as fertilizer and as a component of ammunition for local guns (described under Chapter 3.5). To date, bat guano harvesting is known to occur in Khammouane province. Collection of bat guano in caves with living bat colonies potentially bears high risks of viral (and other pathogen agents) contamination through the inhalation of dust particles.

3.14 Other Exposure Points between Wildlife and Humans

Conflicts

MAF and STEA (2003, p. 75) define wildlife-human conflicts as "*attacks on humans and livestock, and there are incidents of crop raiding. The reasons behind these conflicts are mostly connected to habitat pressures, and the reduction of the wildlife's natural food through increased human activity.*" Schlemmer (2001, p. 60) identified three main sources of wild animal-human conflicts, as shown in the Table below.

Table 16 -- Main Sources of Wild Animal-human Conflicts and Identified Species in Viengthong District (in Houa Phanh Province)

Raids on Crops	Prey on Domestic animals	Harm to Humans
Wild pigs	Tigers	Bears
Bears	Wild dogs (dhole)	Snakes
Porcupines	Unidentified *felidae*	
Rats	Civets	
Monkeys	Birds of prey and other birds	
Bears		
Birds		

Source: Schlemmer (2001, p. 60).

Physical Threat to Humans

Wildlife as a cause of potential physical hazard to humans was rarely mentioned in Lao PDR. Schlemmer (2001, p. 60) found that bears and snakes were the two main wild animals causing physical harm to humans in Viengthong district (in Houa Phanh province). Other animals, including tigers, were reported as pests, raiding crops or preying on domestic animals (ibid, p. 60).

Duckworth, Salter and Khounboline (1999, p. 23) listed reports of attacks by wild animals on humans: as of 1999, reports mentioned two attacks by bears, three by large cats, one by a tiger, two by elephants, and one by a gaur. Seven people died and three survived. No reports mentioned physical harm done by any of the four orders of focus of the present report (primates, small carnivores, rodents, and chiropters).

Pests

According to Salter (1993a, p. 8) and Duckworth, Salter and Khounboline (1999, p. 22), villagers often complain about wildlife being pests.

In a participatory poverty assessment carried out at the beginning of the 2000s (ADB, 2001, p. 67-70), participants mentioned wildlife pests as major causes of poverty. The assessment, however, showed important differences across the country. Pests (e.g., rats, birds, monkeys, bears, and wild pigs) were ranked as priority one (out of eight) in central Lao PDR, as priority two in the North, as priority six in the South, and as priority eight in the East (Annex 22). These findings are in line with earlier observations made by Duckworth, Timmins and Cozza (1993, p. 29), who mentioned porcupines, rats, and primates as main crop pests, along with wild boars and sambar deers. A more recent survey carried out in Xayaburi province showed similar challenges faced by *Phrai* communities. From 65 households interviewed, 77% complained of "*raiding of crops by wildlife*" -- mainly wild boars and mice or rats (WWF, 2006, p. 107). Duckworth, Robichaud and Eve (2005, p. 47) report that porcupines, wild boars, rodents, and bears were the main pests encountered in maize fields in Phongsaly province.

Krahn (2005, p. 101) mentions that *Katu* villagers justified the constant hunting of macaques by the damages they cause to crops, in contrast to langurs and gibbons. This confirms earlier observations made by WWF (2007 cited in FMCP, 2000, p. 21), according to which macaques would raid rice fields in troops of 20 to 100 animals. Villagers around the Phou Hin Poun NPA reported pig-tailed macaques as significant crop pests (Steinmetz, 1998b, p. 7). Macaques, along with wild pigs and barking deer (unspecified species), were mentioned as rice crop pests in the Dong Phou Vieng NPA (WWF, 1998c, p. 17). Gibbons, on the other hand, were reported to be harmless to crops (Bergmans, 1995, p. 291-292).

Some *mustelidae* and *viverridae* are reported as pests preying on poultry in some regions of the world (IUCN, n.d., p. 24). In Lao PDR, some authors mention that **civets** are often considered as pests preying on small livestock (Salter, 1993a, p. 8; Duckworth, Timmins and Cozza, 1993, p. 29; Duckworth, Salter and Khounboline, 1999, p. 192; Schlemmer, 2011, p. 60). Duckworth, Timmins and Cozza (1993, p. 29) also mentioned mongooses as pests preying on domestic animals.

Salter (1993a, p. 34), as well as De Beer et al. (1994, p. 15) mention rats as important crop pests. Vongbounthane (1998a, p. 6) consider that "*rats are dangerous to crops and therefore must be hunted.*" Khamphoukeo et al. (2006, p. 110) estimated that out of 21 murid rodent species found in Lao PDR, at least six were considered as major pests, the main ones being from the *rattus rattus* complex. Duckworth, Salter and Khounboline (1999, p. 240) mention that both urban and field (commensal) rat species are considered as pests.

Aplin et al. (2007, p. 294) created a typology of murine and rhizomyid rodent species according to their destructive potential for crops. Rodents were ranked by farmers as the second main pest in upland agriculture, after insects (Khamphoukeo et al., 2006, p. 111) or after weeds (Douangboupha, Aplin and Singleton, 2003). According to Khamphoukeo et al. (2006, p. 111), rodents are viewed as the pest on which the least control can be exerted. Some rodents (e.g., *rattus rattus)* cause damage not only in field crops, but in village granaries as well. The same authors (ibid, p. 113) assessed that the rodent population found in fields was highest around harvest time (both before and shortly after rice harvesting). The rodent population in villages was found to increase shortly after harvest and to remain high until the middle of the next wet season crops. According to Douangboupha, Aplin and Singleton (2003, p. 105), upland farmers distinguish between chronic rodent infestation and episodic outbreaks. Affected farmers linked chronic infestation to changes in cropping patterns, grain storage practices, and residency patterns, while they related episodic outbreaks to periods of drought and/or flowering of specific bamboo (*khii*) species. It appears that approximately six rodent ethnotaxa were reported to be involved in rodent outbreaks throughout the country: *nuu khii* ("bamboo rat," most probably different rat species with at least two different members of the *rattus rattus* complex), *nuu ban* ("house rat," *rattus argentiventer* or other members of the *rattus rattus* complex), *nuu American* ("foreign rat," bandicota indica), *nuu na* ("field rat"), *nuu mone* (gray-colored rat from the *rattus rattus* complex), and *nuu tongkao* (reported to be only found in the South) (Douangboupha, Aplin and Singleton, 2003, p. 107-108).

In Attapeu province, villagers incriminated rat infestations coupled with drought periods for rice shortages between 1996 and 1999 (Epprecht, 1999). Destruction by rats were also mentioned in some villages in Champassak province (ADB, 2008, p. 75). *Mus caroli* (called *nuu seng* or *nuu gee*) was found to be the most serious crop pest in Dakchung district in Sekong province (Bergmans, 1995, p. 302).

Rats were mentioned as a major pest in the central region of Lao PDR (ADB, 2001, p. 107). In 1997, villagers in Ban Suan Mone in Khamkeut district, Bolikhamxay province reported that the incidence of pest infestations with "red *nu khii*" had increased over the last 10 years (Alton and Sylavong, 1997, p. B I-3), primarily in rice paddy fields (Alton and Sylavong, 1997, p.B 2-5).

According to Robichaud and Stuart (1999, p. 52), a village[111] in Bolikhamxay province changed its location in 1979 after rats totally destroyed its crops.[112] Most villages in the Nakai-Nam Theun NPA experienced post-flooding rat infestations in 1996 (Alton and Sylavong, 1997, p. III-3) and 1997 (IUCN, 1999, p. 16). Alton and Sylavong (1997, p. III-10) mention the case of Ban Thaphayban, a village inhabited by *Brou* people, which "*had virtually no rice crop since virtually all of it (along with corn) was eaten by rodents*." This event was reported to have been the worst natural disaster ever faced in the village's 150-year history (Alton and Sylavong, 1997, p. AIII-1).

Out of a panel of 129 farmers practicing slash and burn agriculture interviewed in Oudomxay and Luang Prabang provinces, 55% mentioned rodents as a major constraint in rice production, the second after weeds. Rodents were ranked as the number-one pest by 85% of the farmers (Roder et al., 1997, cited in Foppes et al., 2011). In Luang Namtha province, upland farmers reported that rats usually destroy 15% of their rice crops in normal years and up to 50% in an "infestation year." Lowland farmers did not report any destruction of their rice crops by rodents (Hedemark, 2003, p. 43). Rats and mice were considered as a major pest in upland rice cultivation in some villages of Houa Phanh province (Hansel, 1997 in Showler, Davidson, Salivong and Khounboline, 1998, p. 75). In one village, the infestation was so bad that rats invaded the village and granaries (ibid, p. 77). Irrigated rice production was reported by villagers in Viengthong district in Houa Phanh province to increase the rat population (Schlemmer, 1999, p. 41). A few villagers claimed that rats are the only wildlife species whose population increases with increasing human population, while some other villagers claim that the population of large mammals also increases following hunting bans and forest zoning[113] (ibid, p. 42). In 2005, some villages in Phongsaly province faced the worst rat infestations in both paddy and hill rice ever encountered. Some villagers had to survive on rice donated by an international agency (Duckworth, Robichaud and Eve, 2005, p. 47).

For Alton and Sylavong (1997, p. IV-3), in the past pest infestations followed a cyclical pattern and could be described as "*perturbations*," while in more recent years they took on "*almost epidemic proportions.*" The problem of pest infestation has been related by ADB (2011, p. 107) to the following ecological factors: imbalance in the environment following shorter fallow cycles and over-exploitation of natural resources, such as habitat degradation and over-hunting of large natural predators including large cats. Krahn (2005, p. 132) made similar observations and suspected that damage to crops by wildlife (including squirrels, rats, porcupines, and wild boars) were closely related to imbalances in the environment and the ecosystem (e.g., forest degradation, disappearing of natural predators such as *felida*e). As stated by Timmins, Evans and

[111] Now Ban Vangban along the Nam Chat River in Khamkeut district.
[112] Now called Ban Na, near Ban Phonkham.
[113] Which allowed to keep intruders outside village forests.

Duckworth (1993b, p. 42) the "*reduction of the forest will increase the possibility of conflicts between the villagers and large wildlife.*"

Chamberlain, Alton, Silavong and Philavong (1996, p. 44) assumed that rat[114] infestations on the Nakai Plateau in the 1990s derived from the increased hunting of natural predators.

Gray-bellied squirrel (*calliosciurus caniceps*) was mentioned by Ban Nam Leuk villagers as being a crop pest (SOGREAH, 1996, p. 22).

Brush-tailed porcupines were reported to eat manioc and destroy palisades erected by villagers to protect crops (Bergmans, 1995, p. 304).

Specific bat species are rarely mentioned as crop pests (Duckworth, Salter and Khounboline, 1999, p. 234).

Sharing Habitat

Round (1998, p. 22) observed that trees (e.g., coconut, kapok, mango) planted around villages in the Dong Khanthung PPA harbored birds and small mammals, including bats. Indeed, except for primates, there is evidence that other focus species of the present review encroach on human habitat and vice-versa.

Oriental civet species "*often live near villages*" (IUCN, n.d., p. 18), as do mongooses "*known to adapt easily to life around human settlements*" (IUCN, n.d., p. 25). A small Indian civet was spotted near a field house (SOGREAH, 1996, p. 23) and small Asian mongooses were reported to be widespread around the Sepon Development Project area (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 13).

Depending on their species, rodents occupy a wide range of habitats, such as forest, bamboo groves, bushes, savannah land, swamps, grassland, paddy fields, gardens, granaries, and houses. Aplin et al. (2007, p. 293-296) assessed the geographical coverage of rodents, which ranges from strictly field or forest habitat to human dwellings. Aplin et al. (2007, p. 297) found that "*the house rat is the most abundant rodent in all habitats within the upland agricultural landscapes of Laos*." According to Perry et al. (2002, cited in Aplin et al., 2007, p. 302) "*chronic high rodent numbers in places where livestock are housed and in rice-cropping and village habitats represent a key factor in the disease nexus.*" Rodents have the largest scope for animal-human interface, as they occupy a large territory ranging from buildings (e.g., *rattus rattus,* house rat and *mus musculus,* house mouse) (Duckworth, Salter and Khounboline, 1999, p. 237), to rice

[114] And insects

fields (e.g., *rattus losea*, lesser field rats and *rattus argentiventer*, field rat) and granaries (*rattus exulans*, Polynesian rat) (ibid, p. 238).

Duckworth, Robichaud and Eve (2005, p. 45) found a high density of tree shrews and squirrels in the vicinity of Phongsaly town. Striped squirrels (e.g., Cambodian striped or eastern striped) were reported to be frequent in the vicinity of the Sepon mine camp (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 18).

Vongkhamheng (2002, p. 96) carried out a survey in seven villages of the Nam Et-Phou Loey and his results are in line with the general observations made by the authors cited above: small mammals such as squirrels and bamboo rats are common in the vicinity of villages; medium-sized ones such as macaques were still relatively abundant around few villages. Other species (e.g., langurs, gibbons, and binturongs) were considered to be rare or even locally extirpated (ibid, p. 94-99).

Hog badgers were reported to live in the vicinity of villages in the Sepon Development Project Area (SDPA) (Crome, Richards, Phengsintham and Somvongsa, 2001, p.14).

Similarly, depending on their species, bats occupy a wide range of habitats, such as forests, bamboo, hollow trees, burrows, caves, rock crevices, rice fields, grassland, flowers, vines, orchards and gardens, wells, houses, and temples (Salter, 1993a, p. 13-14). Selected species of bats are known to live in human dwellings such as houses and temples (Duckworth, Salter and Khounboline, 1999, p. 228). In Thailand, monasteries often provide a sheltered environment for some wildlife in the northern part of the country; numerous temples are built in the vicinity of caves and thus present a close contact with bats (Robinson and Smith, 1997, p. 1). Other bat species, commonly called "fruit bats," forage on flower nectar of "cash crop" tree species such as banana, durian, jackfruit, jambu, and kapok (Duckworth, Salter and Khounboline, 1999, p. 228). Some bats are useful as insect catchers, while fruit and nectarivorous bats are useful as pollinators (Davidson, 1997, p. 4) and as seed-dispersers, two functions indispensable to forest regeneration (Robinson, 1998, p. 157; FMCP, 2000, p. 25). Robinson and Webber (1998, p. 11) observed several bat species foraging on kapok flowers and cultivated banana trees in and around villages. Robinson and Webber (1998, p.15) wrote how "*a group of two to five [bats] were observed foraging together in a small hut [...] used to store un-chaffed rice. [...] The bats were observed flying around inside of the hut circa 1 m. from the level of the rice.*"

Although they do not share their habitat with humans, cave-roosting bat species are most likely to suffer from encounters with humans, as they can be easily trapped (Francis, Khounboline and Aspey, 1996, p. 6; Francis, Gillen and Vongkhamheng, 1997, p. 9; Walston and Vinton, 1999, p. 41). Apart from the previous Khammouane Limestone NPA (the current Hin Nam No NPA), Francis, Khounboline and Aspey (1996, p. 8) recommended bat surveys in the following main

limestone areas in Lao PDR: (1) Vang Vieng in Vientiane province, (2) along the Nam Ou river between Luang Prabang town and Muang Khoa village, and (3) Viengxai near Xam Neua in Houa Phanh province.

Specific Animal Behavior

Specific animal behaviors may result in more frequent encounters with humans. Rhesus macaques, for instance, are a diurnal species and are thus more easily hunted than other species (WCS, 1995c, p. 20; Timmins and Vongkhamheng, 1996, p. 15). This characteristic also applies to Douc langurs, a diurnal species, which are thus more easily targeted than gibbons (Timmins and Duckworth, 1999, p. 483). According to Tobias (1997, p. 13) black giant squirrels are confiding animals and are thus more prone to hunting. According to other authors (WCS, 1996a, p. 10; Duckworth, Robichaud and Eve, 2005, p. 43), it is the diurnal behavior of black giant squirrels, similar to that of some diurnal primate species, which makes them susceptible to hunting and human pressure.

Duckworth, Salter and Khounboline (1999, p. 179) mention that Douc langurs are easier to catch than other monkeys owing to their tame character. Duckworth (1997, p. 80) also found large Indian civets to be "*strikingly confiding.*" On the other hand, Duckworth (1997, p. 18) state that hunting, apart from reducing a population, may also render animals shy and push them to hide further in the forest, thus reducing the frequency of encounters. Steinmetz (1998c, p. 20) was told that pig-tailed macaques descended from karst forests into semi-evergreen forests and pine-diptocarp forests in the rainy season, when both forests provided more food and less human disturbance.

In the Nam Et-Phou Loey NPA, macaques, civets and rodents (e.g., squirrels and rats) appeared to show high resilience to human pressure, although they are targeted for subsistence consumption and hence widely consumed. This fact was imputed to a wide range of factors, including that their "*plasticity in foraging behavior, relatively high survival rate of adults, generalized habitat, high reproductive rates, [and] high growth rate and dispersal.*" The fact that they were targeted for subsistence harvesting and not for trade exploitation was also viewed as a resilience factor (Vongkhamheng, 2002, p. 78). Nevertheless, langurs and gibbons, which are targeted for food, showed high decline rates due to their lower populations and less versatile habits. Porcupines also showed high decline, mainly because they were targeted for both consumption and trade (ibid, 2002, p. 78-79). In general, hunting is reported to make animals more shy. Shy animals are thought to have been less in contact with humans and to be less under pressure (WCS, 1996a, p. 27).

Summary Chapter 3.14: Other Points of Contact between Humans and Wildlife

Villagers report the negative impact of specific wildlife species (as pests) on their livelihood more widely than their potential utility. Among the focus species of this report, rodents are by far the main pest reported by villagers throughout the country. Rats pose a major threat to the livelihood of rural communities by destroying rice crops. Rat infestations are believed to have increased in frequency and geographical scope, a fact imputed to increased natural disorders.

Sharing habitat offers a large scope for human-wildlife interface. This is particularly the case with rats, known to roam everywhere, and to a lesser extent with bats. Spatial exposure of human and fomites to wildlife, mainly rodents, and the associated risk in terms of zoonoses, is therefore rated as high, both in rural and urban areas.

3.15 Wildlife to Wildlife Interface

Duckworth (1997, p. 10) observed *de visu* close encounters (a few cm) between a common palm civet and two slow lorises foraging in the same fruit trees. He also observed aggressive encounters between a common palm civet and a small-toothed civet, as well as between a common palm civet and a masked palm civet (Duckworth, 1997, p.10). He further observed a direct relationship between the presence of rodents and small carnivores. A higher number of rats were found in areas where a high number of encounters with carnivores was registered. Duckworth (1997, p. 18), however, doubted that the relationship was purely causal, as frugivorous palm civets were included in carnivores as well. He advised conducting nocturnal small mammal surveys simultaneous with rodent trapping.

Steinmetz (1998c, p. 20) was told that human disturbances forced the otherwise-allopatric, pig-tailed and Assamese macaques to share different portions of the cliff within the same habitat (limestone karst) in the previous Khammouane Limestone NPA. Timmins and Vongkhamheng (1996, p. 16) observed that records of Cambodian striped squirrels showed that they were often "*associated with bird flocks.*"

Summary Chapter 3.15: Wildlife-to-Wildlife Interface

In the course of their surveys, some researchers came across more or less close physical encounters between wildlife species. Some researchers observed spatial associations between different species within ecosystems (e.g., squirrels and birds, or small carnivores and rodents). Such links and their potential role in disease spread may be investigated further.

3.16 Impact of Human Activities, Including Extractive Industries, on Wildlife

"*The threats to wildlife are intimately connected with patterns of human occupation and use*" (Round, 1998, p. 123). Human uses are therefore often associated with threats to conservation (Duckworth et al., 2010, p. 82). Therefore, authors of wildlife surveys, such as Boonratana, Sengsavanh and Chounlamounty (2000, p. 14) also record "*information on human activities, useful in assessing impacts on wildlife and habitats, hence identifying threats to their long-term viability.*" Often a combination of several human uses are observed, such as fishing, hunting, collection of forest products, and grazing of domestic buffaloes (Steinmetz, 1998c, p. 8).

In the Xe Pian NPA, Bezuijen et al. (2007, p. 223) assessed eight categories of human impact: (1) hunting and wildlife trade, (2) fishing, (3) burning of wetland and forest vegetation, (4) logging, (5) cultivation, (6) livestock grazing, (7) collection of non-timber forest products, and (8) powerline construction.

Population Pressure (Population Increase, Voluntary Immigration or Resettlement)

Schaller (1995, p. 6) remind that until recently the human population density was low in the Lao PDR. Duckworth (1997, p. 1), however, warned that the population increase was one of the highest in the world. In 1997, Alton and Sylavong (1997, p. III-8) calculated the number of years necessary to double the population of eight villages surveyed in the NN-NPA. Based on annual growth rates estimated for each village, which ranged between 2.01% and 6.1%, the number of years necessary to double the village population ranged from 11.8 years to 35.8 years. The same authors concluded that "*the population growth rate is a major factor concerning future land use [...] in the NPA for some time in the future*" (ibid, 1997, p. III-9). Alton and Sylavong (1997, p. IV-1) mention migration -- in addition to family planning and general health improvement -- as one of the key factors weighing on the availability of local resources. The same authors state that "*the hunting, fishing and gathering sub-systems are under severe stress from both domestic population pressure and foreign incursions*" (ibid, 1997, p. IV-2).

Steinmetz and Baird (1998 in WWF, 1998c, p. 50) were told by villagers that in the Dong Phu Vieng NPA, the population increase resulted in increasing both paddy rice and swidden agriculture cultivation, and therefore in declining natural resources such as wildlife. Population increase was the first cause evoked by villagers in Viengthong district in Houa Phanh province for the over-exploitation of wildlife (Schlemmer, 1999, p. 41). In Ban Keng Bid, the village headman wondered why, despite hunting bans, wildlife declined. He, however, conceded that "*as human population increases, wildlife population decreases*" (Hedemark et al., 2006, p. 25). Vongkhamheng (2002, p. 117) observed that the rate of wildlife exploitation was correlated with the length of settlement (the longer-the higher), the population density (the higher-the higher) and the village location (the closer to a road-the higher the rate).

Increasing population pressure was reported to have a knock-on effect on wildlife by reducing the rotation interval between fallows, which in turn decreases rice outputs and thus increases rice shortage and consequently the reliance on NTFPs and wildlife (Steinmetz and Baird, 1998 in WWF, 1998c, p. 52). Besides population increase, Lao PDR was also marked by important population movements within the last half century. Hedemark et al. (2006, p. 42) noticed that among the eight villages surveyed in three districts of Bolikhamxay province, "*nearly all of the villages experienced population movement caused by the Indochina war.*" In 2003, it was estimated that 730,000 people were displaced within the country, while 414,000 left Lao PDR during the American war in Vietnam.

Between 1975 and 1979 550,000 people returned to their provinces. More recently, internal migration and resettlement affected 3.6% of the population between 1985 and 1995 (ICEM, 2003, p. 19). Schaller (1995, p. 6) warned about the destructive impact of northern populations migrating towards the Annamite range. These populations degraded their original habitat with slash and burn practices. Schaller (1995, p. 6) further estimated that the population in the Annamite range would quadruple within 50 years following high birth rates and immigration. According to Timmins and Duckworth (1999, p. 476), in central and southern Lao PDR, people favor level lowland for settlement and habitat clearance. Tobias (1997, p. 47) mentioned the problem posed by voluntary immigration in protected areas, including the pressure on wildlife caused by *H'mong* communities migrating southwards. Human settlements in the Xe Pian NPA were acknowledged "*to increase the area over which human disturbance affects wildlife and habitat values.*" According to Showler, Davidson, Vongkhamheng and Salivong (1998, p. 50), Attapeu and Saravan provinces were planning to resettle over 50% of their upland communities to lowland areas until 2003. In Sekong province, upland communities had already started moving to lowland areas around the Xe Sap NPA. While this migration relieved pressure in upland areas, it increased it in lowland ecosystems (ibid, p. 50). Round (1998, p. 133) observed that human settlement and rice cultivation in the Dong Khanthung proposed PPA would "*increase the likelihood of conflict between villagers and wildlife due to crop-raiding by the latter.*"

In Ban Nakasang in Champassak province, a village widely known to accept people rejected by their own villages or communities, newcomers to the village were said to turn to wildlife trade, as they had no other source of livelihood (TRAFFIC, 1999, p. 44-45). Increase in market demand for wildlife was also imputed to foreign immigration. By the end of the 1990s, 20,000 Chinese were estimated to work in northern provinces for Chinese companies active in construction (e.g., roads, bridges, hydropower, houses) (TRAFFIC, 1999, p. 24).

General Habitat Deterioration

"*Very few areas are likely to be without the effect of human use*" (Timmins and Vongkhamheng, 1996, p. 18). As Timmins, Evans and Duckworth (1993a, p. 40) summarize: "*Any activity*

increasing the amount of time people spend in the forest triggers an equivalent rise in hunting." As stated by WCS (1995c, p. 35), "*any human settlement, permanent or temporary, invariably leads to environmental deterioration, of which the most serious aspects are forest clearance and hunting of key species.*" Duckworth (2008, p. 31) reminds that it is difficult to *"disentangle*" the effects of habitat deterioration and hunting, "*because almost invariably the agents of the former are either themselves hunting, or causing others to hunt for them, for food*." Timmins and Vongkhamheng (1996, p. 18) observed that "*opportunistic hunting [is] concentrated close to areas of regular human activity.*"

Evans, Duckworth and Timmins (2000, p. 59) observed that the proximity of Phou Khao Khouay NPA to Vientiane capital (a two-hour drive) resulted in heavy hunting, even in its most remote parts. For Crome, Richards, Phengsintham and Somvongsa, (2001, p. 34), "*the relative faunal poverty [...] is due to hunting, as much as differences in habitat quality*." Tizard (1996, p. 33) links wildlife habitat destruction to hunting, shifting cultivation, logging, road building, and hydropower projects. To this list, Timmins and Evans (1996, p. 25) add population increase, resettlement of displaced people (for the construction of dams), expansion of markets, and NTFP harvesting by Lao and Vietnamese collectors. In the Sepon mine project area, degraded areas (due to forest clearance, bombing and herbicide use in the war and over hunting) host mostly "habitat generalist wildlife species" (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 34). For Duckworth, Salter and Khounboline (1999, p. 230) human pressure on wildlife will inevitably increase, due to higher human interventions in the ecosystem (e.g., logging, land clearing and large-scale plantations, and extractive activities such as mining and hydropower). Duckworth, Robichaud and Eve (2005, p. 45) observed that in the Phou Dendin NPA, the large area coupled with a lower population than in other NPAs "*means that for any given hunting pressure there is more space for wildlife to evade hunters*." A decade later, such assumptions are confirmed by findings made by ACE and NCG (2011, p. 87) in the Nam Pot hydropower area. Earlier human activities in this area,[115] prior to the establishment of the hydropower dam, resulted in the disappearance of most wildlife. The latter has been either extirpated or "pushed" away to less accessible areas.

Agricultural Clearance and Slash and Burn (aka, Swidden or Shifting) Cultivation

Dense forests show the richest flora and fauna resources and their soil exhibit ideal conditions for upland rice shifting cultivation, such as water retention capacity, structure, and high humus content (Alton and Sylavong, 1997, p. III-2). Alton and Sylavong (1997, p. A IV-5) differentiate between pioneering and rotational swidden agriculture. In the course of time, under increasing population pressure, *Brou* villagers in Ban Kou Ne in the NN-NPA switched from pioneering to rotational shifting cultivation, and nowadays they burn secondary rather than primary forest (Alton and Sylavong, 1997, p. A IV-5). In some villages of the NN-NPA, primary forest was

[115] In Bolikhamxay province.

used mainly for conversion to swidden agricultural land, and the remaining land was used for hunting and gathering (Alton and Sylavong, 1997, p. A IV-4).

For Schlemmer (2001, p. 36), three main reasons may explain clearing of dense forests: (1) population increase, (2) resettlement near existing forest, and (3) a too-short cycle on existing fallow land. Indeed, shorter fallow periods provide opportunities for increased incursions into primary forests (Alton and Sylavong, 1997, p. IV-7).

Although swidden agriculture is largely practiced mainly in the northern part of the country (MAF, 2011, p. 15), it is also practiced by specific populations in the Annamite range (Timmins and Duckworth, 1999, p. 482). In 1998, villagers from the Dong Phu Vieng NPA reported that *"their habitat takeover, sometimes for paddy extension was partly responsible for the decline in some species*" (Steinmetz and Baird, 1998 in WWF, 1998c, p. 55). On the other hand, it was observed that squirrels and civets, the most harvested species, did not decline. Villagers imputed this to the fact that such species "*may benefit from the existence of fallow habitat in the mosaic landscape.*" In the Xe Sap NPA (in Xe Kong province), slash and burn and hunting for subsistence and trade were identified as the main threats to biodiversity (Showler, Davidson, Vongkhamheng and Salivong, 1998, p. xxiv).

Natural and human-caused fires are mentioned by Boonratana, Sengsavanh and Chounlamounty (2000, p. 15) as a major threat to certain species of wildlife in the Dong Sithouane Production forest,[116] including primates and porcupines. *Katang* villagers complained that nobody takes responsibility for the destruction of forest resources through slash and burn (Clendon, 2001, p. 30). Timmins and Duckworth (1999, p. 482) mention slash and burn practices[117] as major threats to Douc langurs.

Free Cattle/Buffalo Grazing

Clendon (2001, p. 30) and Showler, Davidson, Vongkhamheng and Salivong (1998, p. 50-51) view free grazing by cattle as a problem for wild animal resources. Grazing by buffaloes was encountered in the Phou Xieng Thong NPA. There, over 90% of livestock owners interviewed admitted that their livestock graze in the NPA (Southammakoth, 1998, p. 32), the Nam Ha NPA (Hedemark and Vongsak, 2002, p. 12) and in the Dong Houa Sao NPA (ADB, 2008, p. 8). Free ranching cattle and buffaloes were seen as a risk for spreading diseases to wild cattle populations (Boonratana, Sengsavanh and Chounlamounty, 2000, p. 15; Southammakoth, 1998, p. 33). Indeed, Duckworth et al. (1994, p. 203) encountered diseased water buffaloes in the Xe Kong plains in the Xe Pian NPA and in the Phou Xanh He NPA. Bezuijen et al. (2007, p. 228) encountered buffaloes in seven out of nine wetlands within the Xe Pian NPA; herds ranged

[116] Savannakhet province.
[117] Aka swidden agriculture or shifting cultivation.

between one and 43 heads and were unaccompanied. Free grazing by cattle and buffaloes was encountered in the Nam Phoui NPA as well (Boonratana, 1998, p. 46).

Wood and NTFP Collection

Traditionally, hunting is carried out opportunistically while collecting wood as well as NTFPs. Hunting intensifies when outsiders are involved in NTFP collection (Davidson et al., 1997, p. 78). In the past, wildlife harvesting was seen in conjunction with harvesting of NTFPs, mainly *mai dam* (aka *mai ketsana*), which was the main reason for people to go to the forest (Payne, Bernazzani and Duckworth, 1995, p. 21; Boonratana, 1998, p. 45; Philakone, 2009, p. 7). Nooren and Claridge (2001, p. 142) mention the "*obvious connection*" between *mai dam* and wildlife poaching and trade. Hunting was said to be secondary to *mai dam* and wild honey collection (Tobias, 1997, p. 34). In the Xe Pian NPA, collectors established temporary forest camps to fish or to collect *mak chong* (malva nuts).[118] During the *mak chong* season, groups of collectors were comprised of up to 100 to 200 persons (FMCP, 2000, p. 87). In the Nam Phoui NPA, collection of mushroom and green plants was conducted along with fishing and hunting (Boonratana, 1997, p. 23). The same author also found that "*hunting and trapping for wild meat is closely related to mai ketsana*[119] *poaching and harvesting of mak kho and mak taw.*"

Fishing Camps

Duckworth et al. (1994, p. 203) observed that "*fishing takes people furthest into the forest*" and, as it occurs in the late dry season, it brings additional pressure on mammals, which are already under high stress.

Temporary and semi-temporary fishing camps were found to be widespread in Attapeu province (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 9-11). The frequency of active camps was found to range between 0.2 (in 2005) and 0.4 camps per km (in 2000) (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 11). Remains of a long-tailed macaque which had been shot were found at a fishing camp in the Dong Khanthung PPA (Round, 1998, p. 37). Fishermen were estimated to contribute to wildlife harvesting for food and extraction for trade (Round, 1998, p. 124). In the Nam Kading NPA, a fishing camp was encountered near Ban Donme and "*villagers were also harvesting other wildlife for camp consumption.*" While some villagers specialized in fisheries (catch and sale), others also collected NTFP and wildlife along with fishing (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 9). Most local (77%) and outside (78%) families interviewed had established their camps within the last five years. The remaining local (23%) and outside (22%) families had established their camps years before.[120] Villagers who moved

[118] Scaphium macropodium/sterculia lychnophor. Trees bear fruit every 3 to 4 years and yield in April/May.
[119] Aka "Mai dam" (aquilaria spp.).
[120] 22 responses out of 18 camps.

from their village to a camp along the Xe Kong River explained that their *"livelihood is easier here because all types of natural resources, like fish, vomica nuts, squirrels, monitor lizards, are close together*" (Singh, Boonratana, Bezuijen and Phonvisay, 2006, p. 10). Fishing camps in the Xe Pian NPA were reported to be seasonal but constant since the 2000s (Bezuijen et al., p. 230), although local people reported an increase since the 1990s (Singh, Boonratana, Bezuijen and Phonvisay, 2006, cited in Bezuijen et al., 2007, p. 230).

The Nam Ha NBCA showed a high incidence of fishing and hunting camps along the river (Schipani and Marris, 2002).

Road Construction

Roads allow populations to "*promote the cash economy usually at the expense of natural resources*" and "*enable and promote exploitation of natural resources especially timber, wildlife and minor forest products*" (MoC and IUCN, 2000, p. 28). Tobias (1997, p. 32) notes that "*roads provide routes for immigration and access for loggers and hunters and considerably raise hunting levels of efficiency along their length, especially at night*." FMCP (2000, p. 55) acknowledged the same issues with the construction of new roads, "*which can potentially cause greater impact to a protected area than any other single activity*" (FMCP, 2000, p. 77). Showler, Davidson, Vongkhamheng and Salivong (1998, p. 42) listed the following negative impacts brought along by road development:

- Increased hunting pressure;
- Increased potential for both illegal and legal logging activities; and
- Immigration of people and new settlements along the road.

Several authors found evidence of the link between road construction and increased hunting throughout the country. In the Nam Xam NPA, a *H'mong* village was settled to provide cheap labor for the road construction and tree felling for the *Fokienia* trees logging company. As a result, settlers started hunting in the NPA and, after completion of the road, continued hunting both for subsistence and for trade (Showler, Davidson, Salivong and Khounboline, 1998, p. 46). During a wildlife survey in the Nam Ha NPA, a road construction camp, a musket and a military gun were found, as well as a roasted rat and a slow loris (Hedemark and Vongsak, 2002, p. 13). In the Upper Xe Nam Noy catchment and the Bolaven north-east PPA, a former track had been upgraded to a road, which "*was used by many parties of vehicle-borne hunters*" (Evans, Duckworth and Timmins (2000, p. 70). In the Dong Phou Vieng NPA, a Lao company based near the Keng Samate river rapids was active in the 1980s and early 1990s in road building, fish trading, and war scrap metal collection and sale. The company was reported "*to have been heavily involved with wildlife trade as well*" (Steinmetz and Baird, 1998 in WWF, 1998c, p. 49). Vongkhamheng (2002, p. 73) observed that all villages surveyed in the Nam Et-Phou Loey NPA

that were situated close to a road hunted species for trade rather than for food consumption purposes.

Duckworth (1997, p. 19) highlighted the fact that "*most roads stimulate hunting and habitat degradation along their margins.*" "*Edge effects*" of new roads was noticed in the Nam Phoui NPA by Boonratana (1998, p. 46), who feared that, once completed, the road would allow vehicles to take out higher volumes of NTFPs, mainly *mai dam* and wildlife (ibid, p. 47).

In the Nam Phoui NPA, the newly constructed road"*resulted in increased wildlife hunting in the area from both ends of the road*" (Phiapalath and Saisavanh, 2010, p. 20). It is feared that the construction of a new road linking Moulapamok in the Dong Khanthung PPA to the Lao PDR-Cambodia-Thailand triangle will exacerbate hunting by outsiders (Phiapalath and Saisavanh, 2010, p. 26). Duckworth, Robichaud and Eve (2005, p. 5) estimated that the absence of any road in the Phou Dendin NPA was the "*most significant factor in maintaining its habitat and wildlife population.*" In Ban Nadi, the upgrading of Route No. 1 was anticipated to trigger development "*and should a bridge be built there, there will be more wildlife and natural resources trafficking*." Near the Nam Et-Phou Loey NPA, road builders engaged in a barter system with villagers, exchanging manufactured goods for local goods, including wild animals (Schlemmer, 2001, p. 73).

Not only roads, but simple mountain trails are associated with hunting. Timmins and Vongkhamheng (1996, p. 7) found that "*valley good foot trails were generally associated with snare lines extended into the forest.*"

Logging

A stated by ADB (2008), "*many logging trails allow for easy access for hunting and NTFP collection.*" Timmins (1997, p. 15), as well as Chamberlain, Alton and Silavong (1996, p. V-5) mentioned the impact of logging on wildlife decline. Krahn (2005, p. 134) highlighted a direct link between road construction, logging, and increased hunting by outsiders. Steinmetz (1998c, p. 16) was told by villagers that a mineral lick on the Nakai Plateau had been abandoned by animals due to its proximity to a logging road.

In the 1990s, Schaller (1995, p. 6) documented logging of *Fokienia* trees[121] on the Nakai plateau and extraction of logs by helicopter and by road. BPKP, the logging company, had been felling trees on the Nakai Plateau in advance of its future inundation (Steinmetz, 1998c, p. 32-33). The same author was told by a PAFO official that each logging crew was equipped with vehicles and at least one rifle per truck. There were up to 100 to 200 loggers on the plateau, split into unsupervised groups (Steinmetz, 1998c, p. 33). *Fokienia* logging by a Japanese company in Nam

[121] Fokienia, a cedar species highly valued for coffins in Japan

Xam NPA in Houa Phanh province in the late 1990s was found to be a major opportunity for human-wildlife interface, as loggers openly admitted hunting for food. According to the company's Japanese director, loggers had no alternative to find meat than hunting, as the nearest market was a six-hour drive form the logging site (Showler, Davidson, Salivong and Khounboline, 1998, p. 42). Robichaud, Hedemark and Johnson (2002, p. 18) assumed that truck drivers working for commercial logging companies acted as middlemen in the wildlife trade between villagers and downstream traders.

Tree felling has a direct impact on the wildlife habitat (Duckworth, Salter and Khounboline, 1999, p. 13). Duckworth (1997, p. 18) found a confounding effect of logging and hunting on small carnivores in Lao PDR and assumed that civets were less frequently encountered in logged areas than in primary forests. Krahn (2005, p. 129) was told by *Katu* villagers that the low number of red-shanked Douc langurs was correlated to the absence of specific fruit trees. Similarly, decreasing forest cover led to a decrease in flying squirrels and other arboreal wildlife species. MAF (2011, p. 15) mentions that in the North, logging coupled with swidden agriculture resulted in forest fragmentation. The latter, combined with better road access, increases human interface (e.g., hunting). Phiapalath and Saisavanh (2010, p. 22) recommended that loggers should be prevented from hunting gibbons and other wildlife in the Nam Phoui NPA.

Peat Extraction

Peat extraction occurs in the wetlands of the Xe Pian NPA (ADB, 2008, p. 14).

Industrial Crop Plantations

As stated by ADB (2008, p. 11), "*the chief habitat-related threat to biodiversity in the survey area (as throughout the Lao PDR) is not logging itself, but post-logging conversion of the area to non-forest use, notably plantations for exotic trees, e.g. rubber, cashew, acacia and perhaps even palm oil.*" MAF (2011, p. 15) makes an explicit link between industrial plantations[122] and hunting pressure. Concessions granted by the government to private companies to convert natural forest into industrial crop plantations increases the influx of foreign laborers and therefore may increase the risk of hunting. Indeed, forest clearing for coffee plantations resulted in a higher incidence of hunting in the Dong Houa Sao NPA (Timmins, Evans and Duckworth, 1993a, p. 24; Duckworth et al., 1994, p. 203; ADB, 2008, p. 8).

Hydropower

A stated by WCS (1995b, p. 39), a hydropower project *"will precipitate major changes in local human usage and settlement patterns [...] with concomitant pressures on remaining wildlife*."

[122] Among others, rubber, cassava, cashew, acacia, and eucalyptus.

WCS (1996a, p. 16) highlighted the unpredictability of the impact of hydropower development on hunting. The increase in well-being may result either in increased pressure (e.g., more money to buy arms) or in decreased interface (e.g., more employment, less reliance on hunting).

The link between hydropower development and increased human activity and its impact on wildlife was highlighted for the Nam Theun 2 project in Khammouane province (WCS, 1995a, p. 43-44; Steinmetz, 1998c, p. 35), the Xe Nam Noy-Xe Pian Hydropower project in Champassak province (WCS, 1995b, p. 3-4), the Xe Kaman I hydropower project in Attapeu province (Davidson et al., 1997, p. 80-81) and several hydropower schemes in Sekong province (Krahn, 2005, p. 132). In all cases, it was assumed that logging, road construction/upgrading, and resettlement of villagers would result in increased hunting by loggers, temporary workers, truck drivers, and resettled villagers. The main impacts foreseen were:

- **Destruction of habitat** (WCS, 1995b, p. 39).
- **Logging camps** and the danger posed by loggers in terms of hunting (SOGREAH, 1996, p. 50).
- **Road construction** allowing access to previously inaccessible grounds (WCS, 1995b, p. 39). This impact was reported to be potentially devastating on primates (excluding lorises) and black-giant squirrel in the Xe Nam Noy-Xe Pian Hydropower project in Champassak province (WCS, 1995b, p. 27-31).
- **Increased market linkages** for wildlife products with provincial and international (e.g., Thailand) markets (WCS, 1995b, p. 39).
- **Hunting by construction and support services workers** (WCS, 1995b, p. 39). WCS (1995c, p. 27) observed increased hunting by workers employed for the construction of the Theun Hinboun dam. For the Nam Theun 2 Dam, "*the presence of construction/operating staff in the area*" was felt to be a major threat to wildlife (MoC and IUCN, 2000, p. 43).
- **Reliance on a water source** by logging and construction camps, resulting in potential conflict with water resources for wildlife (WCS, 1995b, p. 39).
- **Higher post-impoundment human activities** (WCS, 1996b, p. 18). The number of settlers increases, hunters increase, and markets develop (WCS, 1996b, p. 21).
- WCS (1995b, p. 39) reported that the construction of the Nam Ngum reservoir resulted in a fish "*boom and bust*," attracting new settlers who turned towards wildlife harvesting once fish resources dwindled due to over harvesting.
- Switch from subsistence livelihood to market economy for resettled communities, resulting in higher needs for cash and non-subsistence wildlife trade (WCS, 1995b, p. 40).
- **Disruption of traditional cropping pattern** for non-resettled villagers, resulting in **higher reliance on forest resources** (WCS, 1995b, p. 39).

- WCS (1995b, p. 40; 1995c, p. 31) feared that reduced fish availability downstream the dam would compel people to **switch from fishing to hunting** in order to find protein substitutes to aquatic resources.
- Inundation of valleys results in **clearing slopes and intensifying hunting** (WCS, 1995c, p. 34).
- **Improved boat access to protected areas** through post-inundation backwater effect (WCS, 1995b, p.39; IUCN, 1997, p. 5).
- **Powerlines** construction and maintenance.
- **Possible increase of the vector-borne diseases prevalence** (Chape, 1996, p. 22). Pasteur Institute has been entrusted by NTPC with a research mandate to investigate the prevalence of post impoundment vector-borne diseases in the Nakai-Nam Theun area (Brey, 2011, personal communication).

Mining and Quarrying

As reminded by Duckworth et al. (2010, p. 14), "*mining by its very nature degrades the biodiversity values of the areas exploited.*" Robichaud, Hedemark and Johnson (2002, p. 8) mentioned limestone quarrying for the cement industry as potentially enhancing pressure on wildlife. In 2004, pressure by limestone quarrying was found to exist in one of the 20 NPAs existing at that time, namely the Phou Hin Poun NPA (WWF, 2004, p. 99). Francis, Guillén and Vongkhamheng (1997, p. 9) warned against the impact of quarrying on bat colonies.

Around the previous Khammouane Limestone NPA (now Phou Hin Poun), tin mining initiated by the French was continued by Russian companies in the 1990s (Steinmetz, 1998b, p. 15). In Luang Namtha, a gravel quarry within the NPAs was a source of worry for wildlife extraction by workers (Hedemark, 2003). Small-scale gold mining in the Xe Sap NBCA was found to be potentially harmful to wildlife (Timmins and Vongkhamheng, 1996). Krahn (2005, p. 132) mentioned that planned gold and titanium extraction in Sekong province would lead to intense logging and increased hunting of wildlife.

Lan Xang Minerals Limited, the operating company of the Sepon gold and copper mine in Sepon district in Savannakhet province has been working together with the Water and Environment Resources Agency (WREA) and the Wildlife Conservation Society (WCS) on offset activities[123] relating to biodiversity conservation program since 2009 (MMG, LXML, 2010, p. 8). Mining activities are close to the Phou Xang He NPA and the Laving Laveun PPA. Recent research showed that the main threats to biodiversity are: (1) hunting for sale, (2) illegal logging and gathering of forest resources, (3) habitat loss due to mining and agriculture, (4) hunting for

[123] The offset concept: if a company is likely to do damage to an area of biodiversity value, and if the regulatory authority agrees, then it should compensate for this by providing funds to enrich the biodiversity values of areas beyond the places where it operates (LXML, MMG, 2010, p.8)

subsistence, and (5) infrastructure (roads, power and development). The species ranked as most threatened were: (1) elephant, (2) saola, (3) great hornbill and large antler muntjac, (4) white-chested gibbon, and (5) tiger (MMG, LXML, 2010, p. 10). More specifically, during an earlier assessment, Crome, Richards, Phengsintham and Somvongsa, (2001, p. 34) assessed the potential impact on biodiversity and natural resources of the mine itself as follows:

1. Loss of habitat from prospecting and project infrastructure
2. Loss of biodiversity
3. Noise and dust disturbing fauna
4. Loss of habitat along Route No. 911
5. Impact at water crossings on Route No. 911
6. Effects of tailing storage and any acid drainage from waste

The same authors assessed that the local exploitation of dolomite and limestone, "*extraordinarily abundant in the study area,*" would not endanger caves, as these formations are abundant and therefore bats would not be affected (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 38). According to estimates, fauna would hardly be directly impacted as hunting by camp dwellers would be prohibited and the speed for trucks would be limited (Crome, Richards, Phengsintham and Somvongsa, 2001, p. 38). The impact of temporary 'immigrants" seeking advantage from the soon-to-be-established mine was found to be difficult to assess.

The already high hunting pressure, mainly due to the presence of Vietnamese traders placing orders on specific species, was assumed to increase with immigration (ibid, p. 42).

Tourism

Historically, the relationship between tourism and wildlife pertained more to the interest expressed by tourists from the region (mainly Thai and Chinese) for wild animals in form of trophies, pets, food, or traditional medicine, rather than to observe animals in the wild.

Nooren and Claridge (2001, p. 37) reminded how the opening of the border in March 1989 to Thai tourists increased sales of wildlife at the *Talaat Sao* (morning market) in a dramatic way. In the early years of the 2000s, Lao tour operators mentioned that shopping at local markets was one of the main reasons for regional tourists to come to Lao PDR (Nooren and Claridge, 2001, p. 34).

Nowadays, from a Western perspective, Lao PDR's "*primary tourist attractions for international visitors are the nation's rich natural and cultural heritage*," assets "*that represent two tremendous resources for the development of sustainable community-based ecotourism*" (Schipani and Marris, 2002, p. 1). Eco-tourism is seen as a means to open income opportunities

to rural communities and thus to potentially alleviate some pressure on wildlife resources (Johnson and Vannalath, 2002, p. 3). The first eco-tourism project in Lao PDR was launched in 1999 in the Nam Ha NPA in Luang Namtha by the Asia-Pacific UNESCO Regional office, together with the National Tourism Authority. The same authors observed that "*tourism was one of Laos' few opportunities to earn significant foreign exchange"* and warned that "*any threats to the cultural and natural resource base that supports tourism is of particular concern*."

In a survey carried out on community-based tourism in Savannakhet province, Craig and Soungnavongsa (2000, p. 2) found that 11% of the respondents mentioned wildlife as an interest (compared to 22% for trekking and 19% for camping). Among nine questions evaluated after the "inaugural" expedition with foreign tourists, wildlife received the lowest score (2.2) on a scale of 1 to 4, given the low sighting rate. This was imputed to the fact that the group was noisy (ibid, p. 10). In the Xe Pian NPA, a Canadian NGO set up a small eco-tourism project near Ban Mai (Bezuijen et al., 2007, p. 225). A few years earlier, some authors had expressed opportunities and constraints offered by eco-tourism. In 1996, WCS (1996a, p. 15) stated that the only suitable place for wildlife watching (other than birds) was the Navang logging road in the Nakai-Nam Theun NPA. Other potential places (Phou Khao Khoay and Sangthong forest) were said to host few charismatic species. The same year, a British team investigated a part of Lao PDR's extensive cave network in Vientiane and Khammouane provinces. The investigation was part of the Lao PDR Cave Exploration Project (Gregory, Openshaw, Senior and Papard, 1996, p. 5). The team acknowledged the tremendous economic potential borne by caves in both provinces (ibid, p. 49).

Summary Chapter 3.16: Other Exposure Points

The following fields have been identified as factors potentially increasing human-wildlife interface: agricultural practices, NTFP collection and fishing from forest camps, demography, infrastructure development, hydropower and extractive industry, and (eco-)tourism.

3.17 Mitigation Initiatives

Most conservation projects addressed forest degradation and wildlife extraction issues. Some projects (e.g., within the Lao-WCS Program), comprise law enforcement measures and supports patrolling at checkpoints, at wet markets, and in protected forests. Training of patrolling staff focuses on: patrolling planning and preparation, wildlife identification, wildlife laws, arrest and prosecution technique, data entry and analysis, self defense, forest navigation and field technique, and high-frequency radio use (Hedemark, 2009, p. 2).

Some initiatives have recommended improved livelihood concepts such as cultivation of NTFPs, controlled pen-fed cattle husbandry, and sustainably harvested high-value timber (IUCN, 1999, p. 46-48). *Katang* villagers interviewed by Clendon (2001, p. 38) viewed a balance between

sustainable agriculture, sustainable natural resources, and alternative livelihood activities as a warrant for food security. Organizational and communal resource management was discussed by Hansen and Jeppesen (2004, p. 87). In the Nam Phoui NPA, alternatives to wildlife protein harvesting by soldiers, such as chicken husbandry, were discussed with military personnel (Boonratana, 1997, p. 28). IUCN (1999, p. 58) has recommended pilot guardian village programs and carrying out participatory conservation activities in the NN NPA. Guardian villages have set up Village Conservation Monitoring Units (VCMU) consisting of village militia and village security people.

VCMUs could patrol and monitor within their village boundaries only. Such VCMUs were under the official supervision of the DAFO, which issued guidelines based on the Forestry Law (IUCN, 1999, p. 63). VCMU members, as well as district police and provincial border staff, were trained by the project on Wildlife Monitoring and Participatory Conservation Techniques. Boonratana, Sengsavanh and Chounlamounty (2000, p. 23-24) recommended the introduction of the "village forestry" concept programmed by the Forest Management and Conservation Program (FOMACOP) in the Dong Sithouane Production Forest to make villagers central actors in biodiversity conservation. They proposed forbidding the harvest of wildlife in special conservation management zones in the production forest. WWF (1998c, p. 19) made a series of recommendations to follow-up on the rapid and participatory biodiversity assessment (BIORAP), among others, to "insufflate" "*a sense of ownership, responsibility and pride among villagers.*" They recommended to choose a limited number of flagship species in each village and to target them for monitoring and protection.

Katang villagers in Saravan province observed an improvement on forest conservation awareness since forest and land allocation was carried out in 1998 (Clendon, 2001, p. 30). In the Xe Pian NPA, awareness campaigns on wildlife protection failed in the long-term as they heavily relied on printed material (posters), which was in limited quantities and expensive to reproduce (FMCP, 2000, p. 64). In the Dong Khanthung proposed PPA, awareness efforts yielded mitigate results (Round, 1998, p. 126). Other interventions specifically targeted wildlife trade. Posters were erected at market places and means of transport (buses) were controlled; however, such measures proved to have a limited impact. Checking military and other official vehicles, as well as 'fast courier motorbikes," could not be done (FMCP, 2000, p. 94). Philakone (2009, p. 9) noted that awareness campaigns focusing on posters placed in villages is not sufficient. The Mobile Conservation Education Unit (MCU), a unit within the Faculty of Forestry at the National University of Lao PDR, which receives guidance and financial assistance from WCS, conducted education on environmental issues at the primary school level around Nam Kading NPA in 2002 and 2003 (Philakone, 2009, p. 16).

In the frame of the Integrated Ecosystem and Wildlife Management Project (IEWMP), outreach campaigns were carried out in districts of the Nam Kading NPA. IEWMP is a cooperative

project between Bolikhamxay PAFO, DoF and WCS and is part of the Theun Hin Boun Power Company environmental and social mitigation plan and Nam Kading NPA Management Plan. The project carried out an outdoor education program and used Rare Pride techniques[124] of social marketing to increase knowledge and influence behavior change (ibid, p. 9). In Khamkeut district, actions were conducted with villagers in 15 villages, students in 15 primary and three high schools, as well as at the Lak Xao bus station with drivers and staff and at Lak Xao wet market with vendors. Philakone (2009, p. 12-14) gives a detailed account of activities used during the campaign, such as games, songs, role plays and shows.

It also distributed badges, billboards, posters, and prizes such as "green certificates," story books, flagship species dolls, pens, stickers, and lighters. Pre- and post-survey interviews were carried out to assess the impact of the campaign. The awareness campaign resulted in an increase in the perceived importance of the forest and its resources for livelihood and watershed protection. It also increased students' and villagers' knowledge on how to conserve resources (Philakone, 2009, p. 3). The proportion of villagers identifying wildlife trade as a major driver behind unsustainable hunting increased from 8.3% to 79.8%. With students, the proportion increased from 0% to 75% (Philakone, 2009, p. 34).

Two important initiatives were undertaken to attempt monitor, control, and curb the trade of wildlife:

The Vientiane Capital City Illegal Wildlife Trade Control Project was initiated by WCS and Vientiane Capital PAFO in 2005. Besides patrols at wet markets, restaurants, and Wattay airport, project activities comprised awareness campaigns, including at the boat racing festival, and a questionnaire survey carried out in 2005 to learn about urban consumers' behavior (Stenhouse and Johnson, 2006, p. 5-6).

The Wildlife Trade Working Group, initiated by the Lao National Department of Forest Inspection and the Division of Forest Resources Conservation, was established in 2009. The DOFI and the DFRC are responsible for guarding the country's forests and protected areas through conservation and protection of biodiversity, and prevention, detection and suppression of forest and wildlife crime.[125] The working group comprises the following stakeholders: DOFI, DFRC, Green Discovery Laos,[126] ElefantAsia,[127] the Free the Bears Fund,[128] IUCN-Laos, WCS-Laos, World Bank-Laos, and WWF-Laos.

[124] http://rareconservation.org/how-apply-rare-pride-program
[125] http://www.wildlifetradelaos.org/
[126] Laos first eco-tourism agency.
[127] A French NGO.
[128] An Autralian NGO

Robinson and Webber (1998, p. 37) acknowledged that preventing villagers from hunting was unrealistic and, from a conservation perspective, they advised that hunters should focus on species with high reproductive rates, such as rats and squirrels, rather than on the ones with low reproductive rates, such as bats and primates. They also advised against certain hunting methods, such as mist-nets and guns, which allow large-scale harvesting (Robinson and Webber, 1998, p. 41). Showler, Davidson, Vongkhamheng and Salivong (1998, p. 51) proposed to establish fixed markets along the border with Vietnam in Saravan and Sekong provinces to curb trans-border incursions by Vietnamese traders/poachers.

Summary Chapter 3.17: Mitigation Initiatives

Mitigation initiatives proposed by projects usually concern conservation issues and ranged from awareness campaigns to proposing alternatives to wildlife consumption. One of the most notable initiatives is the Vientiane Illegal Wildlife Trade Control Project carried out by Vientiane municipality PAFO and WCS.

4 Discussion and Conclusions

Most stakeholders contacted and approached at the beginning of the review assured that no study with a focus on human and wildlife interface has ever been conducted in Lao PDR. This assumption proved to be correct. Research carried out in the field of wildlife has so far focused on conservation issues relating to large mammals of world importance (e.g., tigers, saola, and elephants). Out of the four animal orders of focus in this review, the least information could be found on viverrids and non-murine rodents (bamboo rats). Studies on primates and bats focused on taxonomy and conservation issues, while studies on rodents focused on their role as pests (studies conducted by ACIAR researchers in the 1990s) and more recently as vectors of diseases, including zoonoses (CERoPath).

However, most field surveys and research carried out on wildlife in Lao PDR so far contain some information pertaining to human-wildlife interface, which combined together form a comprehensive picture. The multidisciplinary approach used in the literature review to obtain information therefore proved to be adequate in the Lao context. The number of days imparted to carry out the review of literature published in English was not sufficient to delve deeper into each field of interest, considering the extremely wide scope of the review and the amount of literature pertaining to wildlife issues in Lao PDR. For instance, the number of imparted days could have been used for an in-depth study of literature pertaining to rodents alone. The picture sketched out from the present report is therefore global and partially outdated and would need to be refined by focusing on specific zoonoses, specific species (e.g., rodents) or a specific period of time (e.g., last decade instead of the last two decades).

Similarly, most stakeholders approached assured that no research or study on zoonoses potentially deriving from human-wildlife interface had ever been conducted in Lao PDR so far. This proved to be true for primates, viverrids and chiropters. For rodents, this assumption, made by stakeholders mostly active in the English-speaking development or research sphere, turned out to be inaccurate. CERoPath, a French-based network, and associated research institutions in France (including Montpellier University, IRD and CIRAD) and in southeast Asia (Institute Pasteur du Cambodge, Kasetsart University and NAFRI) has been involved in research on the rodent-human interface in southeast Asia, with a large number of studies conducted in a wide range of fields pertaining to rodents (e.g., diseases, spatial distribution, etc.).

The report highlighted an outbreak of animal-borne viral zoonosis with pandemic potential, namely highly pathogenic avian influenza (HPAI) recorded in Lao PDR in 2007, with two human fatalities. The source of the virus was never detected in wild birds in Lao PDR, while domestic poultry were affected (Theppangnga, 2011, personal communication). Serological evidence of hantavirus has been found in humans in Lao PDR, but no outbreak of the zoonoses has been recorded in the country to date.

Several respondents (Sengkeopraseuth, 2011, personal communication; Hongvanhthong, 2011, personal communication; Phommasack, 2011, personal communication) assured that with exception of HPAI, no outbreak of EID has been recorded so far in Lao PDR. It can therefore be concluded with a high level of confidence that no outbreak of viral zoonosis with pandemic potential with wildlife in general -- and primates/viverrids/rodents/chiropters in particular -- as its source has ever been recorded in Lao PDR. This, however, does not mean that such outbreaks have never occurred, considering the regular occurrence of disease outbreaks in rural areas, which remain un-investigated and/or un-reported. To date, disease outbreaks in the human population and caused by pathogens of zoonotic origin involve bacteria, parasites, fungi, and "common" viruses transmitted from domestic animals and to some extent wild animals (e.g., monitor lizards).

The decision to target primates, civets, rodents, and bats for the present study was justified, considering that small mammalians, bats, and rats make up the bulk of all mammals in tropical forests (Tobias, 1997) and that these species are targeted for subsistence consumption and local trade in Lao PDR.. Moreover, these species, except for some primates and bats, were found to show high contact with humans and a high resilience to human pressure. The review also highlighted the importance of wild birds, largely consumed in rural areas and traded for food, as pets and for religious merits. Birds are namely occasionally reported to be the largest group of wildlife caught and consumed, (Alton and Sylavong, 1997, p. AIII-9 and p. BII-13). It would be wise in the future to consider the role played by wild bird consumption and trade in emerging zoonoses in Lao PDR.

The survey has highlighted the importance of subsistence hunting encompassing low-value species (rodents, chiropters) and simultaneously the gradual shift towards hunting of high-value species (e.g., some primates spp., reptiles, most large mammals) for cash generation. The profile of hunters has gradually changed from wildlife harvesters to wildlife extractors. Local consumption -- within the household or at local restaurants -- concerns primarily small mammals (e.g., rats, bats, and squirrels). The importance of wildlife in the livelihood of people is so high that any attempt to ban or strictly control hunting, trading, and consuming would not be effective. Therefore, non-regulatory approaches may be a more effective means to pre-empt diseases.

For Joly (2012) "*wildlife trade is a mechanism for diseases that affect humans to move around the world, and has been implicated in the emergence of H5N1 highly pathogenic avian influenza and SARS.*" In Lao PDR, this link has not been established, as outbreak of zoonotic disease with wildlife as a reservoir has not been encountered to date. Commercial trade concerns larger-sized animals and body parts of animals, highly valued in traditional medicine. Civets and porcupines may be an exception, as they are found at local markets as well as in international markets. In the

course of time, consumption and trade has gradually shifted from the local to the international/regional level, from poor to rich and from rural to urban stakeholders.

For all these reasons, it is therefore difficult to strictly separate subsistence from commercial hunting, as hunting for local trade may be considered as subsistence and most species consumed within the household are locally traded as well.

The clandestine nature of wildlife trade renders monitoring more difficult (Duckworth, Salter and Khounboline, 1999, p. 17). This has important repercussions for planning and targeting research (e.g., sampling for pathogen detection) and interventions (e.g., awareness campaigns on food safety issues). Establishing long-term linkages with a few key stakeholders (e.g., hunters, traders, market retailers) based on mutual trust will be a key factor to effectively implement interventions. Again, non-regulatory interventions may prove to be the best approach.

The review assessed an extremely wide range of exposure points between humans and wildlife. Basically all practices provide an actual and potential source of disease transmission. All activities throughout the value chain, encompassing all physical market functions, were found to bear a risk:

- Killing (hunting/trapping);
- Processing and grading (skinning, gutting, deboning, fermenting, freezing, cooling, rotting, drying, smoking, boiling, roasting);
- Handling live animals (hiding, breeding, collecting, cuddling pets); and
- Consuming (eating raw, dead or alive, rotten, fermented, cooked).

Commercial trade and consumption show similar exposure points to subsistence (local) consumption and concern all four main orders of concern (primates, carnivores/viverrids, rodents and chiropters). Trans-boundary trade practices are assumed to bear risks mainly for primates (e.g., farmed monkeys and pets) and to a smaller extent civets, porcupines and large-sized squirrels. So far, rodents and chiropters seem to be spared from large-scale international trade.

Additional exposure points identified by the review are: human-wildlife conflicts (pests), sharing habitat, and encroaching on wildlife habitat through anthropogenic activities (demographic factors, agricultural practices, road construction, extractive industries, hydropower, natural resource exploitation, tourism). Hence, the following activities may bear specific risks:

- Harvesting rodents by hand (e.g., bamboo rats) bears additional risk of bites.
- Handling dead animals and being exposed to their body fluids.
- Cross-contaminating other food items (vegetables, fish) during transport, wholesale and retail.

- Consuming raw meat, uncooked blood, or fast-grilled whole/un-gutted animals.
- Sharing habitat with high numbers of rodents.
- Playing with pets, especially monkeys (exposure to body fluids, risk of bites).
- Farming primates with a high stocking rate, coupled with extraction from the wild for parental stocking and poor health monitoring.

So far, the main risks borne by such practices are physical injuries (attacks by wildlife, bites), transmission of common viral (rabies) or bacterial diseases (e.g., food-borne diseases) due to general lack of hygiene and the wide cultural habit to eat raw meat and blood.

However it can be reasonably assumed that most, if not all people, remain impermeable to such risks in terms of awareness. The lack of awareness on potential health hazards borne by the consumption of wildlife is amplified by the fact that EIDs have so far remained a rather abstract concept in Lao PDR, even at higher levels. TRAFFIC (2008, p. 66) mention that "*understanding of the links between awareness, attitudes and practices are still at a very early stage in southeast Asia*" TRAFFIC (2008, p. 66) further found that conservation awareness efforts had so far been concentrated on the demand side of the value chain (consumers), rather than on the supply side. This is not the case in Lao PDR, where harvesters have been more targeted by awareness and education campaigns (on conservation issues), than traders and consumers. It is therefore advised to specifically target market facilitators such as traders and retailers, as well as consumers (especially in urban areas) on sanitary risks borne by handling and eating wildlife.

The review did not allow us to assess if the frequency of wildlife and human exposure has increased or decreased. The survey has briefly shown that while the dwindling number of large-mammal species and individuals left for hunting may reduce interface with some species (e.g., primates), it simultaneously increases exposure to other species, which become more targeted. The rarefaction of species urges hunters to penetrate deeper into previously intact forest tracts, a practice which increases exposure to other ecosystems. It is likely that in the future, as most species will be locally or even regionally extinct, only small mammals will be of some importance, more specifically rodents which do not show signs of receding. There is therefore a danger that interface gets increasingly restricted to small mammals with high reproduction rates (e.g., rats) due to empty forest syndrome.

5 Recommendations

In Lao PDR, it is recommended that stakeholders:

- Plan a consumer survey to update and complement data collected in 2009 by a student from the NUOL (Sinthammavong, 2009) within the Vientiane Wildlife Illegal Trade Control Project. *Information shall help to better target awareness campaigns with urban consumers, mainly at restaurants.*
- Use existing, known diseases (e.g., food-borne diseases, anthrax, rabies) as entry points for any future intervention. *Using existing diseases will provide a firmer, less abstract ground for understanding and shall improve effectiveness.*
- Apply the W.A.S.H. concept defined by the Iowa State University Center for Food Security and Public Health Zoonotic Disease Prevention: Wash, Avoid, Safety, Health. This acronym is, however, already widely used by the development community in Lao PDR in connection with water and sanitation projects.
- Focus awareness campaigns on subsistence hunting communities in NPAs with high pressure (e.g., Nam-Et Phou Loey).
- Focus awareness campaigns on commercial hunting communities in NPAs with high pressure (NN-WMPA, Dong Amphan, Xe Pian).
- Target women and children for small mammal hunting, especially rodents.
- Target women for sale of wild animals (bats, rodents).
- Target men for larger catch (primate, civets) and for bat hunting.
- Conduct targeted awareness campaigns on bats in areas with large cave-dwelling colonies in karst limestone (e.g., Khammouane province) by emphasising their ecological usefulness (for mosquito control) and economical importance (for pollination, for guano production) and the necessity to protect them, rather than focusing on the potential dangers they represent in terms of virus propagation.
- Advocate at government level for the necessity to investigate risks posed by private primate farms in term of zoonotic diseases.
- Include wild birds in any future study and or intervention as they are widely consumed, kept as pets or for religious purposes.

In the three other countries of the regions (Vietnam, Cambodia and Indonesia), stakeholders should:

- Use a similar methodological framework to access information **BUT**
- Foresee sufficient working days to allow to apply the multidisciplinary approach **OR**
- Focus on research in zoonotic disease carried out in these countries first
- Integrate birds as target species

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20. WWF, 2007 **cited in FMCP, 2000**

ANNEXES

Annex 1 -- List of People Met by the Foreign Consultant

Institution	Contact person	E-mail
Nam Theun Power Company	M. Ruedi Luthi	ruedi.luthi@namtheun2.com
Nutritionist	Dr.Jutta Krahn	jukrahn@googlemail.com
Pasteur Institute	Dr. Paul Brey	ptb1957@yahoo.com
VSF-Canada	Ms. Sonia Fevre	sonia.fevre@vwb-vsf.ca
WCS-PREDICT	Dr. Lucy Ogg Keatts	lkeatts@wcs.org
Senestech Rodent Control	M. Karl Seitz	karl.seitz@senestech.com
WCS	M. Troy Hansel	thansel@wcs.org
NAHC	Dr. Watthana Theppangnga	wtheppangna@hotmail.com
Forest Conservation Department, MoNRE	Dr. Bouaphanh Panthavong	phanthavong2020@hotmail.com
National Centre for Laboratory & Epidemiology	Dr. Bounthanom Sengkeopraseuth	sengkeopraseuth@yahoo.com
NEIDCO	Dr. Bounlay Phommasack	-
Epidemiologist, consultant	Ms. Marie Ryan	epiconsult@gmail.com
Wellcome Trust & Mahosot hospital	Dr. Paul Newton	paul@tropmedres.ac
Department for Hygiene & Prevention, MoH	Dr. Sibounhom Arckkhawongs	-
Theun Hinboun Power Company	M. Jens Johan Laugen	jens@thpclaos.com
Food and Drug Department, MoH Food Control Division, MoH Traditional Medicine Centre, MoH	Dr. Lamphone Sihakhang Ms. Viengxay Vansilalom Dr. Bouluon Douangdone	- -
CITES, Biotechnology and Ecology Institute , MoNRE	Dr. Sourioudong Sundara	sourioudong@yahoo.co.uk
IUCN	M. Vene Vongphet	vene.vongphet@iucn.org
World Bank	Ms. Renae Stenhouse	rstenhouse@worldbank.org
WCS-Wildlife Trade Control Project	M. Keopithoune Bounnak	kbounnak@wcs.org
WCS-PREDICT	Dr. Zoe Greatorex	zgreatorex@wcs.org
WWF	M. Thibault Ledecq	thibault.ledecq@wwfgreatermekong.or
Comite de Coopération avec le Laos	no specific contact	
Nabong University	no specific contact	

Annex 2 -- List of People Contacted by Internet that Provided Information but Were Not Met

Institution	Contact Person	E-mail
ILRI	Dr. Jeff Gilbert	J.Gilbert@CGIAR.ORG
IRD	Jean-Christophe Castella	j.castella@ird.fr
IRD-CNRS	Audrey Bochaton	audreybochaton@hotmail.com
CIRAD Regional Director	Jean-Charles Maillard	
CERoPath	Vincent Herbreteau	vincent.herbreteau@ird.fr
WHO	Dr. Francette Dusan	DusanF@wpro.who.int
ACIAR	Dr. Kate Blaszak	blaszakkate@yahoo.com.au
TABI-Bern University	Vicky Houssiere	
IFMT	Dr. Hubert Barennes	barenneshub@yahoo.fr
Swiss Tropical Institute	Dr. Peter Odermatt	
Lux-Development	Dr. Frank Haegemann	frankhaegeman@hotmail.com
Poverty Reduction Fund	Julien Rossart	pmt@prflaos.org
AVSF	Cedric Martin	c.martin@avsf.org
Consultant	Dirk Van Gansberghe	dirkvangansberghe@yahoo.com
Consultant	John Connell	connell.tsv@gmail.com
Consultant	Joost Foppes	jfoppes@gmail.com

Annex 3 -- List of Key Informants for the Lao Review Part

Name	Organization	Contact no.
Mr. Chanhthavong	DDG of Nation Frond Lao Construction Committee (Neo Lao Xang Xath)	02055 819 871
Ms. Bouaphanh	National Centre of Laboratory Epidemiology	02055 036 006
Dr. Silavanh' secretary	Department of Forestry	021 215 000
Mr. Bouasy Hongvanhthong's secretary	Malariology, Parasitology and Entomology Research Center	021 214 040
Dr.Bounkhouang Dr. Bounlom	DG of Department of Livestock and Fisheries. Head of National Animal Health Center	
Mr. Sa Ngath	Wildlife Conservation Division, Forest Conservation Department, Ministry of Nature Resource & Environment (MoNRE)	02055 800 340
Mr. Duangchith Latanakone	Chief of Cabinet of *Pasason* Newspaper	02055 599 338
Mr. Bouasy Hongvanhthong	Acting Director to Research Center of Malariology, Parasitology and Entomology	
Dr. Phouvong	National Animal Health Center , LFD	
Ms. Phonedavanh Phinsavanh Ms. Somchanh	Chief Cabinet of Lao Women's Union Training Center (focus on food preparation)	02055 578 889
Ms. Chansuck	Planning Division of Forest Department	
Mr. Sounthala' secretary	Customers Department	02055 909 502
Col. Douangpasong Amphone	Head Group of editor security radio	02055 603 699
Col. Songdeth Piyananh	In Chief Editor of *Kong Thap Pasason* Lao Newspaper	02099 800 248
Dr. Bounlay' secretary	NEIDCO	02055 509 456
Mr. Soulivong Luangaphay	Deputy Chief Cabinet of Lao National Tourism Administration (LNTA)	02058 555 111
Mr. Bounpheng Souliyong	DDG of Planning Department- LNTA	02022 166 666
Mr. Koun Sithammakhot Ms. Palima Sisaykeo	DG of Import-Export Department Trade Facilitation Division	02022 499 909 02022 499 909
Mr. Bouaphanh Phanthavong	DG of Forest Conservation Department, MoNRE	02055 699 461
Dr. Vatthana Theppangnga	Deputy Head of Animal Disease Diagnostic Laboratory Unit, national Animal Health Center , LFD	02056 494 592
Mr. Sounthala Takountong Mr. Deuane	Chief cabinet of customers Department Cabinet office staff	02055 513 580 02022 228 258
Mr. Viyoly	Deputy to Chief Cabinet of Information and Culture Ministry	
Mr. Bounhong Southavong	DG of Traditional medicine Center, Public Health Ministry	
Dr Sengchoy' secretary	Health Education & Information Center	021 214 039
Dr. Sibounhom' secretary	Department of Hygiene and prevention	021 241 924
Dr Bounlay Phommasack	DG of NEIDCO	02022 222 176
Dr. Bounthanom	Deputy Chief of Epidemiology Unit, NCLE	021 315 857

Mr. Chantha Tiphavong	DG of Agriculture and Forestry Department, VTEM	02055 669 581
Mr. Sengphet	Head of Forest Division, DAFO, VTEM	02055 669 581
Mr. Phoumy Photisane, Ms. Siphay Vongsouangtham	Deputy to DG of Health Education & Information Center	02055 649 906 021 214 039 021.223723 02022 218 484
Mr. Sibounhome Arckawongs	Department of Hygiene and Prevention	02099 804 824
Ms. Lamphone Sihakhang	Deputy to DG Department of Food and Drug Dpt.	02022 232 511
Receptionist	Ministry of Science and Technology	021 262 002
Dr. Sourioudong Sundara	DG of Biotechnology and Ecology Institute	02055 629 190
Dr. Keopithoune Bounnak	WCS-Wildlife trade control project	
Library	NAFRI	
Library	Department of Forestry	
Library	Faculty of Agriculture, Nabong, NUOL	
Library	Academy of Social Sciences, Ban Simuang	
Library	Faculty of Forestry, Dong Dok, NUOL	
Library	Social and Culture Institute, Ban Nahaidio	

Annex 4 -- List of Key Words

Step 1: general search	**Wildlife/Wild animals Mammals (small/large) Non Timber Forest Products (NTFP)**			
Step 2: search by species	**Chiropter* Bat Flying fox***	**Primate Monkey**	**Rat Rodent Squirrel Porcupine**	**Civet Badger**
Consumption/eating habits Food source Livelihood Traditional medicine/Chinese medicine Habitat Ecology/biology				
Hunting/trapping/snaring/shooting Handling Use Management				
Conservation Production Farming Trade Commercial* Value chain				
Guano Feces Manure Collection/harvesting/trade				
Zoono*(zoonosis/zoonoses/zoonotic) Animal borne disease Human animal interaction Disease transmission Disease vector				

Annex 5 -- Disease Transmission Modes

Type of Exposure	Specific Transmission Pathway	Type of Activities	Examples of Zoonotic Diseases
Direct transmission			
Direct animal contact	Skin to skin, scratches, bites	Handling infected live animals (hunters, traders, pet keepers)	Ringworm, rabies
	Body fluids, organs, tissues	Handling infected body parts during carcass processing	Anthrax, Ebola
	Fecal-oral	Through inappropriate hygiene	Salmonellosis
	Droplets	Sneezing or splattering of droplets	Nipah
Indirect transmission			
Airborne	Dust particles	Inhalation after soil disturbance, manipulation of hides, collection of bird and bat guano…	Hanta, Anthrax, Histoplasmosis
	Airborne droplets	Airborne transmission after sneezing, exhalation	H5N1
Oral	Ingestion of contaminated food or water	Consumption of inadequately cooked or raw infected meat/food, consumption of infected water	Trichinosis, anthrax, brucellosis, E.coli
	Ingestion of arthropods, helminthes, copepods via contaminated soil	Ingestion of soil particles	Echincoccus granulosus, Toxocara canis
Vector-borne	Arthropod bites	Exposure to ticks, fleas, mosquitoes…	West Nile fever, Japanese encephalitis, Lyme, Plague…
Contact with the environment	Indirect contact with soil, vegetation, water	Skin contact with infected environment	Ringworm, leptospirosis
Fomite contact	Indirect contact through inanimate objects	Exposure to contaminated objects (knives, boards…)	Toxoplasmosis, Salmonella

Source: EcoHealth Alliance (hard copy obtained from FHI 360)

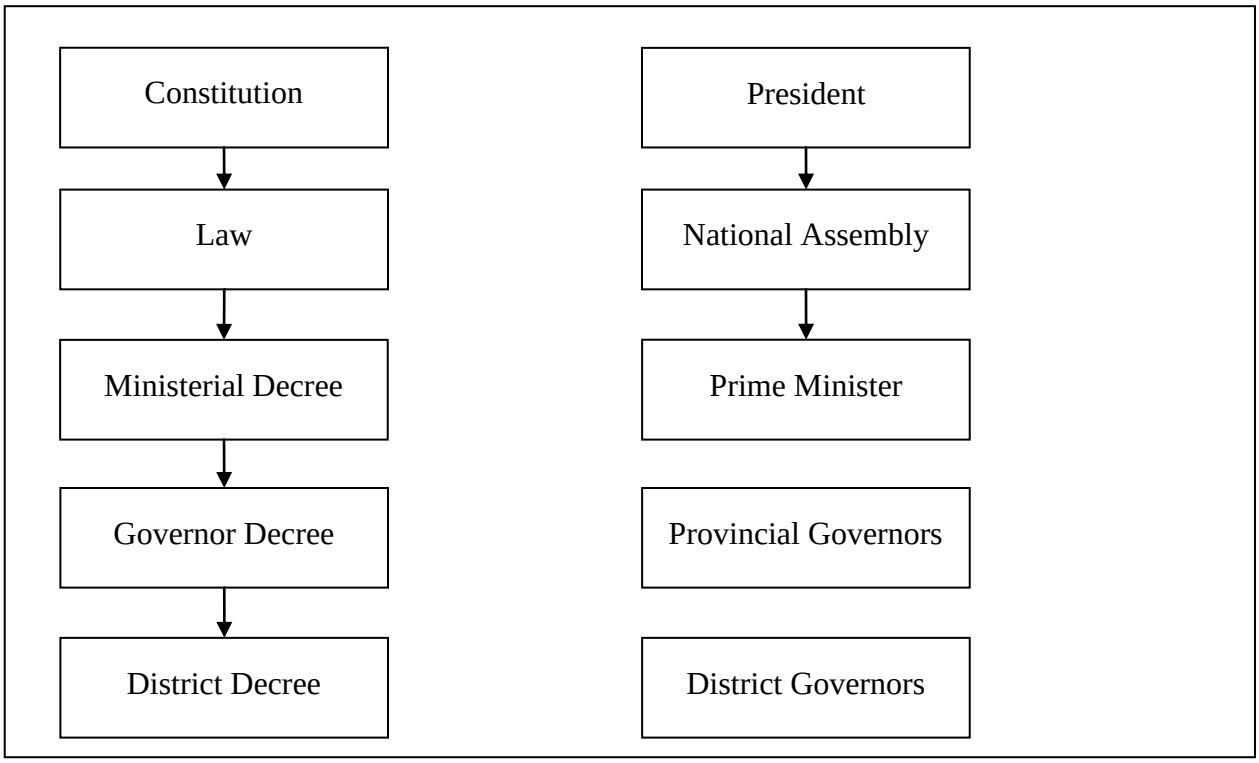
Annex 6 -- Government Agencies Involved in Environmental and Wildlife Issues

Agency	Responsibilities
Science Technology and Environment Agency (under Office of the Prime Minister**) until 2011**	• Overall Coordination • Oversight of environment affairs • Environmental management (setting policy and regulatory framework) • Monitoring state of the environment and compliance with policies and regulations • Fisheries, livestock, crop production
Ministry of Natural Resources and Environment (MoNRE) **since 2011** ➢ Forest Conservation Department, wildlife Conservation Division ➢ Institute of	• **Protection forest** resource use and management • Biodiversity conservation and management • Soil resource management • Water resource management
Ministry of Agriculture and Forestry ➢ Department of Forestry ➢ Department of livestock and Fisheries, National Animal Health Centre	• **Production forest** resource use and management • Fisheries, livestock, crop production • Domestic animal health
Ministry of Industry and Commerce (7 departments, 2 offices, 1 institute) ➢ Import-export Department ➢ Domestic trade department	• Trade supervision • Tax collection
Ministry of Finance	• Collection of fines
Ministry of Health ➢ Department of Hygiene and Prevention (5 divisions, among others Disease prevention division, Health promotion division, Environmental health division) ➢ Department of Health Care ➢ Department of Food and Drugs ➢ National Centre for Laboratory and Epidemiology	• Public health and sanitation • Medicinal plants and traditional medicine
State Planning Committee	• National Development Planning • Development projects and approval

Ministry of Energy and Mines	• Hydropower development • Mining
Lao National Tourism Administration (LNTA) under Office of the Prime Minister	• Tourism development, among others eco-tourism
Mass organizations (women union, Lao construction committee,	• Development, awareness, education, project implementation at grass-root level

Source: Adapted from ICEM, 2003, p.52 and various meetings with stakeholders

Annex 7 -- Legal System in the Lao PDR



Source: Stenhouse, 2006, p. 54.

Annex 8 -- Brief History of Legislation on Wildlife in Laos

A Decree (185/CCM) issued by the Council of Ministers in 1986 prohibited trade of a range of wildlife species. The Council of Ministers Decree No.47/CCM issued in 1989 on the State Tax System indicated that wildlife trade is subject to a tax (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 37), while subsistence hunting was tax exempted (Srikosamatara, Siripholdej and Suteethorn, 1992, p. 3). Some wildlife species subject to trade taxes under Decree No.47/CCM were in fact prohibited under Decree (185/CCM) (Nooren and Claridge, 2001, p. 21).

MAF Regulation No.0360 (2003) governs the use of other NTFPs as well (Hansen and Jeppesen, 2004, p. 47).

In June 2001, the "Regulation on the Management of the National Biodiversity Conservation Area (NBCA), Aquatic and Wild Animals No.0524/AF.2001 was issued by MAF. Article 17.6 of the regulation stipulated that "*it is illegal to buy and sell fully protected aquatic animals and all wildlife species*" (Hansel, Vannalath and Johnson, 2004, p. 6) or more specifically "*trading of fully protected species of aquatic animals and all wildlife with characteristics of being sold for profit to factories, export to foreign countries restaurants, hotels, clubs and all markets is prohibited*" (Stenhouse, 2006, A6 p. 2). In other words according to the Law, species could be hunted for subsistence, but not for trade.

The Regulation No.0360 originally issued in 1996 by MAF was revised in 2003. This regulation[1] contained a list of protected species which cannot be hunted and used. It relaxed previous articles on trade and stated that only protected species are banned from trade (Singh et al., 2006, p. 32). According to article 20 of the Law, "*no commercial transaction of wild and aquatic life species described in list I or list II will be permitted*" (Stenhouse, 2006, A2, p. 2). According to Stenhouse (2006, A6, p. 3) it is a weakening of the law. By 2006, 57 species were included in the restricted category list and 37 species in the management category list. Rural people were allowed to hunt management species as well as non listed species (Stenhouse, 2006, p. 16).

Annex 9 -- Law on Aquatic and Wildlife Resources

Article No.	General Content	Specific Content
Article 10	States that there are three categories of wildlife and aquatic resources	
Articles 11	Defines category I as the **prohibition** category	Animals shall be managed, inspected, preserved. The **utilization of these animals shall be permitted by the government**
Article 12	Defines category II as the **management** category	Animals shall be managed, inspected, preserved, protected and **use will be controlled**
Article 13	Defines category III as the **common or general** category	**Can be used in accordance with the law** and shall guarantee the use not to threaten species numbers
Article 21	Defines capture of animals	Animals can be held in captivity in accordance with the law
Article 22	Defines that:	• animals from category I and II held in captivity for **business purposes** have to be registered with DAFOs, which report to PAFOs • animals from category I and II held in captivity **not for business purposes** should (but do not have to) be registered with the Village Forestry Unit, which report to PAFO

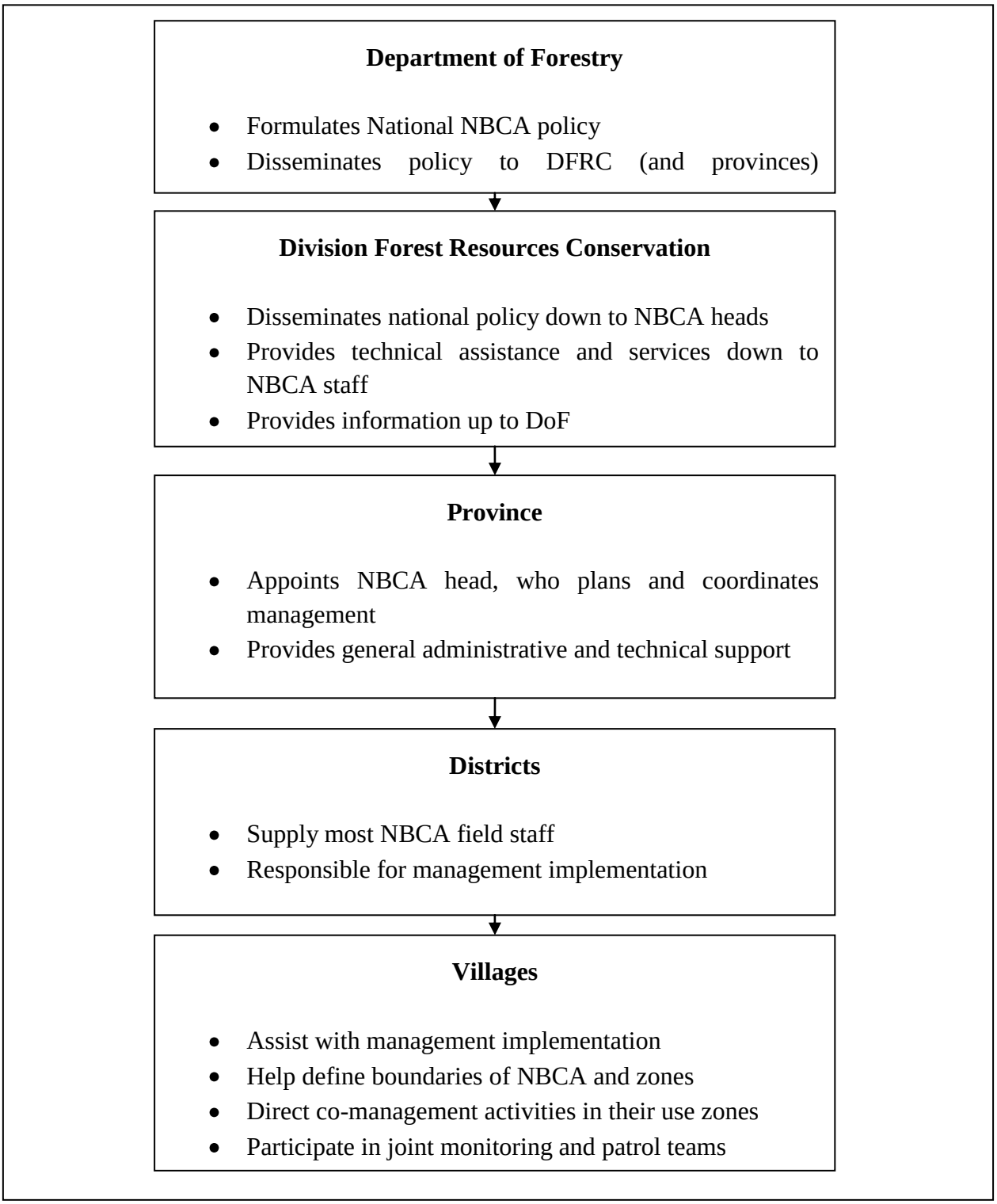
Annex 10 -- Legislation Pertaining to Wildlife

Piece of Legislation	Main Content	Source
Decree of the Council of Ministers No. 185/CCM, in relation to prohibition of Wildlife Trade, **21 October 1986**	• Prohibits trade of a range of wildlife species • Prohibits export of all wildlife	FMCP, 2000, p. 58-59 Duckworth, Salter and Khounboline, 1999, p. 26 ICEM, 2003, p. 55
Decree of the Council of Ministers No.47/CCM, on the State Tax System, **26 June 1989**	• Lists types of natural resources including various species of wildlife and aquatic animals and parts of and their associated resource tax rates and special fees, 67 species or species groups of wild animals are listed • Subsistence level users of natural resources are exempted from resource tax	Duckworth, Salter and Khounboline, 1999, p. 26 ICEM, 2003, p. 55
Decree of the Council of Ministers No.118/CCM on the Management and Protection of Aquatic Animals, Wildlife and Hunting and Fishing **5 October 1989**	This decree forms the basis for all legislation pertaining to wildlife in the Lao PDR. It establishes that: • Wildlife is State property • Wildlife management falls under the Ministry of Agriculture and Forestry (MAF) • Local people use wildlife according to regulations • Prohibits hunting and breeding of protected or endangered species (unspecified) except when human life is in danger • Prohibits hunting by means of mass destruction 9explosicves, poison,) • Allows import/export of wildlife with specific authorisation	TRAFFIC, 1993, p. 3 Duckworth, Salter and Khounboline, 1999, p. 26 ICEM, 2003, p. 55
Instructions by MAF **1991**	MAF issued a list of instructions aimed at clarifying ambiguities contained in decree No.118/CCM.	FMCP, 2000, p. 58-59
Decree of the Prime Minister No.164, **29 October 1993**	• Establishes NBCAs and states that to chase, hunt or fish any species within them is illegal • Explosives, chemical, poisons and other substance harmful to wildlife are banned in NBCAs • MAF may warn of fine anyone who	Duckworth, Salter and Khounboline, 1999, p. 26 ICEM, 2003, p. 55

	disobeys the decree and may confiscate illegal items	
Order 54/MAF on the Customary Rights and the Use of Forest Resources **7 March 1996**	• Secures legal rights for local people to use forest resources for subsistence, including hunting and fishing of non-protected species • Customary rights may be recognised by signed agreements or by law and local people shall be compensated for loss of customary means of livelihood	Duckworth, Salter and Khounboline, 1999, p. 26 ICEM, 2003, p. 55
Recommendation No. 0377/MAF to provincial, municipal, special zone agriculture and forestry services and DAFOs on customary use of Forest Resources **1996**	n.a.	FMCP, 2000, p. 58-59 ICEM, 2003, p. 55
Regulation No. 0360/MAF **1996**	n.a.	Singh et al., 2006, p. 32
Decree No. 1074/MAF **11 September 1996**	• Prohibits wildlife trade • Prohibits hunting of some species such as Asian elephant, banteng, saola, Douc langurs.... • Prohibits hunting during a closed (breeding) season, and/or by dangerous methods, and/or by the use of weapons in NBCAs, protected areas and towns • Bans wildlife trade, except for research and/or conservation • Bans exporting wildlife used for food • Responsibility for PAFO to coordinate with other agencies to collect and register weapons used for hunting	FMCP, 2000, p.58-59 Duckworth, Salter and Khounboline, 1999, p.26 ICEM, 2003, p.55
Declaration of the President No.125/PO on the Forestry Law approved by the National Assembly No.04/NA **11 October 1996**	• Classifies forest into 5 types for use • Grants State ownership of and authority to manage wildlife • Prohibits possession of wildlife without permission • Mandates state to define two categories of protected wildlife • Prohibits hunting during a closed season (unspecified) and/or by means of mass destruction	WWF, 2008 Duckworth, Salter and Khounboline, 1999, p. 26 ICEM, 2003, p. 55

	• Prohibits hunting of and trade in prohibited species, with certain exceptions • States that all guns and hunting equipment must be registered with certificates • Established by Law Wildlife day as of 13 July annually	
Mining Law No.04/97/NA **1997**	• Defines the system of management, preservation exploration, exploitation and processing of minerals for local consumption and export with the use of natural resource potential in the industrial process and upgrading the population's quality of life	ICEM, 2003, p. 55
Decree of the Prime Minister No. 68 on the establishment and activities of the Science, Technology and Environment Agency **21 May 1999**	• Establishment of STEA • Established fundamental principles and makes provision for regulations and other measures for the protection, conservation mitigation and restoration of the environment including environmental impact assessment • STEA's article 3.9 endorses STEA's role in cooperating on negotiating and signing international instruments	ICEM, 2003, p. 55
MAF Regulation No.0524/2001 on the Management of National Biodiversity Conservation Areas, Aquatic Animals and Wildlife **2001**	• Identifies which species can be hunted and where, the seasons and methods of harvest and who has access to NPAs • States that it is illegal to sell wildlife (Article 17)	WWF, 2008 Johnson, Singh, Dongdala and Vongsa, 2003, p. 6
MAF Regulation No.0360 **2003**	Revised	Singh et al., 2006, p. 32
National Growth and Poverty Eradication Strategy (NGPES) **2004**	The GoL commits "to conserve the natural environment and protect threatened species."	(NGPES, 2004, p. 53 in WWF, 2004, p. 86).
National Biodiversity Strategy and Action Plan **2004**	n.a.	WWF, 2004, p. 87).

Annex 11 -- Management Structure of NPAs



Source: Robichaud et al, 2011 in ICEM, 2003, p. 22

Annex 12 -- Types and Numbers of Firearms Seized in Nakai, Gnomalath and Khamkeut Districts

	1996-1997	**1998**
Muzzle/"gap"	3,660	4,822
Shotgun	63	26
Ak-47	35	113
K44	20	132
CKC	29	58
Carabine	16	59
5.9 handgun	1	13
Airgun	28	27

Source: IUCN (1999, p. 80).

Annex 13 -- List of Hunting Methods and Devices Recorded by Chazée

		North	South
Traditional gun	Birds and mammals	xxx	x
War gun	Large mammals	xxx	xx
Cross-bow	Rats, birds, hares, barking deers	x	x
Bow	Hares, barking deers, muntjac		x
Catapult	Small birds	xx	
Sling-shot	Small birds	x	
Spear	Rats, hares, bears, pheasants, partridges	x	x
Dog hunting with gun	Hares, sambar, barking deer, muntjac	x	
Dog hunting with spear	pheasants, partridges	x	
Net	Birds (Xieng Khouang), deers (Attapeu)	x	x
Doves, pigeons, cocks glue, nets, snares		xx	
Snare	Rats in rice fields	xx	
Hunting with lamp	Hare, loris, pangolin, birds	xx	Xx
Trap	Mustelidae	x	
Trap	Bear, sambar	x	
Trap with gun	Large game	x	
Trap with spear	Large game		x
Hunting with fire	Large game		x
Hunting with fosse	Large game		x

Source: Chazée (1990).

Annex 14 -- List of Species Found on Lak Xao Wet Market in 1994 and 1995

	Individuals		Days	
	1994	**1995**	**1994**	**1995**
Free-tailed bats	30	0	1	0
Hyposideros lylei	0	10	0	1
Northern treeshrew	2	1	1	1
Civets spp.	6	0	4	0
Common palm civet	1	0	1	0
Cooked squirrels	0	3	0	2
Callosciurus erythreaus	12	10	8	4
Callosciurus inornatus	24	2	11	2
Tamiops rodolphei	8	1	2	1
Tamiops maritimus	1	0	1	0
Tamiops spp.	2	0	2	0
Dremomys rufigenis	9	1	5	1
Ratufa bicolor	0	1	0	1
Hylopetes phayrei	5	0	3	0
Petaurista philippensis	0	1	0	1
Cooked rats	**115**	**73**	**15**	**4**
Leopoldamys/maxomys	165	0	17	0
Maxomys	0	45	0	5
Grey Maxomys	0	4	0	1
Leopoldamys	0	1	0	1
Large Berylmys spp.	7	0	5	0
Small Berylmys spp.	2	0	2	0
Bandicota spp.	3	1	2	1
Rattus/Niviventer spp.	2	0	2	0
Cane rat spp.	12	1	7	1
Porcupine spp.	0	1	0	1

Source: Timmins and Evans (1996, Annex 6).

Annex 15 -- Number of Mammals Sold at That Luang Market

	Dry Season (30 days)		Wet Season (16 days)	
	Days observed	**Individuals**	**Days Observed**	**Individuals**
Large Indian civet	-	-	1	1
Civet	17	34	-	-
Civet	13	22	1	1
Black Giant squirrel	22	83	-	1
Variable squirrel	25	107	9	19
Red-bellied tree squirrel	25	106	-	-
Indochinese ground squirrel	4	8	1	2
Red cheeked squirrel	21	56	1	2
Red giant flying squirrel	16	61	-	-
Flying squirrel	12	40	-	-
Particolored flying squirrel	1	1	-	-
Giant bamboo rat	-	-	3	4
Hoary bamboo rat	3	8	-	-
Great bandicoot	-	-	8	146
Brush-tailed porcupine	5	7	-	-

Source: Srikosamatara, Siripholdej and Suteethorn (1992, p. 11-12).

Annex 16 -- Selected Wildlife Species Sold at Different District Markets in Champassak, Saravan and Attapeu Provinces Between 29 November and 3 December 2011

Species	Number	Preparation	Price (in LAK)
Slow lorises	23	Live (pets), dead (food)	15,000-130,000/head
Civet spp.	54	Dead, meat, live	25,000-300,000/head[129]
Brush-tailed porcupines	1	Dead	130,000/kg
Bamboo rats spp.	13	Dead or live	20,000-120,000/head
Rats spp.	16	Dead for food	10,000-25,000/head
Flying squirrels	110	Dead and live (all for food)	10,000-15,000/head
Squirrel spp.	3	Dead	Not specified
Inornate squirrels	5	Dead and live (all for food)	12,000-25,000/head
Pallas squirrel	51	Dead and live (all for food)	15,000-30,000/head
Black-giant squirrels	3	Dead	100,000-130,000/head
Red-cheeked squirrels	2	Dead	15,000/head
Bats (insectivorous)	-	-	-
Treeshrews	13	Live (food)	120 THB/head
Various birds	100	Dead (food), live (pets)	3,000-300,000/head

Source: primary data from WCS-PREDICT.

[129] Also expressed in Baht.

Annex 17 -- Selected Wildlife Species Sold at Different District Markets in Vientiane, Xieng Khouang and Houa Phanh Provinces Between 13 and 26 December 2011

Species	Number	Preparation	Price (in LAK)
Civet spp.	16	Dead (1 live)	70,000-350,000/head
Brush-tailed porcupines	25	Dead	50,000-500,000/head
Bamboo rats	126	Live or dead, some fresh	50,000-300,000/head
Rats spp.	19	Dead fresh	For home consumption
Niviventer rat	43	Dead fresh	Home consumption
Edward's giant rat	5	Dead fresh	n.a.
Long-tailed giant rats	28	Dead or dead fresh	6,000-10,000
Flying squirrels	3	Dead	13,000-30,000/head
Indian giant flying squirrel	11	Dead	180,000-300,000/head
Inornate squirrels	61	Dead	15,000-25,000/head
Black-giant squirrels	2	Dead	150,000-200,000/head
Red-cheeked squirrels	42	Dead	15,000-25,000/head
Bats (insectivorous)	22	Dead fresh	For home consumption
Various birds	>985	Dead (few live as pets)	3,000-120,000/head

Source: primary data from WCS-PREDICT.

Annex 18 -- Selected Wildlife Species Sold at Two Different District Markets in Vientiane Province Between 7 and 9 January 2012

Species	Number	Preparation	Price
Civet	3	Dried or dead	50,000/kg
Brush-tailed porcupines	2	Dead	40,000-120,000/kg
Bamboo rats	12	Live or dead	25,000-150,000/head
Rats spp.	64	Dead or dried	2,000-18,000/head
Niviventer rat	4	Dead	20,000/head
Long-tailed giant rat	8	Dead	15,000/head
Red-cheeked squirrels	10	Dead	20,000-29,000/head
ibid	3	**Live for pets**	
Inornate squirrels	33	Dead	20,000-29,000
Other squirrels	31	Dried or dead	20,000-25,000/head
Tree shrews	40	Dead	5,000-12,000/head
Bats (insectivorous)	83	Dead	5000-12,500/head
Various birds	202	Dead or alive for food, live as pets	

Source: primary data from WCS-PREDICT.

Annex 19 -- Prices for Wildlife Served at Restaurants Recorded by Several Students of the NUOL Between 2004 and 2009 in Several Restaurants in Luang Namtha and Vientiane Capital

Species	2004	2004	2004	2005	2008	2009	2009
Squirrels	30,000	n.a.	n.a.	25,000	n.a.	n.a.	35,000 (piece)
Flying squirrels	n.a.	n.a.	n.a.	n.a.	n.a.	280,000	28,000
Civets	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	30,000
Bats	n.a.	n.a.	n.a.	n.a.	n.a.	30,000	30,000
Porcupine	30,000	30,000	n.a.	n.a.	180,000	90,000	90,000
Rats	n.a.	n.a.	n.a.	n.a.	n.a.	30,000	n.a.
Bamboo rats	n.a.	n.a.	n.a.	n.a.	n.a.	30,000	n.a.
Cheapest dish	n.a	30,000	n.a.	25,000	50,000	30,000	n.a.
Most expensive	n.a	300,000	n.a.	395,000	180,000	400,000	n.a.
Location	Luang Namtha	Luang Namtha	VTEM	VTEM	VTEM	VTEM	VTEM
Source	Singlormant, 2004	Syhalath, 2004	Inthilath and Hanmaha, 2004	Xamounty, 2005	Khammavong, 2008	Khonsavanh, 2009	Onsyma, 2009
	6/30	5/10	17/19	15/19	18/32	13/29	13/29

Annex 20 -- Price of Mammals Sold at That Luang Market in 1991

	Unit weight (kg)	Unit individual price (US)	Total weight (kg)	Total price (USD)
Large Indian civet	8	17.14	8	17.14
Variable squirrel	0.25-0.4	0.57-0.86	7	13.71
Indochinese ground squirrel	0.2	0.43	0.4	0.86
Red cheeked squirrel	0.25	0.71	0.5	1.43
Giant bamboo rat	1.2-5	11.43-12.14	12.7	75.71
Great bandicoot	0.2-0.3	0.21-0.43	31.1	45.21

Source: Srikosamatara, Siripholdej and Suteethorn (1992, p. 11-12).

Annex 21 -- Average Annual Cash Income (in LAK) per Household from Sales of Different Products on the Nakai Plateau

Ethnic	HH	Agriculture	Wildlife	NTFP	Fish	Average
Bo	274	84,825	11,958	59,328	17,153	173,264
Brou (Katuic)	289	108,609	18,637	56,431	28,460	212,137
Ahoe (Vietic)	51	16,275	48,029	229,804	18,627	293,127
New villages	106	51,849	17,618	258,019	32,476	359,962
Total	**720**	**84,661**	**18,027**	**98,104**	**24,052**	**224,844**

Source : Chamberlain *et al*. (1996a, p. 39).

Annex 22 -- Major Issues and Shortcomings Mentioned by Villagers throughout Lao PDR in a Participatory Poverty Assessment

	North **Phongsaly, Oudomxay, Luang Namtha, Bokeo, Luang Prabang, Xayabury**	**East** **Houa Phanh, Xieng Khouang, Bolikhamxay, Khammouane**	**Centre** **Vientiane province, Vientiane Municipality, Xaisomboun Special zone**	**South** **Savannakhet, Saravan, Sekong, Champassak, Attapeu**
Priority 1	▪ Livestock diseases ▪ Land allocation	▪ Land allocation, swidden circle too short, production land insufficient ▪ Soil fertility, environmental degradation	▪ **Pests, insects, rats, wild pigs, bears** ▪ Production land too small ▪ Lack of cash savings for investment ▪ Too many children, population increasing	▪ Natural disasters, floods and drought
Priority 2	▪ Soil fertility, environmental degradation ▪ **Pest (insects, rats, birds, wild pigs, bears)**	▪ Livestock diseases ▪ Paddy land not sufficient, not available	▪ Lack of irrigation, water supply ▪ Low education level ▪ No access to health facility ▪ Poor health	▪ Lack of roads, cannot produce for markets
Priority 3	▪ Opium addiction	▪ Lack of technical knowledge, skills	▪ Lack of roads ▪ Not smart, lack intellect	▪ Livestock diseases
Priority 4	▪ Natural disasters ▪ Lack of irrigation/water supply ▪ Lack of technical knowledge/skills ▪ Lack of cash savings for investment ▪ Frequent illness affects labor output ▪ Lack of commercial knowledge, cannot compete ▪ Lack of cash crops and markets	▪ Lack of all-weather road to village ▪ No cash savings for investment in livelihood	▪ Do not like paddy cultivation ▪ Lack technical knowledge, skills ▪ No knowledge of commerce ▪ Lack trained teachers ▪ Lack clean water	▪ Lack of technical knowledge, skills
Priority 5	▪ Usable paddy land not available ▪ Low education level ▪ Lack of local leadership	▪ Natural disasters, weather, floods, drought, logging ▪ Land allocated to replace swiddens not feasible for		▪ Land allocation, swidden circle too short,

	▪ Our parents were poor, therefore we are ▪ Theft of cows and buffaloes, not allowed to shoot thieves ▪ Crops promoted by government but no markets ▪ Forbidden to grow opium ▪ Lack of clean water ▪ Lack of roads	cultivation ▪ Do not like paddy cultivation or lack of know-how		
Priority 6	▪ Lack of village leadership ▪ Production time limited by need to hire labor ▪ Forest supply dwindling ▪ Increasing prices ▪ Resettlement, relocation ▪ Labor shortage, young people have abandoned the village to go to the provincial capital or to Thailand to find work and not returned	▪ Lack of irrigation, water supply ▪ Lack of health service, not sufficient ▪ Families too large, population increase ▪ Lack of knowledge of commerce, cannot compete		▪ **Pests, insects, rats, birds, wild pigs, bears, monkeys** ▪ Soil fertility, environmental degradation ▪ Frequent illness affects labor outputs
Priority 7		▪ Cash crops cannot grow due to climate ▪ Low education level ▪ Village far from hospital		▪ Lack of irrigation, water supply ▪ Low education level ▪ Lack of commercial knowledge, cannot compete ▪ Increasing consumer prices ▪ Exhausted all possibilities, it is up to authorities ▪ Gender inequality, women most of the work
Priority 8		▪ Pests, insects, rats, birds, wild pigs, bears ▪ Production time limited by need to hire out labor ▪ Forest resources dwindling ▪ Waiting to be moved from dam site don't want any improvements ▪ Frequent illness affects labor		▪ Lack of cash crops or ability to cultivate ▪ Forest supply dwindling ▪ Not enough paddy land available ▪ Must sell livestock to buy rice ▪ UXOs ▪ Borrow rice at usurious rates

		outputs ▪ Our parents were poor, therefore we are ▪ UXOs		
Priority 9				▪ Do not like paddy, do not know how to cultivate ▪ Lacks funds to increase livestock holdings ▪ Health services insufficient ▪ Epidemics ▪ No cash savings for investment ▪ Labor insufficient due to having to compensate for rice deficiency ▪ Resettlement and the burden of having to open up new fields, providing food during this 3 years period ▪ Theft of cows and buffaloes