Environmental Impact Assessment

Project Number: 41924
July 2014
Document Stage: Final

Nam Ngiep 1 Hydropower Project
(Lao People's Democratic Republic)

Appendix B: Biodiversity Offset Design Report

Prepared by Nam Ngiep Power Company Ltd. with assistance from ERM-Siam Co., Ltd. and Environmental Research Institute, Chulalongkorn University for the Asian Development Bank. This is an updated version of the draft originally posted in January 2012 available on http://www.adb.org/projects/documents/nam-ngiep-1-hydropower-project-results-eia

Nam Ngiep 1 Hydropower Project

Biodiversity Offset Design Report

NAM NGIEP 1 POWER COMPANY LIMITED

July 2014

0200749

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ERM

FINAL REPORT

NAM NGIEP 1 POWER COMPANY LIMITED

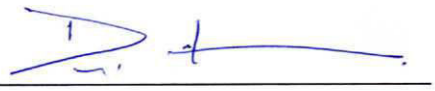
Biodiversity Offset Design Report

July 2014

Reference 0200749

For and on behalf of
ERM-Siam Co., Ltd.

Reviewed by: David Nicholson

Signed: 

Position: Principal Consultant – Biodiversity Lead

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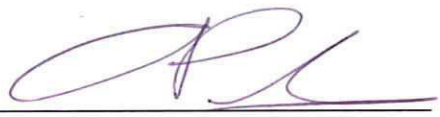
Signed: 

Position: IAP Partner

Date: 10 July 2014

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EXECUTIVE SUMMARY

The NNP1 Project involves construction and operation of a 290 megawatt (MW) hydroelectric power generation facility on a build-operate-transfer basis at the Nam Ngiep River, Lao PDR.

The Nam Ngiep 1 Power Company (NNP1PC) has been requested by the Asian Development Bank (ADB) and the Project's Independent Advisory Panel (IAP) to study the biodiversity offset requirements for the NNP1 Project and has contracted Environmental Resources Management ERM-Siam Co. Ltd (ERM) to undertake these studies.

The investigation for biodiversity offsets has been triggered by the Policy Principles of ADB Safeguard Policy Statement, Environmental Safeguards. (ADB 2009). This policy requires that impacts to Natural Habitats including the significant conversion or degradation of habitats are to be avoided or appropriately mitigated. The Project has been categorised under ADB's Safeguard Policy Statement (SPS) 2009 as an "A" for all of three safeguards categories; environment, involuntary resettlement (IR), and Indigenous People (IP).

The residual impacts identified for the NNP1 Project relate to unavoidable habitat loss within the operational footprint of the Project (including habitat for IUCN listed species) and barrier to aquatic fauna movement as a result of the dam wall. From a human use perspective the impacts relate to ecosystem services values lost from the direct use of biodiversity values. It is evident that villagers in the Project area regularly use local terrestrial and aquatic biodiversity – e.g. as a food source – largely for subsistence purposes. However, the dependence on natural resources varies by village and is primarily associated with accessibility. For example, remote villages tend to rely more heavily on biodiversity (e.g. medicinal plants as access to pharmaceuticals is limited).

To consider the required quantum of biodiversity offset, ERM has developed a biodiversity offset metric that captures the type (habitat and species), amount and condition of biodiversity. The biodiversity offset metric is based on the Habitat Hectare model (BBOP 2012a). This model captures the type, amount and condition of the biodiversity values present on the impacted site and candidate offset sites. The approach is designed to create a "balance sheet" to compare the biodiversity losses at the impact site with the gains available from candidate offset sites. The basis of the analysis is calculating the change in condition (loss) at the impact site compared to the change in condition (gains) at candidate offset sites over time from management. The application of the offset rules enables the most appropriate candidate offset sites to be chosen to achieve a no-net-loss of biodiversity values.

ERM has also undertaken consultation with Lao PDR government. The Nam Ngiep 1 Independent Advisory Panel and NGOs to design implementation mechanisms for the biodiversity offset. The delivery of the biodiversity offset package will be through a combination of governance, legal and institutional arrangements to administer projects designed to improve biodiversity values.

Land use activities in the Nam Ngiep and Nam Xan watershed that were likely to be a major threat to the long-term management of biodiversity offsets were identified. The exercise identified that the major threats to the biodiversity offset sites are mining leases and Production Forests. It was identified that this is of particular concern in the Nam Xan watershed where the majority of forested areas are Production Forests, limiting the ability to use these areas as primary conservation areas to protect terrestrial biodiversity values. Mining leases were also located across both watersheds.

The following recommended options have been developed and endorsed by the Lao PDR Government. The biodiversity offset framework for habitats and specific species includes:

1. *Forested and riverine areas of the Nam Ngiep Watershed to manage biodiversity in terrestrial and aquatic habitats; and*

2. *Species specific offsets within the Nam Ngiep Watershed or other candidate areas (such as the Phou Khao Khouy NPA or other areas as required).*

The recommended areas are based on feedback presented by the IAP during a consultation session held in January 2014 on the biodiversity offset package for the NNP1 Project and consultation workshop with the Government of Lao PDR and NGOs in March 2013 and MoNRE in March 2014.

Funding would be provided by the existing negotiated concession agreement funds allocated to manage the offset package (approximately $11.5M over 27 years). Additional funds may be required to facilitate species offsets and this will be determined later.

The offset balance sheet analysis indicates that sufficient habitat is available to offset the impacts from the project on biodiversity values. Species specific management to manage residual impacts on species are also recommended.

Management oversight for the offsets is recommended to occur through a management committee (NNP1 Offset Advisory Committee) formed to administer offset management and with assistance for offset management by appropriately qualified NGOs. It is recommended that NP!PC work closely with the Ministry of Natural Resources and Environment of the Lao Government to implement the offset projects.

1 INTRODUCTION

The NNP1 Project involves construction and operation of a 290 megawatt (MW) hydroelectric power generation facility on a build-operate-transfer basis at the Nam Ngiep River, Lao PDR.

The NNP1 Project site is located on the Nam Ngiep River, in the provinces of Vientiane, Xieng Khouang and Bolikhamxay, approximately 145 km northeast from the city of Vientiane or 50 km north from Pakxan District. The Project will generate 262MW of its capacity for export to Thailand and 20MW for domestic supply.

The Project will be funded predominantly by private sector funds. The owners of Nam Ngiep Power Co. Ltd. include The KANSAI Electric Power Co. Inc. (Kansai) from Japan, Electricity Generating Authority of Thailand (EGAT) International Co. Ltd. from Thailand, and Lao Holding State Enterprise (LHSE) from the Lao PDR. A company has been established (Nam Ngiep 1 Power Company (NNP1PC)) as a partnership between these entities.

The NNP1PC has been requested by the Asian Development Bank (ADB) and the Project's Independent Advisory Panel (IAP) to study the biodiversity offset requirements for the NNP1 Project and has contracted Environmental Resources Management ERM-Siam Co. Ltd (ERM) to undertake these studies.

The investigation for biodiversity offsets has been triggered by the Policy Principles of *ADB Safeguard Policy Statement, Environmental Safeguards* (ADB 2009). This policy requires that impacts to Natural Habitats including the significant conversion or degradation of habitats are to be avoided or appropriately mitigated. The Project has been categorised under ADB's Safeguard Policy Statement (SPS) 2009 as an "A" for all of three safeguards categories; environment, involuntary resettlement (IR), and Indigenous People (IP).

The Project was also deemed as Highly Complex and Sensitive Project. ERM has updated the EIA in relation to the biodiversity values, to identify the residual biodiversity values impacted and those requiring offset.

The ADB requirements require the design of appropriate biodiversity offset measures to achieve at least a "no net loss" of biodiversity values.

1.1 PURPOSE OF REPORT

The purpose of this report is to outline the approach, methods used and results of the biodiversity offset analysis undertaken for the Nam Ngiep Hydro Power Project (NNP1 Project). This report should be read in conjunction with the NNP1 Baseline Biodiversity Report and NNP1 Revised Biodiversity Impact Assessment Report.

1.2 APPROACH

ERM has used the frameworks contained in the following Business and Biodiversity Offset Program (BBOP) resource documents:

- *Biodiversity Offset Design Handbook* (BBOP 2012a); and
- *Resource Paper: No Net Loss and Loss-Gain Calculations in Biodiversity Offsets* (BBOP 2012b).

ERM has applied the methodology as described by BBOP in designing the biodiversity offset for the NNP1 project.

Specifically this report includes the:

- Defining the residual biodiversity values requiring to be offset;
- Proposed delivery mechanisms for the biodiversity offset;
- Recommended biodiversity offset package;
- Methodology and approach to the design of the biodiversity offset (including loss/gain calculations);
- Framework for operational management plans, stakeholder participation programs, monitoring and evaluation arrangements, governance roles and requisite capacities; and
- Analyse available budgets and financial arrangements.

2 BIODIVERSITY VALUES REQUIRING TO BE OFFSET

This section of the report documents the residual biodiversity values impacted following the application of the avoidance and mitigation steps of the following mitigation hierarchy. The avoidance and mitigation steps have been applied in the EIA undertaken for the project. It is the residual values that are required to be offset to achieve a no-net-loss of biodiversity values.

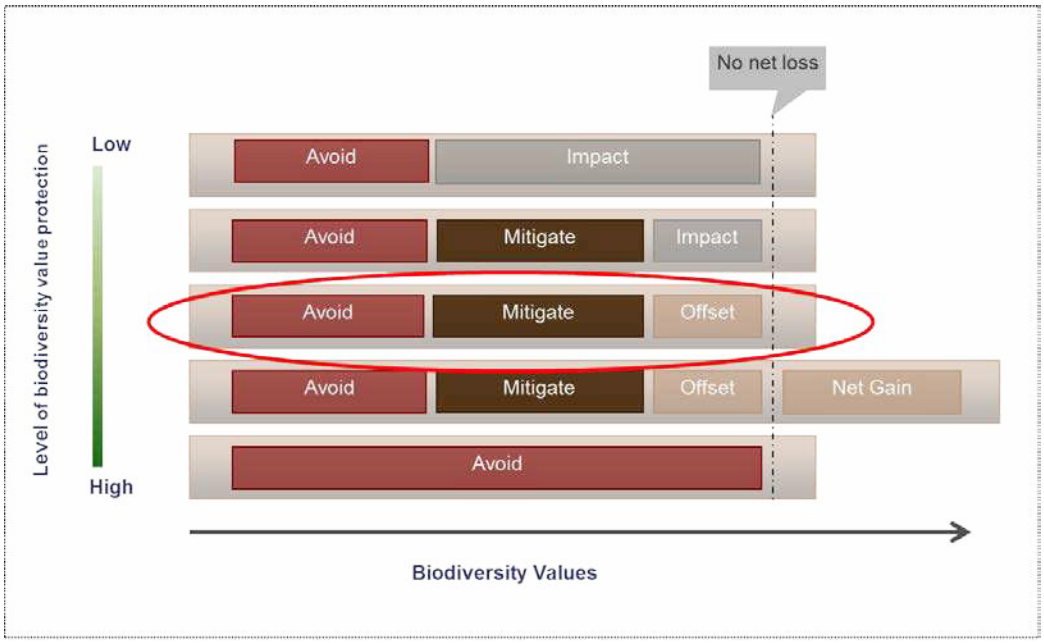
The mitigation hierarchy is outlined in *Figure 2.1*.

Figure 2.1 Mitigation Hierarchy

1. **Avoidance –**
   activities that limit impacts by avoiding high biodiversity areas in the development footprint;
2. **Mitigate (restoration) –**
   reducing the severity of impacts through onsite measures to protect and enhance biodiversity values;
3. **Residual Impact –**
   significant effects left after mitigation measures
4. **Offset –**
   compensation for residual impacts by *improving* biodiversity values elsewhere

The approach to the application of the mitigation hierarchy to achieve no-net-loss is outlined in *Figure 2.2*. No-net-loss is achieved where biodiversity values are appropriately mitigated and offset.

Figure 2.2 Achieving No-net-loss of Biodiversity Values



Documentation of the assessment process is contained in the revised Environmental Impact Assessment (EIA) (ERM 2014).

2.1 *RESIDUAL IMPACTS ON HABITATS*

The residual impacts identified for the NNP1 Project relate to unavoidable habitat loss within the operational footprint of the Project (including habitat for IUCN listed species) and barrier to aquatic fauna movement as a result of the dam wall. Direct disturbance to habitats will be minimised where possible however this impact assessment has identified an unavoidable loss of approximately 3944 ha of natural habitat and 3549 ha of modified habitat. *Table 2.1* summarises the breakdown of land cover types that will be permanently removed or altered.

Table 2.1 Impacted land cover areas within the Project Area

Land Cover	IFC Habitat Class	Code	Area (ha)			Total (ha)
			Main dam	Re-regula-tion dam	Resettle-ment	
Deciduous Forest	Natural	DF	2721	132	56	**2909**
Evergreen Forest	Natural	EF	508	27	0	**535**
Old Fallow Land	Modified	OF	1321	194	163	**1678**
Young Fallow Land	Modified	YF	1036	143	82	**1261**
Bamboo	Natural	B	241	127	132	**500**
Slash and Burn	Modified	SB	328	27	19	**374**
Rice Paddy	Modified	RP	107	5	15	**127**
Water	-	W	368	42	0	**410**
Grassland	Modified	G	108	0	0	**108**
Urban Area	Modified	U	38	3	0	**41**
Rock	Natural	R	1	0	0	**1**
Cloud	-	CL	4	0	0	**4**
Shadow	-	SH	16	0	0	**16**
			6797	700	467	**7964**

2.2 *RESIDUAL IMPACTS ON SPECIES*

ERM has applied a risk based assessment of species values to determine the significance of impacts on biodiversity values following mitigation. This risk assessment approach is outlined in the revised EIA for the NNP1 Project (ERM 2013). *Table 2.2* outlines the terrestrial species that have been identified that have residual impacts remaining after mitigation. *Table 2.3* outlines the fish species that have residual impacts on their habitats following mitigation.

Table 2.2 Terrestrial species with residual impacts following mitigation

	Species	
Flora	Dipterocarpus turbinatus	Afzelia xylocarpa
	Shorea roxburghii	
Mammals	Asian small clawed otter	Southwest China serow
	Asian elephant	Dhole
	Smooth coated otter	Sun bear
	Sunda pangolin	Bengal slow loris
	Leopard	Pygmy slow loris
	Tiger	Asiatic golden cat
	Fishing cat	Leopard cat
	Phayre's leaf monkey	Sambar
	White-cheeked gibbon	Himalayan black bear
	Golden jackal	
Birds	Wreathed hornbill	Red-breasted parakeet
	Great hornbill	Darter
	Green peafowl	Rufous necked hornbill
	White winged duck	Crested argus
	Greater coucal	Spot-bellied eagle owl
	Siamese fireback	Red-collared woodpecker
	Silver pheasant	Hoopoe
	Grey peacock pheasant	
Reptiles	Reticulated python	Elongated tortoise
	King cobra	Big-headed turtle

Table 2.3 Aquatic species with residual impacts following mitigation

Species name	Common name
Poropuntius deauratus	Yellow tail brook barb
Cirrhinus cirrhosus	Mrigal carp
*Luciocyprinus striolatus**	
Cyprinus carpio	Wild common carp
Scaphognathops bandanensis	Bandan sharp-mouth barb
Yasuhikotakia splendida	Jaguar loach
Cirrhinus molitorella	Mud carp
Mekongina erythrospila	
Hemibagrus wyckioides	Redtail catfish
Luciosoma bleekeri	Apollo shark minnow

* Species specific mitigations and offsets have been developed for *L striolatus.*

2.3 RESIDUAL IMPACTS ON HUMAN USE VALUES

From a human use perspective the impacts relate to ecosystem services values lost from the direct use of biodiversity values. It is evident that villagers in the Project area regularly use local terrestrial and aquatic biodiversity – e.g. as a food source – largely for subsistence purposes. However, the dependence on natural resources varies by village and is primarily associated with

accessibility. For example, remote villages tend to rely more heavily on biodiversity (e.g. medicinal plants as access to pharmaceuticals is limited).

Development of the project will likely impact the ability of villagers to access both tangible human use provisioning services and intangible cultural heritage values. This includes:

- Hunting, gathering and fishing. This typically includes small animals, such as squirrels and rats, and flora species, such as bamboo and mushrooms. The flora and fauna are primarily consumed within the household;
- Collection and use of medicinal plants;
- Cultural heritage, such as cemeteries. In most cases, villagers did not identify intangible cultural heritage values, which may be attributed to relatively recent settlement of the local villages; and
- Collection of timber products to be used as fuel or in construction.

3 BIODIVERSITY OFFSET OPTIONS ANALYSIS

This *Section* outlines the biodiversity offset options available to NNP1PC to offset the residual impacts on the biodiversity values identified above.

The biodiversity offset options discussed in this *Section* of the report are outlined in terms of:

- Results of stakeholder consultation;
- Governance arrangements available to manage offsets;
- Candidate offset sites identified;
- Threats to the establishment of biodiversity offsets;
- Offset management programs that are available to supplement offset management.

To refine the options a "Strengths, Weaknesses, Opportunities and Threats" (SWOT) analysis has been undertaken (refer to *Table 3.1*). The biodiversity offset options are analysed in the SWOT analysis at *Table 3.4*.

Figure 3.1 shows the location of candidate biodiversity offset sites within the Nam Ngiep and Nam Xan watersheds.

3.1 STAKEHOLDER CONSULTATION

ERM conducted stakeholder engagement with Regional Agencies, Lao PDR Government Departments, local officials and Non-Government Organisations (NGO) in February 2013. Follow up consultation occurred in August 2013 regarding the preferred offset framework. Full results of the stakeholder analysis can be found in *Annex A*.

A field mission occurred with the Independent Advisory Panel (IAP) for the NNP1 project in November 2013 to discuss the project as well as biodiversity offsets. Following this consultation, further refinement of the offset package occurred.

A consultation forum was held with the Lao PDR Government and NGO stakeholders in March 2014 to discuss the refined framework. Following feedback, a further refined framework was provided to representatives of the Government in April 2014.

A summary of the consultation to date, stakeholders involved, results and responses to the consultation is contained in *Table 3.1*.

Table 3.1 Results of Stakeholder Consultation on the Offset Package

Date	Stakeholders	Results Summary	Response
February 2013 & August 2013	IAP - Independent Advisory Panel WCS - Wildlife Conservation Society IUCN International Union for the Conservation of Nature MRC Mekong River Commission MoNRE – Ministry of Natural Resources and Environment MICT - Ministry of Information, Culture and Tourism MPI - Ministry of Planning and Investment DFRM - Department of Forest Resource Management DESIA Department of Environmental and Social Impact Assessment Theun-Hinboun Power Company Ltd	Expanding scope of the study Requirement for like for like offsets Strengthening existing protected area management Long term view for the management of protected areas Benefit sharing with communities NGO involvement in offsets Military management of Phou Khao Khoay NPA Water shed management committees Compensation for impacts on forest resources Establishment of a biodiversity offset fund Lao PDR Environmental Protection Fund	The offset package was developed to focus on the watershed management framework proposed by MoNRE. Inclusion of the Environment Protection Fund as the primary financial vehicle to deliver the funding for offsets based on views of the Lao PDR Government Management and legal arrangements included to improve accountability and transparency in offset delivery Inclusion of tendering arrangements to manage capacity building
November 2013	IAP - Independent Advisory Panel	Concerns over the translocation of fauna from main dam area. Uncertainty on the budget for biodiversity offsets. Uncertainty on the suitability of Huay Ngua PPA as a biodiversity offset site. Support for the Lao NPA network to achieve conservation gains. Potential hydro power in Phou Khao Khouy NPA may threaten future offset work. Biomass removal in the main dam area of concern. Cumulative impacts from other hydropower projects on habitats and species. Opportunity for an Aggregate Offset Fund	The offset package was refined to remove the requirement for translocation of fauna and flora from the dam area. Huay Ngua PPA was removed from the offset package given its lower conservation value as an offset. PKK was proposed as a candidate offset site although further assessment is required on its suitability. Framework for an Aggregate Offset Fund was included.
March 2014	MoNRE – Ministry of Natural Resources and Environment WCS - Wildlife Conservation Society IUCN International Union for the Conservation of Nature	Suitability of Phou Khao Khouy NPA as a candidate offset site given threats from projects and current concession agreements in the NPA. Preference to use the watershed as the primary biodiversity offset area.	Addition of PKK as a candidate for species offsets that are not represented in the watershed offset area Removal of the Aggregate Offset Fund from the recommended package

Date	Stakeholders	Results Summary	Response
	MRC Mekong River Commission MICT - Ministry of Information, Culture and Tourism MPI - Ministry of Planning and Investment DFRM - Department of Forest Resource Management DESIA Department of Environmental and Social Impact Assessment	Preference not to use the Aggregate Offset Fund within the proposed offset framework. Preference not to use a Trust fund arrangement to provide funds for offset management. Concession Agreement requirements for funding should be considered as a baseline.	Removed the trust fund arrangements from the recommended package Refocus on the concession agreement requirements for funding.
April 2014	DFRM - Department of Forest Resource Management MoNRE – Ministry of Natural Resources and Environment	Preference not to use a tendering arrangement for procuring capacity building.	Removal of tendering to procure capacity building from the refined offset package. Capacity building will be directly contracted to DFRM.

250000 300000 350000 400000

2150000 2100000 2050000

Legend

- Catchment Boundary
- Waterbody
- Road
- City or Town
- Lao PDR Boundary

Nam Ngiep 1 Hydropower Project:

- Inundation Area
- Re-regulation Dam
- Re-settlement Area
- Proposed Access Road

Candidate Offset Sites:

- Nam Ngiep Offset Area
- Huay Ngua Provincial Protected Area
- Phou Khao Khouay National Protected Area
- Nam Xan Offset - River Centreline

N 0 10 20 30Km

1:600,000

Basemap: Bing Maps

Phoukout
Phonsavan
Nonghet
Muang Khoun
Phaxai
Nam Ngum
Nam Ngiep
Nam Ngiep Catchment
Thathom
Nam Xan Catchment
Vang Vieng
Nam Ngum 2 Reservoir
Nam Song Diversion
Nam Xan
Hinheup
Nam Ngum Reservoir
Ba. Donkha
Nam Ngum Reservoir
Longxan
Thinkeo
Phonhong
Nam Ngum Reservoir
Nam Leuk reservoir
Ban Keun
Nam Mang 3 Reservoir
Pakxan
Mekong River
Hai
Tha Ngon
bing

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Date:	13/09/2013	Drawing Size: A3	
Drawn By:	TC	Reviewed By: DN	

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 3.1 - Map of Offset Sites

Nam Ngiep 1 Hydropower Project
Biodiversity Offset Design Report

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch,
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

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3.1.1 Discussion

The results of the stakeholder analysis have identified:

- issues to be considered when designing the biodiversity package, including constraints from existing land uses and threats;
- opportunities to leverage existing conservation programs;
- constraints and opportunities to achieve effective offset programs through previous experience;
- identification of legal, financial and institutional arrangements necessary to deliver offsets; and
- identification of management measures needed to facilitate effective improvements in the value of biodiversity offsets.

Legal

The legal issues discussed with stakeholders highlighted the lack of appropriate legal frameworks and inexperience with securing offsets for the long term in Lao PDR. Discussions with existing offset managers indicate that they prefer to undertake offset management themselves rather than hand responsibility to Lao PDR Government agencies. The ability of government agencies to administer and enforce laws was also identified as a key issue. However, stakeholder engagement identified opportunities to use the *Forestry Law* to secure offsets through forest classification changes (*Article 44* of the *Forestry Law 1996*); and the ability to use the *Forestry Law* to make additions to existing protected areas. It also identified that the Environmental Protection Fund (EPF) could be used as a mechanism to administer funds designed to deliver an offset. Some concern though was raised on the robustness of the EPF's governance.

Institutional and Management

The institutional and management arrangements identified during the stakeholder engagement process highlighted that enhancement and support of the existing protected area network was seen as a preferred option for biodiversity offsetting. This would be through either: environmental contributions to the Lao PDR Government; support of existing conservation management programs (through NGOs); or additions to the protected area network from current land used for forestry. These approaches however would need to be undertaken within a management framework and supported by adequate funding and delivery mechanisms. Engagement of Lao PDR government agencies and NGOs was highlighted as being essential to deliver these options on the ground.

The experience of the Theun-Hinboun Power Company and MMG Sepon has highlighted that existing private funding arrangements through NGOs (WCS and IUCN) to support on-ground management has been used successfully. Stakeholders highlighted that benefit sharing, building capacity of Lao PDR government agencies, data management, governance and accountability were items that need to be considered when designing biodiversity offsets with the involvement of NGOs in delivery.

Regarding management of existing protected areas as a biodiversity offset mechanism, stakeholders highlighted some good examples and their concerns regarding others. The existing programs where DFRM were the custodian of the NPA (such as at Nam Kading NPA) were described as being successful. This was in some part due to the work of WCS in delivering management in conjunction with DFRM. However, there was concern with the current management of Phou Khao Khoay NPA and the opportunity to consider management support. It was acknowledged by stakeholders that insufficient funds exist to facilitate adequate management. However, working with the military at PKK was noted as being untested and may prove to be a risk in delivering adequate biodiversity outcomes unless capacity building is s incorporated into offsetting proposals and adequate resources are provided for the management of the NPA.

Financial

Financial considerations and the costs of setting up and managing offsets were highlighted by all stakeholders. The main points being: the current lack of funding for existing conservation initiatives; lack of coordination between Lao PDR government agencies; lack of adequate or untested accountability frameworks to deliver funding (payments for ecosystem services); and the ability of existing NGOs and Lao PDR government agencies to administer funds appropriately (including the EPF). However, stakeholders identified that a number of existing tested conservation programs exist that could be supplemented by additional funding to deliver conservation outcomes as part of a biodiversity offset package.

Existing and Future Land uses

Stakeholders highlighted that the lack of adequate land zoning makes it difficult under the *Land Law 2003* to adequately demarcate land sufficiently to protect biodiversity outside of the protected area network. Development within Protected Areas was also highlighted as an issue with existing and new hydropower schemes being developed within Nam Kading and Phou Khao Khoay NPA. Similarly, legal protection of cultural heritage was highlighted, including that sites of cultural significance require acknowledgement and management through the biodiversity offsetting process. Compensation of any losses of land to local communities due to biodiversity offsets was also identified as something that would need to be considered. Generally

however, local communities responded positively to the concept of managing local Production Forests for conservation.

Threats from mining, hydro schemes and forestry where highlighted by stakeholders as the major threats that could arise when locating biodiversity offsets. Careful siting of the offset was seen as the best approach to limit impacts. However, it was raised that it was difficult to gather information on all current development proposals to provide an indication of the geographic location of threats from changing landuses. Development pressures from provincial roads and changing technologies were also highlighted as an issue.

Threats

Stakeholders identified a range of current threats to biodiversity management. These included: existing and future planned developments (mining and hydro schemes); pests; wildlife trade; forestry; agriculture; resettlement sites; and cumulative impacts from development and human impacts. Opinion suggested that the siting and management of offsets was important to ensure that future land uses would not impact on any offsets and that adequate management was undertaken to reduce the impacts of identified threats.

3.2 THREATS TO THE ESTABLISHMENT OF BIODIVERSITY OFFSETS

The location of land use activities in the Nam Ngiep and Nam Xan watershed were identified that were a major threat to the long-term management of biodiversity offsets. These included:

- Existing and future hydropower projects;
- Mining Leases; and
- Production Forest Areas.

This information was provided by the Ministry of Energy and Mines and DFRM.

Figure 3.2 outlines the location of these land use threats in relation to the candidate biodiversity offset areas.

The exercise identified that the major threats to the biodiversity offset sites are mining leases and production forests. This is of particular concern in the Nam Xan watershed where the majority of forested areas are production forests, limiting the ability to use these areas as primary conservation areas to protect terrestrial biodiversity values.

This information has been used in the SWOT analysis.

250000
300000
350000
400000
2150000
2100000
2050000

Legend

- Catchment Boundary
- Waterbody
- Road
- City or Town
- Lao PDR Boundary
- Surrounding Hydroelectric Power Projects
- Nam Ngiep 2 Tunnel

Mining Tenements:

- Mining Lease Under Survey (mining not yet approved)
- Mining Lease with Survey Proposed (mining not yet approved)
- Mining Lease with Concessions

Nam Ngiep 1 Hydropower Project:

- Inundation Area
- Re-regulation Dam
- Re-settlement Area
- Proposed Access Road

Candidate Offset Sites:

- Nam Ngiep Offset Area
- Huay Ngua Provincial Protected Area
- Phou Khao Khouay National Protected Area
- Nam Xan Offset - River Centreline

Forest Zone:

- National Protection Forest
- Production Forest

N

0 10 20 30Km

1:600,000

Basemap: ESRI World Imagery

Note: Known extent of mining tenements displayed, with some tenements partially shown.

Phoukout
NKL Co., Ltd
Nam Ngum 4A
Phonsavan
Vinacomin
COECCO
State Enterprises for Agriculture - Industry Development (DAI)
Nonghet
Daosavan Investment and Construction., Ltd
Phongsabthavy Construction., Ltd
Muang Khoun
Phou Bia Mining Limited
Nam Ngiep 3A
Phongsabthavy Construction., Ltd
PPC Consultant., Ltd
Phaxai
Nam Ngiep 2 Tributary Dam
Nam Ngiep 2 Main Reservoir
Nam Chain
Nilandon Development Mining., Ltd
Nam Pot
Nam Ngiep 2 Powerhouse
Nam San 3A
Nam Ngum
Nam Ngiep
Namchong-Namgneup
Nam San 3B
GnotNamxan NamPeuak
Lao-Muang-om Mining., Ltd
Nam Ngiep Catchment
Thathom
Nammo
China Base Ningbo Foreign Trade Co., Ltd
Neyland Lao Minng., Ltd
Phoupasang-Punghok
Nam Phouan
CAVICO Vietnam & Laoyongchaluen Trading Import-Export
Nam Xan Catchment
Phak Beak
Nam Bak 2
PT Construction Company., Ltd
Nam Ngum 2 Reservoir
Agriculture Development
Phoutume
Hinheup
Nam Ngum Reservoir
Ba. Donkha
Longxan
Nam Mang 1
Thinkeo
Phonhong
Nam Leuk reservoir
Lao Thong Her Development., Ltd
Ban Keun
Nam Mang 3 Reservoir
Mekong River
Pakxan
Qinghai xingoi Co., Ltd.
Schuan Above
Advantage Lomon Mining (Lao) Co., Ltd
Hai
Tha Ngon

Client:	Nam Ngiep Power Company Ltd.		**Figure 3.2 - Land Use Threats**
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Date:	17/01/2014	Drawing Size: A3	Nam Ngiep 1 Hydropower Project Biodiversity Offset Design Report
Drawn By:	TC	Reviewed By: DN	Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

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3.3 BIODIVERSITY OFFSET GOVERNANCE OPTIONS

3.3.1 Establishment of an Aggregate Offset Fund

This model would comprise of an Aggregate Offset Fund (AOF) (or Conservation Bank) set up under the EPF or other financial body that administered and provided funding to biodiversity offset projects in Lao PDR, including the NNP1 project.

The basic administrative and governance components to establish an Aggregate Offset Fund exist within Lao PDR. These include: a financial body capable of managing capital for projects (EPF); central government agencies (MoNRE and DFRM) able to determine priorities for conservation investments; a system of provincial and district governments responsible for natural resource management and ability to administer offset projects; an established protected area system (that is largely unfunded); and an established NGO network able to deliver or support offset management services (WCS, WWF, & IUCN). Offsets can also be legally required either through a Prime Ministerial Decree or through formal agreements with Lao PDR agencies.

The lack of a formal biodiversity offset framework in Lao PDR (through either legislation or a Prime Ministerial Decree) is however a drawback. This means that some components necessary to measure the biodiversity values to be offset and the amount of funds to be deposited do not currently exist. These include a common biodiversity assessment metric to measure the quantum of offset required by developments and a mechanism to determine the cost or monetary value of the "fund" deposit. These components are necessary as the offset metric "caps" the size of the offset required (in terms of area, type and condition of biodiversity). An assessment of the required fund deposit is also necessary to provide certainty to developers of the cost of offsetting using the AOF. Value setting mechanisms can relate to the cost of management of the offset over a set time period or an evaluation of the value of ecosystem services.

If an AOF were to be established in Lao PDR, it is recommended that a formal framework be established that builds on the existing capacities and establishes mechanisms to measure the offset quantum and calculate costs. The ADB in collaboration with other partners may be in a position to support this approach.

3.3.2 MoNRE Management of Offset and River Basin Activities

Under his model, the Ministry of Natural Resources and Environment (MoNRE) would be responsible for the administration of biodiversity offset projects. This is within their core responsibilities as a natural resource

management agency within the Government. This would be undertaken in accordance with the draft *River Basin Management Plan Guideline* currently being prepared by the agency. This includes utilising the existing Central, Provincial and Village government structures to manage natural resource management, including biodiversity. This would integrate with the planning frameworks being developed at each level of government. See the outline of the draft structure as proposed by MoNRE at *Figure 3.2*.

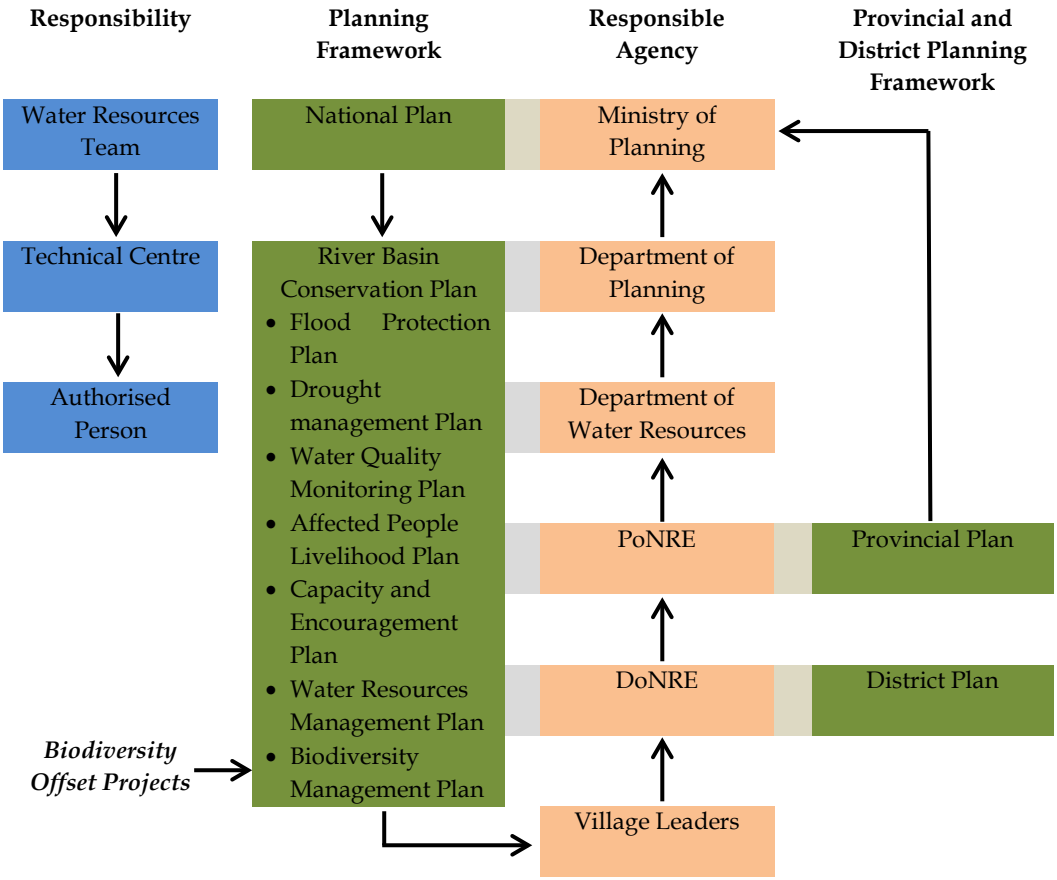
During consultation with MoNRE, representatives expressed preference to this model to administer watershed and biodiversity offset projects. They indicated that the approach better integrates with the management structures already in place and avoids duplication of governance frameworks. They expressed concern that a River Basin Committee or Watershed Management and Protection Authority resulted in duplication and could disenfranchise local officials.

Appropriate governance measures would however be required to be put in place so that accountability occurred over the expenditure of funds, at a central and provincial government level. This could be achieved through oversight by MoNRE and a Provincial Government level committee, with representatives from NNP1PC.

The governance model would administer biodiversity offset projects at the Provincial and District levels of government and fit within the River Basin Conservation Plan. Funding would be provided to MoNRE Central and Provincial offices (Provincial office of Natural Resources and Environment (PoNRE)) or through the Lao PDR Environment Protection Fund (EPF). Specific tied funding could be made to the EPF for specific projects as part of the biodiversity offset package.

Figure 3.3 outlines the proposed governance structure provided by MoNRE as the preferred model to manage river basin management projects.

Figure 3.1 *Draft MoNRE River Basin Management Plan Guideline Framework*



PoNRE – Provincial office of Natural Resources and Environment

DoNRE – District office of Natural Resources and Environment

3.3.3 Nam Ngiep River Basin Committee

A River Basin Committee (RBC) could be established to oversee watershed management activities within the Nam Ngiep Watershed. The Committee would facilitate management of land, water and forest resources as part of the biodiversity offset package.

Funding would be provided directly by NNP1PC to MoNRE Central office or through the Lao PDR Environment Protection Fund (EPF) to establish the RBC. Monetary contributions from other hydro projects and other interests in the river basin could also be sought. Specific tied funding could be made to the EPF for projects as part of the biodiversity offset package over a 30 year period. These funds would be invested by the EPF to provide ongoing management payments for these projects.

MoNRE is currently being supported as part of the AusAID *Lao PDR National Integrated Water Resources Management Support Project*. The development of the RBC should occur with the ongoing support with AusAid.

Specific projects as part of the biodiversity offset package could be funded directly by NNP1PC or by the EPF. The intent would be that these projects would be administered by the RBC to focus on protecting water resources entering into the Nam Ngiep Reservoir and biodiversity offset management.

During consultation, MoNRE expressed concern over using an RBC to administer biodiversity offset projects. They cited experience in the Nam Ngum watershed, saying that the structure duplicated effort and was not connected to existing government structures. They also expressed concern over the use of the EPF as the funding mechanism, preferring to receive direct payments at a Central and Provincial level.

3.3.4 Watershed Management and Protection Authority

A Watershed Management and Protection Authority (WMPA) could be established by Prime Minister's Decree to manage the biodiversity offset package for the project. An Authority has been established for the Nam Theun 2 Watershed Management and Protection Authority in 2005 (Prime Minister's Decree 39/PM).

The WMPA could be used to administer the biodiversity offset package of the NNP1 project. Funding for the WMPA would be administered by NNP1PC or through the EPF through financial payments by NNP1PC over a 30 year period.

Operations of the WMPA would be undertaken under the provisions of a Prime Ministerial Decree. An *Environmental Management Framework and Operational Management Plan* would be required to describe and outline the specific activities of the WMPA.

During consultation with MoNRE, representatives expressed concern that WMPAs were too specific and did not service the needs of provincial and local governments. They expressed concern that they ceased to exist when the funding stopped and that the responsibility of management would then be passed to Provincial Governments without sufficient funding or historical knowledge of the projects.

3.3.5 Lao PDR Environment Protection Fund

The Lao PDR Environment Protection Fund (EPF) could be used as a vehicle to deliver and manage funds as part of the biodiversity offset package. The EPF is untested in this regard and it would need to be supported to ensure adequate management and disbursement of funds as well as monitoring to determine outcomes. The EPF *Operations Manual* does however include requirements for an environmental and social safeguard framework; financial management; and monitoring and evaluation through the establishment of a Specialised Financial Window.

If the EPF was used to deliver funding for a biodiversity offset, the rules and standards that would apply to expending any funds would need to be carefully defined and drafted to ensure adequate expenditure of funds and management frameworks to deliver biodiversity conservation outcomes.

During consultation, mixed concerns were raised about the ability of the EPF to efficiently administer funds for the purposes of biodiversity offset management. There was an indication that the EPF had not managed specific tied funding in the past. There were also concerns that MoNRE was better placed to deliver value for money, removing unnecessary bureaucracy. The EPF and Ministry of Mines and Energy were however supportive of using the EPF as the primary vehicle to manage offset management funds.

3.4 CANDIDATE BIODIVERSITY OFFSET SITE OPTIONS

3.4.1 Watershed Management Activities in the Nam Ngiep and Nam Xan Watersheds

Nam Ngiep Watershed

There are opportunities to promote the management of biodiversity and water resources above the high water level of the inundation area of the NNP1 dam to act as an aquatic biodiversity offset. This would include all forested areas immediately adjacent to and within the watershed of the lake. Active management of Protection Forest in this area would aim to improve both aquatic and terrestrial biodiversity values.

Management of forestry activities and NTFP collection could also occur in areas retained as Production Forest. Local community engagement in managing threats (such as hunting) would also occur, as would manage use for the collection of non-timber forest products. Management of terrestrial biodiversity in this area would also have a direct benefit of reducing the potential for water quality impacts from sediment and erosion in the watershed. Facilitation of environmental programs (such as SuFoRD/SUPSFM or REDD+) could be undertaken to promote sustainable forestry operations and improve biodiversity management and watershed protection.

During consultation, the Department of Forestry Resource Management (DFRM) was supportive of this approach, citing joint benefits of improving forest management and watershed protection. They also said that there are no existing projects in this area for biodiversity or sustainable forest management, with the implication that management would not be additional to existing programs.

Nam Xan Watershed

There are opportunities to promote watershed management activities in the Nam Xan River watershed to act as an aquatic biodiversity offset. ERM identified a stretch of the Nam Xan River between Thasi to Ban Kheadong and Borikhan that is approximately 50km in length. This is a North-South flowing part of the Nam Xan River in the mid to lower reaches of the watershed. It is currently mostly vegetated with a relatively low population density, poor vehicular access, and steep riparian terrain.

Whilst hydro schemes are likely to regulate the water resource within the Nam Xan River and development pressures remain (particularly forestry and agriculture), this section of the river would benefit from appropriate water shed management practices to maintain and improve the aquatic values of this stretch of the river and hence provide an appropriate offset. There is an opportunity to link into SuFoRD/SUPSFM or REDD+ projects to promote sustainable forestry operations within the watershed along this stretch of the Nam Xan River.

During consultation, there was concern raised by DFRM and MoNRE that it will be difficult to manage watershed activities that impact on water quality in the Nam Xan watershed. The forested areas adjacent to the river were mainly Production Forests; a new road had recently been built in the watershed and upstream development pressures from mining, agriculture and hydro projects would threaten watershed management activities. They also expressed the view that better managing the Nam Ngiep River below the dam wall may be more achievable.

3.4.2 Protected Areas

Nam Xan Valley

During ERM's field visit in March 2013, portions of Production Forest in the Nam Xan watershed were identified that could be reclassified Protection Forest in Xieng Khouang Province and Bolikhamsay Province. These areas of forest may match "like for like" with the identified residual impacts from the inundation area of the watershed. These areas are currently utilised for Production Forest and are adjacent to existing Protection Forest within the watershed.

Compensation and management in the form of Payments for Ecosystem Services (PES) to MoNRE Forestry Department to better manage the timber resource and promote sustainable forest management in this area could also occur as part of the biodiversity offset. Links to REDD+ and SuFoRD/SUPSFM projects may also be considered to enhance management of remaining areas subject to forestry.

During consultation, DFRM indicated that they were unlikely to support reclassification of Production Forest in the Nam Xan watershed. They however express interest in PES programs and forest management activities.

Nam Kading NPA

Nam Kading NPA falls within Bolikhamsay Province and is considered to have some of the most important biodiversity values within Lao PDR. The NPA has similar biodiversity values as the NNP1 Project site and Nam Xan Watershed. There are significant ongoing threats at the NPA including hunting and habitat loss. The NPA has seen many concerted efforts to improve conservation and there are established programs for monitoring and management, currently managed by the WCS.

WCS has been involved in undertaking management at Nam Kading NPA since 2005 with successful management programs. There are opportunities to supplement the work that WCS are currently undertaking at Nam Kading NPA either by contributions to existing programs or the design of new distinct programs aimed at offsetting biodiversity values impacted by the NNP1 project. However, hydro power schemes are proposed for the NPA and would need to be considered to ensure that management to improve biodiversity values is not lost through future development.

During consultation, representatives from MoNRE and DFRM expressed that management activities already occurred within Nam Kading NPA and that the values represented were geographically removed from the impacted area. They were of the view that this restricted the ability of this area to be used as a biodiversity offset.

Phou Khao Khouay NPA

Phou Khao Kouay NPA (PKK) was also considered as a potential biodiversity offset option to improve biodiversity values through funding and management. Appropriate management of the protected area could also achieve a supplementary aquatic offset by improving the Nam Mang and Nam Leuk Rivers that flow through the NPA. However, similar to Nam Kading NPA, pressures from hydro schemes remain in this watershed and this would need careful consideration in terms of appropriate methods for delivery. Currently the NPA is managed by the local military that do not have the capacity or appropriate training to facilitate conservation as highlighted during the initial stakeholder engagement. Supporting an NGO such as the IUCN or WCS to work with the local military may be considered to improve capacity.

During consultation, MoNRE and DFRM were supportive of providing funds to PKK NPA to improve and manage biodiversity values. They provided a management plan that was prepared for the NPA (No English translation available). They also expressed that insufficient funds currently exist to manage the NPA. They identified that managing ecotourism, access, NTFP collection and biodiversity enhancement works would be necessary. Concerns were raised about whether existing or future concessions agreements may impede the use of PKK NPA as an offset site either through providing offsets for those project or impacting on the NPA itself (such as the construction of a hydropower scheme within the boundary.

Huay Ngua Provincial Protected Area

Huay Ngua Provincial PA lies East of the NNP1 project area and along the lower reaches of the Nam Ngiep River. The PA is currently degraded due to extensive logging activities and impacts from wildlife hunting. The area has the added potential of providing a buffer to reduce impacts to the resettlement area located to the South of the PA. Involvement of the community would be central to achieving offset gains at this site and the area has the added benefit as potentially acting as a biodiversity corridor between protected areas (PKK and Nam Kading NPAs).

Concern was raised by the IAP on the suitability of the HN PA as a candidate offset site. The reasoning was that its current "protected area" status is more in line with a "provincial reserve" that promotes education and multiple uses. The area is also isolated within the landscapes and does not provide an important habitat corridor. It is also currently degraded from agricultural and forestry use.

MoNRE and DFRM were supportive of providing funds to manage the HN PA. They said that funds were not currently available to implement management practices as outlined in the PA. They expressed concern that the PA was small and was subject to substantial existing degradation. The proximity of the resettlement area was also raised as an issue, leading to impacts from NTFP collection and hunting. The proposed funding and management activities are recognised as a potential benefit and may assist in significantly reducing these identified impacts.

3.5 BIODIVERSITY OFFSET PROGRAM OPTIONS

3.5.1 Payments for Ecosystem Services

Payments for Ecosystem Services (PES) are an approach that could be used to provide funding to Lao PDR Government agencies and the community to compensate for losses of ecosystem services caused by the NNP1 project. Provisioning, regulating and cultural services would need to be assessed to determine the value that would require to be compensated. Provisioning

ecosystem services would include: forest resources, water resources and fishing catch. Regulating services would include flood protection, carbon sequestration, water filtration and waste assimilation. Cultural values include recreation, aesthetics, landscape values and cultural uses.

Valuation techniques would need to be applied to each of the identified impacts and benefits on ecosystem services as a result of the construction of the NNP1 project. Any deficits in the final value would then be made as payments to affected persons, communities or to the Lao PDR government. These payments could be direct payments or payments into the EPF.

There is little experience in Lao PDR for the application of PES and its application remains relatively untested. DFRM did indicate during the stakeholder engagement that they had recently participated in a pilot program for PES from the Nam Ngum 3 Hydropower Scheme. DFRM were concerned however of the complexity of the approach and that it was untested. It was also expressed that it was a surrogate for direct payments to manage land for conservation that already existed but with a more complicated approach to determine financial values.

3.5.2 Contributions to Existing Conservation Programs

There are opportunities to work with existing conservation programs to deliver biodiversity offsets for the NNP1 project.

These existing programs include:

- Convention on Biological Diversity (CBD) projects;
- Reduced Emissions from Deforestation in Developing Countries (REDD+) projects in Lao PDR;
- Sustainable Forestry and Rural Development (SuFoRD) project (now known as SUPSFM);
- IUCN Lao Illegal Wildlife Trade Action Group;
- IUCN Gibbon Conservation Action Plan; and
- KfW Entwicklungsbank Bank Forest Protection Program (*now defunct*).

During consultation with DFRM and MoNRE, they identified REDD+ and potential forestry related projects as potential supplementary mechanisms for biodiversity offsets. They discounted the current projects run by the IUCN as they are geographically removed from Bolikhamxay Province (although the models can be used). Also, CBD projects are currently being funded by other sources as of August 2013.

DFRM mentioned a new project funded by the World Bank and the Government of Finland in May 2013. It replaces SuFORD and is called the Scaling-Up Participatory Sustainable Forest Management (SUPSFM) Project. This project is aimed at implementing participatory approaches to sustainable forest management. It links into the current REDD+ to avoid the unnecessary loss of forests and increased carbon storage.

Table 3.1 Biodiversity Offset Governance, Site and Program SWOT analysis

	Factors relevant to NNP1PC		Relevant external factors	
Mechanism	**Strengths** *Characteristics that give the option an advantage over others*	**Weaknesses** *Characteristics that place the option at a disadvantage relative to others*	**Opportunities** *Elements that are advantageous for the option*	**Threats** *Elements that could constrain the option*
Governance options				
Aggregate Offset Fund	Provides NNP1PC with a mechanism to manage biodiversity offsets. Provides an administrative approach to enable offset package management beyond the concession agreement horizon. Offset package delivery by government and NGO stakeholders who are better placed to manage biodiversity offset programs and sites.	The AOF has yet to be established and there are timing risks with ensuring that the legal and administrative procedures are in place to administer the offsets for the NNP1 project.	Provides Lao PDR with a consistent approach to manage biodiversity offsets through the AOF. Allows engagement of NGOs to provide management of offset sites in Lao PDR and building capacity of the Lao PDR Government agencies (such as MoNRE and DFRM). Provides a long-term sustainable funding mechanism for conservation management in Lao PDR.	Establishment of the AOF has not been completed; however the basic framework has been established and is in place. Capacity of Lao PDR government agencies to manage the AOF in the short term will require support and capacity building. Further work is required to develop the metric required to determine the offset quantum and the value of trust fund deposits for the AOF.
MoNRE Management through provincial government structures	Provides NNP1PC an existing mechanism to work with MoNRE to implement watershed and biodiversity offset management for the project. Provides an administrative approach to enable offset package management beyond the concession agreement horizon. Offset package delivery by MoNRE who have experience in managing offset management operations.	Lack of control in the management of specific projects to achieve the required biodiversity offset improvements.	Is compatible with Lao PDR Strategies for improving natural resource management. Engages regional and local stakeholders in the management of water resources and the biodiversity offset package.	Development of the River Basin Management Guideline Process has not been completed. Provincial and District level governments untested in managing and implementing biodiversity offsets, however they have had experience in administering programs for biodiversity protection (in conjunction with WCS).

	Factors relevant to NNP1PC		Relevant external factors	
Mechanism	**Strengths** *Characteristics that give the option an advantage over others*	**Weaknesses** *Characteristics that place the option at a disadvantage relative to others*	**Opportunities** *Elements that are advantageous for the option*	**Threats** *Elements that could constrain the option*
River Basin Committee	Provides NNP1PC a mechanism to influence upstream management of water resources in the Nam Ngiep Watershed. Provides an administrative approach to enable offset package management beyond the concession agreement horizon. Offset package delivery by government and NGO stakeholders who are better placed to manage biodiversity offset programs and sites.	Lack of control in the management of specific projects to achieve the required biodiversity offset improvements. Biodiversity offsets proposed for the Nam Xan watershed and PKK NPA would be outside the jurisdiction of the proposed RBC and would be required to be directly administered by NNP1PC or the EPF rather than the RBC.	Provides a whole-of-river basin approach to managing offsets. Is compatible with Lao PDR Strategies for improving water resource management. Engages regional and local stakeholders in the management of water resources and the biodiversity offset package.	RBC not established in a timely fashion by the Government of Lao PDR. Lack of engagement by stakeholders in the establishment of the RBC. Insufficient funds are provided by the Government of Lao PDR and other interested parties to support the establishment of the RBC.
Water Management and Protection Authority	Provides an administrative approach to enable offset package management beyond the concession agreement horizon. Offset package delivery by government and NGO stakeholders.	Approach does not enable a whole-of-river approach to the management of water resources and hence limits NNP1PC to influence the process and outcomes of the WMPA.	Provides a framework to directly manage the biodiversity offset package. Approach is compatible with Lao PDR Strategies for improving water resource management. Engages regional and local stakeholders in the management of water resources and the biodiversity offset package. Enables the competitive tender of management of offset sites. This has advantages in terms promoting value for money for the management of offset sites.	WMPA not established in a timely fashion by the Government of Lao PDR. Lack of engagement by stakeholders in the establishment of the WMPA.

	Factors relevant to NNP1PC		Relevant external factors	
Mechanism	**Strengths** *Characteristics that give the option an advantage over others*	**Weaknesses** *Characteristics that place the option at a disadvantage relative to others*	**Opportunities** *Elements that are advantageous for the option*	**Threats** *Elements that could constrain the option*
Environment Protection Fund	Provides an established mechanism to administer funds for the biodiversity offset sites and programs. Removes responsibility for financial management for offsets from the NNP1PC beyond the concession agreement horizon.	Removes control over the expenditure of funds by NNP1PC and hence direct influence on outcomes. May increase costs of management through additional administrative requirements of the EPF.	The EPF allows Lao PDR Government to have control and administer the biodiversity offset package. Establishes the EPF as a mechanism to manage biodiversity offsets in Lao PDR.	Lack of experience in the administration of the EPF for biodiversity offsets. Capacity of the EPF to manage multiple biodiversity offset projects.
Candidate Offset Site Options				
Nam Xan Valley	Equivalent "like for like" aquatic and terrestrial biodiversity values are present in the Nam Xan Valley to meet the obligations of NNP1PC.	Land tenure and existing resource use (forestry, water and minerals) constrain the ability of the watershed to be used for terrestrial and aquatic biodiversity offsets and hence the offsetting obligations of NNP1PC.	Opportunities exist to manage the section of river between Thasi to Ban Kheadong and Borikhan as an aquatic offset. Some forested areas of Production Forest could be reclassified as Protection Forest in Xieng Khouang Province and Bolihanxay Province to form part of a terrestrial biodiversity offset.	Threats exist from existing hydro power projects in the upstream portion of the watershed. Mining and forestry activities may impact on the aquatic and terrestrial biodiversity values that the offsetting is designed to protect and manage. Currently no coordinated river basin wide approach to managing threats exists. DFRM may not agree to reclassifying forest without compensation.

	Factors relevant to NNP1PC		Relevant external factors	
Mechanism	**Strengths** *Characteristics that give the option an advantage over others*	**Weaknesses** *Characteristics that place the option at a disadvantage relative to others*	**Opportunities** *Elements that are advantageous for the option*	**Threats** *Elements that could constrain the option*
Nam Ngiep Valley	Equivalent "like for like" aquatic and terrestrial biodiversity values are likely present in the Nam Ngiep Valley that meet the requirements of the ADB. Benefits from coordinated watershed management can meet biodiversity, aquatic and watershed protection outcomes for NNP1PC.	Continued upstream activities (forestry, hydropower and mineral development) constrain the ability of portions of the watershed to be used as suitable aquatic and terrestrial offsets. Current land uses and tenure (mining, forestry, agriculture) constrain the ability of the area to be used for the purposes of biodiversity offsets.	Opportunities exist to manage the area of forest immediately adjacent to the reservoir and sub watersheds for aquatic and biodiversity related offsets. Some forested areas of Production Forest could be reclassified as Protection Forest within the watershed to form part of the terrestrial biodiversity offset and assist in the management of watershed resources.	Threats exist from existing hydro power projects in the upstream portion of the watershed. Agriculture, mining and forestry activities are also a primary threat to aquatic and terrestrial biodiversity values. Currently no coordinated river basin wide approach to managing threats. DFRM may not agree to reclassifying forest without compensation.
Nam Kading NPA	Significant biodiversity values are present in Nam Kading NPA that require management intervention to prevent degradation and loss that would benefit from management as an offset by NNP1PC.	Equivalent "like for like" biodiversity values may not be present in the Nam Kading NPA and hence might not meet the obligations of NNP1PC.	Existing management of the site by WCS provides an established framework to build on for management of biodiversity values. Nam Kading NPA contains significant biodiversity values that would benefit from ongoing management funding and actions.	Threats from hydro power projects, management of poaching, pests and weeds are ongoing issues in the NPA that would require careful management.

	Factors relevant to NNP1PC		Relevant external factors	
Mechanism	**Strengths** *Characteristics that give the option an advantage over others*	**Weaknesses** *Characteristics that place the option at a disadvantage relative to others*	**Opportunities** *Elements that are advantageous for the option*	**Threats** *Elements that could constrain the option*
Phou Khao Khouy NPA	Significant biodiversity values are present in Phou Khao Khouy NPA that would benefit from management intervention to prevent further loss of biodiversity values. Equivalent "like for like" biodiversity values are present for some of the values required to meet the obligations of NNP1PC.	Not all equivalent "like for like" biodiversity values are present in the NPA. No current management of biodiversity values exists for the NPA and hence no established framework is available to build upon. NNP1PC would need to establish a framework for management to occur.	Conservation gains by actively managing biodiversity values of the NPA would be beneficial given there is no current management.	The local military are the current custodians of the NPA. The ability for the local military to adequately manage the reserve for conservation purposes is unproven. Threats from hydro power projects, management of poaching, pests and weeds are ongoing issues in the NPA that would require careful management.
Huay Ngua Provincial Protected Area	Significant biodiversity values are present at Huay Ngua Provincial Protected Area that would benefit from management intervention to present the further loss of biodiversity values. Equivalent "like for like" biodiversity values are present in the PPA and would meet some of the values required to meet the obligations of NNP1PC. Ability to engage affected communities in the management of biodiversity values given the proximity of the PPA to the resettlement site.	Not all equivalent "like for like" biodiversity values are present in the NPA. No current management of biodiversity values exists for the PPA. A draft management plan exists but will need to be updated. No established framework is available to build upon to administer the PPA. NNP1PC would need to establish a framework for management to occur.	Conservation gains by actively managing biodiversity values of the PPA would be beneficial given there is no current management. Ability to engage the local community directly in management, including those who have been resettled as part of the project.	The PPA is located next to the resettlement site for the NNP1 project. Impacts from poaching, NTFP collection will need to be carefully managed. The PPA is currently managed for multiple uses that are not conducive to conservation.

Mechanism	Factors relevant to NNP1PC		Relevant external factors	
	Strengths *Characteristics that give the option an advantage over others*	**Weaknesses** *Characteristics that place the option at a disadvantage relative to others*	**Opportunities** *Elements that are advantageous for the option*	**Threats** *Elements that could constrain the option*
Program options				
Payments for Ecosystem Services	Enables NNP1PC to provide a payment for ecosystem service value to meet biodiversity offset obligations rather than physically managing offset sites and managing programs. Obligations for management are undertaken by third parties who may be better placed to manage biodiversity offsets.	Comprehensive assessment of the ecosystem service values of the residual biodiversity values lost will need to be undertaken. This is likely to be costly and time consuming. Quantifying losses and gains for the offset metric is problematic, hence achieving "no-net-loss" of biodiversity values will be difficult to quantify.	Conservation gains by paying existing resource managers (DFRM; MoNRE) to manage biodiversity values means that PES payments can build capacity of the agencies to deliver biodiversity protection.	DFRM expressed concern on the obligations imposed as a result of the Nam Theun 2 Project through PES payments. Untested approach to delivering biodiversity offsetting within Lao PDR.
CBD Projects	Existing CBD Projects have been prepared by WCS. These projects are focussed on the management of biodiversity values in Nam Kading NPA. This may partially meet the offset obligations for NNP1PC. Obligations for management are undertaken by third parties who may be better placed to manage biodiversity offsets.	The CBD projects are currently out-of-date and require further analysis before they would be ready to be funded. The CBD projects do not adequately ensure a "like for like" biodiversity offset outcome as the offset sites do not match all of the residual biodiversity values required to be offset. Quantifying losses and gains for the offset metric is problematic as assessments have not been undertaken for the areas covered by the CBD projects, hence achieving "no-net-loss" of biodiversity values will be unknown.	Builds on existing work being undertaken by WCS in enhancing the NPA network in Lao PDR.	Ongoing funding of projects beyond the 5 year horizon not outlined nor confirmed. Additional funding proposals would need to be prepared.

	Factors relevant to NNP1PC		Relevant external factors	
Mechanism	**Strengths** *Characteristics that give the option an advantage over others*	**Weaknesses** *Characteristics that place the option at a disadvantage relative to others*	**Opportunities** *Elements that are advantageous for the option*	**Threats** *Elements that could constrain the option*
REDD+ and SuFORD Projects (*Note SUPSFM has now replaced SuFORD*)	Existing REDD+ and SuFORD projects are undertaken in Lao PDR and could be used as mechanisms to deliver offset management programs within the Nam Ngiep and Nam Xan watersheds. (Note that SuFORD has now been replaced by SUPSFM as of May 2013).	REDD+ and SuFORD projects primary objectives are for carbon capture and sustainable forestry. Tangible outcomes for biodiversity values would be secondary outcomes. Ensuring biodiversity outcomes meet NNP1PC's obligations would need to be inbuilt into the project definitions. Third parties would be responsible for the delivery of the REDD+ and SuFORD projects. These parties may not adhere to the biodiversity objectives explicit for achieving a biodiversity offset for the NNP1 project.	REDD+ and SuFORD projects have been extensively used in Lao PDR to manage forestry activities. This experience can be applied to the Nam Xan and Nam Ngiep watersheds to supplement biodiversity offsets through specific targeted projects.	Management of REDD+ projects is subject to the international trade in carbon permits. This market may not be stable and impact on offset management if carbon credits derived are not able to be traded. The SUPSFM project is new and will require further analysis to determine its application to candidate offset areas.
IUCN Programs	Existing IUCN projects are undertaken in Lao PDR to manage Gibbons and the Illegal Wildlife Trade. These projects can be supported through an environmental contribution to supplement the biodiversity offset package.	The existing IUCN projects will only supplement the requirements for a biodiversity offset. The IUCN projects are undertaken in a different geographic area in Lao PDR than the Nam Ngiep Project. This may not meet the "like-for-like" offset requirements.	Existing IUCN projects offer the opportunity build on capacity developed in species specific conservation management in Lao PDR.	Ongoing funding and support of these projects is required to ensure long term biodiversity gains. This funding and commitment is not guaranteed beyond the 5 year horizon.

4 RECOMMENDED BIODIVERSITY OFFSET PACKAGE

The following biodiversity offset package has been derived based on the analysis of the options outlined in *Section 3* of this report and feedback on the consultation processes with the Government of Lao PDR, NGOs, the ADB and the IAP.

Regarding the proposed Aggregate Offset Fund (AOF), this mechanism has not been recommended as an offset option following consultations with the Lao PDR Government. Further work would be required to create a greater understanding of the approach and strengthen the capacity of the Lao PDR Government to develop and implement such an appraoch. Further policy work and engagement with the Government is also required to define an appropriate offset metric and a method to determine the value of trust fund deposits. The World Bank, the ADB or other stakeholders may consider this option in the future.

The following recommended options have been developed and endorsed by the Lao PDR Government. The biodiversity offset framework for habitats and specific species includes:

3. Forested and riverine areas of the Nam Ngiep Watershed to manage biodiversity in terrestrial and aquatic habitats; and
4. Species specific offsets within the Nam Ngiep Watershed or other candidate areas (such as the Phou Khao Khouy NPA or other areas as required).

The recommended areas are based on feedback presented by the IAP during a consultation session held in January 2014 on the biodiversity offset package for the NNP1 Project and consultation workshop with the Government of Lao PDR and NGOs in March 2013 and MoNRE in March 2014.

Funding would be provided by the existing negotiated concession agreement funds allocated to manage the offset package (approximately $11.5M over 27 years). Additional funds may be required to facilitate species offsets and this will be determined later.

This section provides an overview of the legal, administrative, governance, monitoring and reporting requirements to establish an AOF within Lao PDR. Further discussion on the specific offsets required to be established for the NNP1 project are discussed at *Section 4.1.2*.

A map of the recommended offset areas can be found at *Figure 4.1*.

290000 300000 310000 320000 330000 340000 350000 360000 370000

2160000 2150000 2140000 2130000 2120000 2110000 2100000 2090000 2080000 2070000 2060000 2050000 2040000

Xay
Phianloung
Dhu
Plain of Jars
Phonsavan
Muang Khoun
Phaxai
Ban Pou
Thathom
Thongkhoun
Namcha
Xiengmi
Ban Hat Gniun
Ban Hatsaykham
Ban Thahuea
Ban Sisavath
Ban Nonsomboun

Legend

- Nam Ngiep Inundation Area
- Watershed Management Boundary
- Watercourse
- Road
- City, Town or Village

Candidate Offset Areas:

- Nam Ngiep Offset Area
- Phou Khao Khouay National Protected Area

Forest Zone:

- Protection Forest
- Production Forest

N

0 5 10 15Km

1:325,000

Basemap: Bing Maps

Client:	Nam Ngiep Power Company Ltd.		
Drawing No:	0185065b_Watershed_Man.mxd		
Date:	09/04/2014	Drawing Size: A3	
Drawn By:	TC	Reviewed By: DN	

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 4.1 - Watershed Management and Biodiversity Offset Areas

Nam Ngiep 1 Hydropower Project

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

4.1 OUTLINE OF THE BIODIVERSITY OFFSET PACKAGE

4.1.1 Legal Requirements

The protection forests of the Nam Ngiep watershed currently do not have sufficient legal protection from illegal and inappropriate activities that may impact aquatic and terrestrial habitats. This means that a legal mechanism should be established to secure the land tenure for offsets to manage land-use activities and to enable the administration and management of those areas.

The Concession Agreement (*Section 7 Biodiversity Offset, subsection c.*) requires the biodiversity offset area to be classified as a "Conservation Area". However, it is recommended that a "Provincial Government Decree" be used to secure the Protection Forests of the Nam Ngiep 1 watershed for the purposes of a biodiversity offset.

This can be achieved under the provisions of the *Forestry Law 1996* by declaring the forested areas and define to a "Total Protection Zone"[1] or "Controlled Use Zone"[2] under the existing Protection Forest classifications. The area could also be declared as a "Provincial Protected Area" by the provincial governor.

The recommended offset area is within the newly created Xaysomboun province. This would mean that the Xaysomboun Provincial Government would be required to draft and proclaim the chosen Decree.

The *Water Resources Law 1996*, *Land law 2003* and the *Wildlife and Aquatic Animals Law 2007* may also be used to implement and enforce offset management activities. However, no specific changes to these laws are required specific to establishing the offset for the NNP1 project.

4.1.2 Administration and Governance

To administer and govern the identified offset areas, it is recommended that an "NNP1 Offset Advisory Committee" be established. This Committee should be formed with membership from PoNRE, DFRM and NNP1PC.

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[1] *Total protection zone* are the forest areas of which the slope is above 35 degrees, containing areas of water resources, forests along the rivers, roads and other areas with a high risk of environmental degradation. These areas must be strictly protected and it is prohibited to conduct activities such as shifting cultivation, cutting, destruction, burning, removing trees, collecting firewood, feeding animals, constructing houses or any other construction activities, including extraction of soil, stones, mining and ore and harvesting of NTFP with exceptional cases stated in *Articles 44* and *70* of the *Forestry Law*.

[2] *Controlled use zone* is the forest area without high risk of environment impacts. These areas must be protected similar to the total protection zone, but people are allowed to use wood and forest products according to the management plan.

This would be chaired by DFRM at representatives from MoNRE, the community, NNP1PC (as an observer) and an independent advisor holding seats on the committee. Other representatives and stakeholders can be invited to sit on the Committee as required. The Committee would:

- Lead the development of a conservation needs assessment for the offset areas;
- Provide overall direction to the offset package and resolve any disputes;
- Recommend employment of appropriately qualified persons with experience in conservation and landscape restoration to provide capacity building to DFRM;
- Review the annual report to determine the adequacy of management measures;
- Recommend to NNP1PC to release funds; and
- Review recommended changes in management plans and actions.

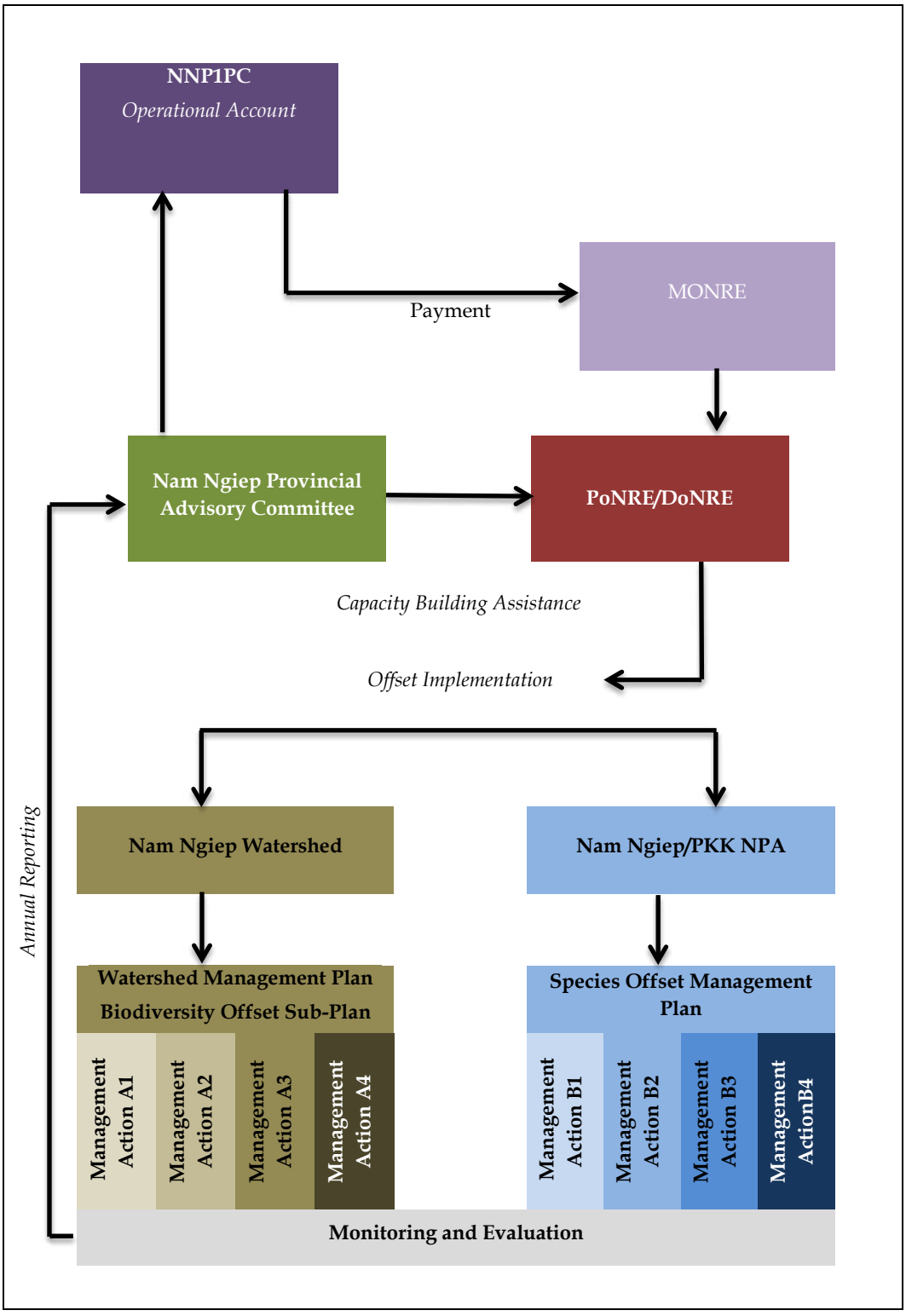
The recommended roles and responsibilities for offset management are outlined in *Table 4.1*.

Figure 4.2 outlines the proposed structure for offset administration and management.

Table 4.1 Roles to administer and manage the NNP1 Offsets

Agency	Roles
MoNRE	Coordinate across government agencies for the administration of funds as technical coordination team may be established.
PoNRE/DFRM	Coordinate offset management activities at the provincial and district level and directd management of the offset sites. Chair and provide support for the Nam Ngiep 1 Offset Advisory Committee.
DoNRE	Implement offset management through the application of management measures. Work with the capacity building NGO when needed to implement and monitor the effectiveness of offset management.
Capacity Building NGO	Assist GoL agencies in the design of offset measures and implementation of the offset package.
NNP1PC	Oversee the implementation of offset site management and provide funding based on performance measures.
Independent Advisor	Provide independent advice to NNP1 Offset Advisory Committee on the adequacy of offset measures.
Capacity Builder	Provide support and technical advice for the development and implementation of management plans, monitoring and evaluation.

Figure 4.2 Proposed structure, roles and responsibilities for offset management.



4.1.3 Relationship to Watershed Management

This offset framework is designed to manage the defined offset areas. These areas are contained within the area of responsibility of the *Nam Ngiep Watershed Management Committee*. The Committee will have overall responsibility for managing the watershed of the Nam Ngiep River. The purpose of the watershed management activity is to manage activities in the watershed to protect water quality and manage future development through landuse planning and management. It should be noted that the area for management is the entire Nam Ngiep watershed, including areas of aquatic habitats downstream of the dam wall.

Management of the offset areas will be through a sub-plan of the *Nam Ngiep Watershed Management Plan* and will be managed by a separate sub-committee of the *Watershed Management Committee*. The primary focus of the sub-committee will be managing the offset areas for conservation of terrestrial and aquatic biodiversity. The offset areas are also only part of the watershed management area, being the production and protection forests of the Nam Ngiep watershed.

Management measures required for the watershed should be complementary to the biodiversity offset management areas. Particular attention should be made to the design of the *Watershed Management Plan* in relation to the management of aquatic and terrestrial habitats as outlined in *Section 4.2* below.

The conservation needs assessment undertaken for terrestrial and aquatic habitats should be used as one of the primary inputs into the watershed management planning process.

4.2 OFFSET SITE MANAGEMENT

4.2.1 Nam Ngiep Watershed

Managing Terrestrial Habitats

Standard management actions have been designed to achieve gains in biodiversity values for the terrestrial habitats of the Nam Ngiep Watershed Production and Protection Forests. These actions should be further developed and incorporated into the *Watershed Management Plan Biodiversity Offset Sub-Plan*.

The first step of the development of the Plan will be a "conservation needs assessment". This assessment is designed to identify and prioritise key conservation needs for the habitats within the offset area based on the baseline data collected. This exercise should be undertaken to identify key current and future potential threats; priority conservation areas based on significance; landscape planning (such as identifying wildlife corridors) and the

involvement of key stakeholders. The development of the conservation needs can then be used to track management actions and the implementation of any future adaptive management requirements.

An appropriately qualified and experienced consultant should be used to develop with management plan. The management should also be peer reviewed. The standard management actions are outlined in *Table 4.2*.

Table 4.2 Biodiversity Offset Standard Management Actions for Terrestrial Habitats

Management Action	Purpose	Description
1. Conservation Needs Assessment	Determine the priority biodiversity values and management requirements for biodiversity values	This would be informed by the baseline biodiversity data and local stakeholder participation; and would inform the design of the management plan. A baseline for management should be established and enable future tracking for effectiveness by using a tracking tool (such as the GEF tool), which could be updated periodically to guide future adaptive management actions.
2. Management Plan	Defines governance framework for management of offset projects.	The management plan is to provide the roles, responsibilities, accountabilities, actions, resources and budgets available to actively manage biodiversity offset sites. Clear goals and objectives linked to the monitoring and evaluation framework should be set. Development of the management plan would normally be prepared through consultation with key stakeholders and participation of affected local communities.
3. Monitoring and evaluation	Defines approach to monitor the implementation of management actions	The monitoring and evaluation framework is to define an approach to determine the effectiveness of the management actions in achieving biodiversity conservation goals. The approach should look at the institutional, financial and governance frameworks applied as well as relevant biodiversity indicators (species richness, basal area). The monitoring and evaluation should directly relate to goals and objectives set for offset management. The outcomes of the monitoring and evaluation should be used as a basis for (i) reporting to relevant stakeholders; and (ii) informing adaptive management actions, including the periodic update of management plans.
4. Management of hunting	Manages threats to animals from illegal hunting and poaching.	The management of hunting should aim to monitor and enforce in conjunction with MoNRE and the community, activities that illegally hunt and poach wildlife within the offset site. The approach should include: patrols and surveillance for illegal hunting activities; education and awareness; and incentives.
5. Sustainable forestry management	Manages unsustainable and illegal use of timber.	Sustainable forestry management should focus on the ecologically sustainable harvesting of timber from the offset site for the use within the local community. The approach should restrict impacts on known habitats to threatened species; sustainable yield assessment and harvesting approaches; patrols and surveillance for illegal forestry activities; education and awareness and incentives.
6. Wildlife Corridors	Links habitats within the landscape	Development of appropriate wildlife corridors enables the movement of wildlife between discrete areas of habitat within the landscape. This can be achieved through landuse planning or supplementary establishment of habitat.
7. Sustainable forest product use (NTFP)	Manages unsustainable NTFP use.	The sustainable use of NTFP should focus on documenting cultural and heritage usage of NTFP; analysis of sustainable yield for NTFP; identifying alternatives where sustainable collection is identified; and education and awareness on sustainable collection practices.
8. Management of weeds and pests	Manages threats to biodiversity from introduced weeds and pests.	Managing weeds and pets should: identify and monitor the distribution and abundance of weeds and pests in the area; identify appropriate controls at a spatial and temporal scale; define control techniques and actions. Actions may include active control of weeds or specific hunting programs for pest animals.

Management Action	Purpose	Description
9. Fire management	Manages impacts on biodiversity from inappropriate use of fire.	Managing fire should: identify historical fire regimes within the offset site at a spatial and temporal scale; determine ecological fire regimes based on intensity and frequency of fire; defining and map exclusion zones; consider threatened species responses to fire; and design ecological fire control methods.
10. Sediment and erosion control	Manages impacts on water quality and soil integrity from sediments and erosion.	Sediment and erosion control should focus on key sources of sediment pollution within the watershed. Mapping of soils and erosion sources should be undertaken; and targeted management actions should be designed to manage sediment sources (natural surface roads, areas of existing erosion). A detailed maintenance and monitoring regime should also be designed to ensure the effectiveness of management control measures.
11. Assisted natural regeneration	Promotes biodiversity where natural regeneration is constrained due to past land use or ecological factors.	Assisted natural regeneration should focus on the establishment of relevant plant stock to assist natural regeneration of disturbed areas. Assessment and mapping of areas identified as being suppressed or degraded; determination of suitable plant stock and planting regime; collection and propagation of plant stock; preparation and management of regeneration areas. Local community engagement in horticultural activities is recommended.
12. Habitat installation (eg. nest boxes and salt licks)	Provides habitat for species where natural habitats have been removed.	Habitat enhancement should focus on restoring critical habitat features such nesting hollows that have been impacted or removed from the forest. An assessment should be undertaken of the presence of habitat features (such as nesting tree hollows, shelter and refuge sites) within the offset area. A program of habitat installation should occur to mimic the natural presence of these features within the landscape. An example is the installation of nest boxes for hollow dependant birds or salt licks for terrestrial mammals.
13. Community engagement and development	Provides consultative mechanisms and engages the community in active participation in biodiversity conservation.	Community engagement and development is designed to involve the local community in the management actions developed for each the offset sites. Consultation during the preparation of the management plans is required to ensure that the management actions and approaches are acceptable to the community. This can include direct engagement in undertaking actions (hunting patrols, employment at the nursery; manufacture of nest boxes). Community engagement is an essential component in determining the appropriateness and ensuring success of the sustainable forest practices and NTFP development.
14. Education and awareness	Provides education and awareness for local communities to promote biodiversity conservation.	Education and awareness approaches are integral to the success of offset management. This should include community engagement surveys; education seminars; posters and flyers; identification of community champions and incentives. Each management action should include an education and awareness component.

Managing Aquatic habitats

In relation to managing aquatic habitats within the Nam Ngiep watershed, the standard management actions in *Table 4.3* have been developed. These are intended to be implemented in the *Watershed Management Plan* to be prepared by MoNRE. Downstream aquatic environments will be managed through the environmental flow management regime.

Assessment of fish species in the Nam Ngiep watershed was undertaken by Dr Maurice Kottelat, including in relation to new-to-science endemic species found in tributaries of the Nam Ngiep. Dr Kottelat has provided advice that protection of the watershed through management activities aimed at protecting water quality is the preferred approach to protecting habitats for these species. *Table 4.3* outlines the key management measures required as they relate to the protection of habitat for these species.

Similar to the development of management measures for terrestrial habitats, managing aquatic habitats will require a "conservation needs assessment" as the first step. This assessment should consider the assessments undertaken by Dr Kottelat and data collected for fish species in the Nam Ngiep River. Based on this data, the needs assessment should develop management actions consistent with those management actions contained in *Table 4.4*, but based on the specific requirements contained in the watershed or sub-watersheds. Additional measures may be added based on specific needs of particular species or threats identified.

An appropriately qualified and experienced consultant should be used to develop the requirements for the management of aquatic habitats within the offset management plan. The management plan should also be peer reviewed.

The target species to be defining aquatic habitat management actions using the conservation needs assessment are outlined in *Table 4.3*.

Table 4.3 Target species for the development of aquatic habitat management actions

Species name	Common name
Poropuntius deauratus	Yellow tail brook barb
Cirrhinus cirrhosus	Mrigal carp
Cyprinus carpio	Wild common carp
Scaphognathops bandanensis	Bandan sharp-mouth barb
Yasuhikotakia splendida	Jaguar loach
Cirrhinus molitorella	Mud carp
Mekongina erythrospila	
Hemibagrus wyckioides	Redtail catfish
Luciosoma bleekeri	Apollo shark minnow

Table 4.4 Standard Offset Aquatic Management Actions

Activity	Actions
Conservation Needs Assessment	The conservation needs assessment should be based on the baseline biodiversity data and local stakeholder participation. This assessment will enable specific actions to be developed based on the conservation needs of habitats and particularly species. This step should be used to inform the design of the management plan. A baseline for management should be established and enable future tracking for effectiveness by using a tracking tool (such as the GEF tool), which could be updated periodically to guide future adaptive management actions.
Monitoring and evaluation	Monitoring and evaluation of the impacts on aquatic species and habitats will be undertaken. This will include: • Research into the fishery health of the Nam Ngiep River; • Analysis of the fishery yield of the Nam Ngiep River; • Research into the lifecycle of CR and EN fish within the lower Nam Ngiep; • Water quality monitoring; • Watershed protection activities; and • Watershed risk mapping.
Sediment and erosion control	Sediment and erosion control activities from natural surface roads, agriculture and developments in offset areas and the Nam Ngiep river will be targeted. This will include: • education and awareness of best practices for sediment and erosion control; • dissemination of best practice guides for sediment and erosion control; • engagement with MoNRE regarding the design and maintenance of natural surface roads; • engagement with DFRM on sediment and erosion control in Production Forests; and • agricultural extension activities.
Riparian area protection	Targets the protection of riparian areas to enhance habitats and prevent degradation of water quality from overland diffuse sources of pollution. This will include Watershed management activities that protect riparian habitat; management of diffuse and point source pollution; land use management activities; education and awareness; workshops and engagement with landholders to promote sustainable land use practices, including agricultural and forestry extension activities.
Management of fish habitat	Targets the management of fish habitat to protect and enhance habitat for species lifecycle. Management of fish habitat includes the preservation of in-stream habitat from clearance; active enhancement of existing habitats; Watershed management activities to manage diffuse and point pollution sources; and sustainable fisheries management techniques.
Community engagement and development	Community engagement and development is key to improving watershed management and habitat quality. The diffuse nature of water pollution and its impact on water quality requires community extension activities aimed at: • awareness of landuse activities on water quality; • extension activities with major landuse activities (agriculture, forestry, hydro and mining developments); and • Fisheries awareness and sustainable management.

Activity	Actions
Education and awareness	Education and awareness activities should be aimed at Government (MoNRE; PoNRE and DFRM); industry and the local community. Engagement of MoNRE and PoNRE through the administration of offsets will improve capacity and understanding of watershed management activities. At a local level, community engagement and development activities should be aimed at improving the knowledge and understanding of watershed management activities and key threats to aquatic ecosystems.

4.2.2 *Terrestrial Species Specific Management Actions*

Table 1.4 outlines the presence of species values within candidate offset sites (Nam Ngiep Watershed and PKK NPA) and the management program required for those species to manage and recover these populations.

Both the Nam Ngiep and PKK NPA are included in the offset package in order to increase the opportunities for identifying and protecting the target species. Target species in this instance mean those species where habitat has been identified but the species has not been found present. If the target species are identified through survey in the Nam Ngiep Watershed, species offsets in PKK NPA may not be necessary. However, if these species are not identified or management is not successful in either location, additional offsets may be required elsewhere in Lao PDR.

The first step will be a comprehensive survey in the Nam Ngiep Watershed offset area to identify the target species. The species denoted with an * in *Table 4.4* under the "Nam Ngiep Watershed" should be the priority species for survey as they have not previously been recorded in the watershed area above FSL. Further survey would be required in PKK NPA for those species not identified as present in the Nam Ngiep Watershed. Other areas within Lao PDR may also be required to be surveyed to identify presence of the target species if they cannot be found within the Nam Ngiep Watershed or PKK NPA.

It is recommended that a *Species Offset Management Plan* be prepared to outline the management actions required for the target species once their presence has been confirmed. This management plan should be prepared by a suitably qualified and experience consultant under the direction of the Nam Ngiep Offset Advisory Committee. The plan should also be peer reviewed prior to implementation.

Table 4.4 Species Management Framework

	Species	PKK NPA	Nam Ngiep Watershed	Offset Management Required (included Species Offset Management Plan)
Category 1 species where the species are more restricted in their range or specific lifecycle elements indicate that the residual impacts remaining after mitigation on habitats for the species is likely to be more significant than for Category 2 species.				
Mammals	Asian small clawed otter	*	✓	• Survey and monitoring of species presence within offset areas. • Identification of core habitat and management of identified populations • Species specific management actions identified to manage identified populations. • Targeted campaigns to manage key threats (eg. education and awareness activities for individual species). • Alignment of conservation priorities to National and International management plans and requirements • Monitoring the effectiveness of offset management activities on species populations
	Asian elephant	✓	✓	
	Smooth coated otter	✓	✓	
	Sunda pangolin	✓	✓	
	Leopard	*	*	
	Tiger	*	✓	
	Fishing cat	*	✓	
	Phayre's leaf monkey	✓	✓	
	White-cheeked gibbon	✓	✓	
Birds	Green peafowl	*	*	
Reptiles	Elongated tortoise	*	*	
	Big-headed turtle	*	✓	
Category 2 species have a wide distribution and the residual impacts remaining after mitigation on habitats for the species from the project is a relatively small proportion of the total distribution of habitat for the species				
Flora	Dipterocarpus turbinatus	-	✓	• Supplementary planting of individuals.
	Shorea roxburghii	-	✓	
	Afzelia xylocarpa	-	✓	
Mammals	Golden jackal	*	*	• Survey and monitoring of species presence within offset areas. • Targeted survey for species not identified (particularly birds). • Management of key threats. • Identification of core habitat and management of populations • Monitoring the effectiveness of offset management activities on species populations
	Southwest China serow	-	✓	
	Dhole	✓	✓	
	Sun bear	*	✓	
	Bengal slow loris	✓	✓	
	Pygmy slow loris	*	✓	
	Asiatic golden cat	*	*	
	Leopard cat	*	*	
	Sambar	*	✓	
	Himalayan black bear	✓	✓	

	Species	PKK NPA	Nam Ngiep Watershed	Offset Management Required (included Species Offset Management Plan)
Birds	Wreathed hornbill	*	*	• Alignment of conservation priorities to National and International management plans and requirements
	Great hornbill	*	*	
	White winged duck	*	✓	
	Greater coucal	*	*	
	Siamese fireback	*	*	
	Silver pheasant	*	*	
	Grey peacock pheasant	*	*	
	Red-breasted parakeet	*	*	
	Darter	*	*	
	Rufous necked hornbill	*	✓	
	Crested argus	*	*	
	Spot-bellied eagle owl	*	*	
	Red-collared woodpecker	*	*	
	Hoopoe	*	*	
Reptiles	Reticulated python	*	*	
	King cobra	*	✓	

✓ - Denotes survey or literature has identified the presence of the species

* - Denotes likely habitat present for the species

4.2.3 *Funds available*

Table 1.6 outlines the current funds available from the Concession Agreement to manage offsets.

Table 4.6 Funds available from the Concession Agreement to manage offsets

NNP1 Offset Concession Agreement Available Funds	Before COD	After COD	Total
Available to be used for Biodiversity Offset Under Clause 54 of Annex C of the CA			
Wildlife Protection Program Protection program	$356,000	$432,000	$788,000
Wildlife conservation awareness	$72,000	$96,000	$168,000
Wildlife translocation	$90,000	-	$90,000
Forest regeneration	$450,000	$1,200,000	$1,650,000
Survey and monitoring of aquatic biota	$336,000	$840,000	$1,176,000
Sub Total	$1,304,000	$2,568,000	$3,872,000
Available Funds from the Watershed Management Fund Item 1-6 of Annex C of the CA			
Watershed Management Fund*	$3,250,020	$3,300,000	$6,550,020
Species Offset Management**	TBD		
Total	**$4,754,020**	**$6,468,000**	**$11,522,020**

**Clause 4i of Annex C of the Concession Agreement Requires that the following budget breakdown is applicable to watershed management activities:*

i. $5,650,000 for forestry management and reservoir boundary survey in the catchment area, comprising:
- *US$ 10,000 (survey, single payment),*
- *US$ 400,000 per year for 6 years from the Effective Date, and*
- *US$ 120,000 per year for 27 years from COD);*

ii. US$ 800,000 for replantation, based upon the area of the reservoir (single payment);

iii. US$ 40,020 for wildlife removal in the reservoir area, comprising of an annual recurring payment of US$ 6,670 per year for six (6) years prior to impoundment;

iv. US$ 60,000 for water quality monitoring by MONRE, comprising of an annual recurring payment of US$ 12,000 per year for the first five (5) years following COD.

Watershed management shall consist of the following activities in the reservoir area: (i) translocation of wildlife within the watershed and/or in the identified biodiversity offset area; and (ii) forestry protection and management for the entire catchment area, including: replantation of forests, survey of tree species and timber, protection of wildlife, monitoring of landslides and identification of activities of third persons that could have an impact on the watershed, the allocation of water and water quality.

*** Currently unfunded in the CA and will be determined once appropriate costing has been completed*

The requirements as outlined in the CA must be implemented as required. Additional funding allocation may however be required to achieve the objectives of the management of the watershed and species management requirements actions deemed un-funded as outlined in the CA.

4.3 NEXT STEPS

It is proposed that the next steps outlined in the following tables be implemented to progress the Biodiversity Offset package. These recommended next steps include:

- Work sequences to complete the set-up, implementation and review of the package. Proposed work sequences are outlined for:

    1. Implementation of the Nam Ngiep Watershed Management Offset Area (*Tables 4.6, 4.7* and 4.*8*); and
    2. Implementation of the species specific offsets (*Table 4.9*).

- Recommended draft terms of reference for the NNP1 Biodiversity Offset Committee. A draft "terms of reference" is contained at *Table 4.10*; and

- Outlines of recommended capacity building requirements. Draft minimum capacity building requirements are outlined at *Table 4.11*.

Table 4.6 Work Sequence for the Establishment of the Nam Ngiep Watershed Offset Area

	NNP1 Offset Package Implementation	Responsibility	2014	2015
1.	Consultation with Lao Government (MoNRE. PoNRE and DFRM) and stakeholders (NGOs)	NNP1PC EMO	Complete	
2.	Refinement of Offset Package	ERM	Complete	
3.	Endorsement of the Lao Government	MoNRE	Complete	
4.	Community Consultation	ERM/NNP1PC EMO	April	
5.	Financial advice on operating account for NNP1PC	NNP1PC EMO	April	
6.	Initial payment to MoNRE for Watershed Management	NNP1PC/ MoNRE	April	
7.	Development of a MoM to outline the roles and responsibilities for offset management	NNP1PC EMO	April	
8.	Drafting of Provincial Government Decree for Nam Ngiep Watershed	NNP1PC EMO/Xaysomboun Province	May-June	
9.	Drafting terms of reference for NNP1 Offset Advisory Committee	NNP1PC EMO	May-June	
10.	Invite Members for NNP1 Offset Advisory Committee	NNP1PC EMO/Xaysomboun Province	May	
11.	Establishment of NNP1 Offset Advisory Committee	NNP1PC EMO/Xaysomboun Province	August	
12.	Drafting of administrative procedures for NNP1 Offset Advisory Committee	NNP1PC EMO/Xaysomboun Province	August-September	
13.	Meeting of NNP1 Offset Advisory Committee	NNP1PC EMO/Xaysomboun Province	October	
14.	PoNRE capacity building for offset management	PoNRE	December	
15.	PoNRE seek capacity building support	PoNRE		February 2015
16.	First Management Payment from NNP1PC	NNP1PC		February 2015

The following work sequences (outlined in *Tables 1.7* and *1.8*) are proposed for offset management between years 1 - 5 and years 1 – 27.

Table 4.7 Work Sequence for Offset Management Years 1 to 5

Years 1-5 Offset Management Action Sequence	Responsibility	2015	2016
1. Receive Management Payment	PoNRE/ NNP1PC EMO	February	
2. Engage with the Community	NNP1PC EMO/ PoNRE/ Sub Consultant	March	
3. Undertaken conservation needs assessment	NNP1PC EMO/ PoNRE/ Sub Consultant	April/May	
4. Determine Habitat Specific Management Actions	NNP1PC EMO/ PoNRE/ Sub Consultant	April	
5. Determine Management Logistics and Costs	NNP1PC EMO/ PoNRE/ Sub Consultant	April	
6. Develop Watershed Management Plan Biodiversity Offset Sub-Plan (based on conservation needs assessment)	MoNRE/ NNP1PC EMO/sub consultant	May-June	
7. Undertake Baseline Survey(s)	NNP1PC EMO/ PoNRE/ Sub Consultant	June - July; December – January 2016	
8. Submission of Management Plan to NNP1 Offset Advisory Committee	NNP1PC EMO/ PoNRE/ Sub Consultant	August	February
9. Review of Management Plan by peer reviewer and technical advisor	NNP1 Offset Advisory Committee	September-October	March
10. Implement Management Actions	PoNRE/ NNP1PC EMO/ Sub consultant	From November and ongoing to year 5	
11. Annual Monitoring Surveys	PoNRE/ NNP1PC EMO/ Sub consultant		June - July; December - January 2017 and every year until year 5
12. Annual Submission of review	PoNRE/ NNP1PC EMO/ Sub consultant		January and ongoing and every year until year 5
13. Annual Review of performance	NNP1 Offset Advisory Committee		January-February and every year until year 5
14. Management Payment	NNP1PC		February and every year until year 5
15. Review of offset framework implementation	NNP1 Offset Advisory Committee		Year 5 (2020)

Table 4.8 Work Sequence for Offset Management Years 1 to 27

	Management Action	Years 1-5	Years 6-10	Years 11-15	Years 16-20	Years 21-25	Years 26-27
1.	Undertake Conservation needs assessment	Year 1	Year 6	Year 11	Year 16	Year 21	Year 26
2.	Determine Conservation Priorities	Year 1					
3.	Determine Baseline Biodiversity Values	Year 1					
4.	Develop Watershed Management Plan Biodiversity Offset Sub Plan	Year 1					
5.	Determine Species Specific Management Actions	Year 1					
6.	Determine Habitat Specific Management Actions	Year 1					
7.	Establish Permanent Monitoring	Year 1					
8.	Implement Habitat Specific Management Actions	Annual	Annual	Annual	Annual	Annual	Annual
9.	Report on Performance	Annual	Annual	Annual	Annual	Annual	Annual
10.	Review Monitoring results	Year 5	Year 10	Year 15	Year 20	Year 25	Year 27
11.	Review Management Plan	-	Year 6	Year 11	Year 16	Year 21	Year 26
12.	Review Habitat Specific Management Actions	-	Year 6	Year 11	Year 16	Year 21	Year 26
13.	Review Species Specific Management Actions	-	Year 6	Year 11	Year 16	Year 21	Year 26

Table 4.9 Implementation of Species Specific Offset Management Work Sequence

Years 1-5 Offset Management Action Sequence	Responsibility	2015	2016 and ongoing until year 27
1. Survey and monitoring of species presence within offset areas.	PoNRE/ NNP1PC EMO/ Sub consultant	February - March	
2. Undertaking a conservation needs assessment for each target species	PoNRE/ NNP1PC EMO/ Sub consultant	April - May	
3. Development of a Species Offset Management Plan for the Nam Ngiep and PKK NPA (if required)	PoNRE/ NNP1PC EMO/ Sub consultant	May - July	
4. Identification of core habitat and management of identified populations	Sub consultant	June - July	
5. Species specific management actions identified to manage identified populations.	Sub consultant	June - July	
6. Peer review of offset Species Offset Management Plan	Relevant expert	July August	
7. Targeted campaigns to manage key threats (eg. education and awareness activities for individual species).	PoNRE/ NNP1PC EMO/ Sub consultant		Undertake Action
8. Monitoring the effectiveness of offset management activities on species populations	PoNRE/ NNP1PC EMO/ Sub consultant		Undertake Action
9. Review conservation needs assessment based on the effectiveness of management actions	PoNRE/ NNP1PC EMO/ Sub consultant	As needed and every 5 years	As needed and every 5 years

Table 4.10 Draft Terms of Reference for the NNP1 Offset Advisory Committee

	Requirements
Role	Provide leadership and strategic advice for the management of the Nam Ngiep Biodiversity Offset Package
Responsibilities	Coordinate across government agencies for the administration of funds as technical coordination team may be established. Coordinate offset management activities at the provincial and district level and direct management of the offset sites. Chair and provide support for the Nam Ngiep 1 Offset Advisory Committee. Provide independent advice to NNP1 Offset Advisory Committee on the adequacy of offset measures.
Membership and Voting	DFRM (Chair) MoNRE (Permanent member) PoNRE (Permanent Member) DoNRE (Permanent Member) NNP1PC (Observer) Independent Advisor (Observer)
Chair	DFRM Representative
Frequency of Meetings	Initially once every month then as required
Calling Meetings	Formal notice by email or post
Quorum	75% of permanent members and observers
Resources	To be outlined
Reporting	Reporting to the MoNRE

Table 4.11 Outline of Capacity Building Requirements for Offset Implementation

Management Actions Requiring Capacity Building Assistance	Expertise Required
Conservation needs assessment for aquatic and terrestrial habitats	• Experience in the assessment of South East Asian aquatic and terrestrial habitat. • Experience in the design of conservation management plans and management frameworks
Conservation needs assessment for target species	• Experience in the assessment of South East Asian aquatic and terrestrial species (Species specific expertise may be required). • Experience in the design of conservation management plans and management frameworks
Development of the Watershed Management Plan Biodiversity Offset Sub-Plan (based on conservation needs assessment)	• Experience in conservation biology and design of conservation management plans • Community and stakeholder engagement expertise
Development of the Species Specific Biodiversity Offset Plan	• Experience in conservation biology and design of conservation management plans for specific target species (Species specific expertise may be required). • Community and stakeholder engagement expertise
Baseline Survey(s)	• Experience in the design of flora and fauna baseline surveys. Suitable South East Asian field experience.
Review of Management Plans by peer reviewer	• Technical expertise in conservation biology in South East Asia
Targeted campaigns to manage key threats (eg. education and awareness activities for individual species).	• Education experience in relation to conservation activities in South East Asia
Monitoring the effectiveness of offset management activities on species populations	• Review and management experience in relation to the management of conservation management activities.

5 BIODIVERSITY OFFSET RULES AND METRICS

The purpose of this *Section* of the report is to outline the offset calculation methods used to define the offsets required for the residual impacts on biodiversity values identified from the impact assessment process for the NNP1 project.

This *Section* satisfies *Step 5* of the BBOP Methodology: *Choose methods to calculate losses/gains and quantify residual losses of biodiversity values.*

ERM has used the approach as outlined by the Business and Biodiversity Offset Program (BBOP) (BBOP 2012a; BBOP 2012b).

Our approach includes:

- Defining the rules to achieve a no-net-loss of biodiversity for the project;
- Identification of an appropriate biodiversity offset metric; and
- Defining the approach to quantifying the losses and gains of biodiversity values.

5.1.1 Managing Uncertainty and Risk

There are inherent risks to analysing and designing biodiversity offsets due to the uncertainty in terms of matching what is lost and the risk of failure to secure and manage an appropriate offset (BBOP 2012a). *Table 6.1* outlines the likely uncertainties and risks associated with the offset analysis, approaches used to limit these risks and mechanisms used to manage the risk.

Table 6.1 Risks associated with the offset analysis

Risk	Management Approach	Mechanism
Biodiversity losses are not all accounted for in designing and implementing the offset	• No-net-loss rules and the offset metric have been designed to achieve like for like offsets. • Consideration has been made of the components of biodiversity impacted and offset (habitat and species). • Candidate offsets have been chosen based on their contribution to conservation criteria and the biodiversity values they contain. • Standard management measures have been identified for offset sites • Monitoring and evaluation is included in the offset package to determine responses to management measures.	No-net-loss rules Management framework

Risk	Management Approach	Mechanism
Impacts to biodiversity components cannot be offset	• Assessment of impacts has not identified any critical habitat that will be impacted by the project (which cannot be impacted and hence offset) • Biodiversity baseline data has been collected to determine the conservation significance of the species and habitats present. • Careful selection of offset sites and environmental contributions will be undertaken to match the impacts on a like-for-like basis.	Offset metric Management framework
Dissimilar biodiversity between impact and offset sites	• The type and condition of land classes has formed the basis of the offset analysis to limit risks of offsetting dissimilar biodiversity values.	Offset metric
Uncertainty in offset performance	• There is inherent risk in the performance and responses to management of the ecosystems for candidate offset sites. • Gains in condition from management have been conservatively set based on long management time frames (up to 30 years). • Recommendations on ongoing monitoring and evaluation have been included to determine the effectiveness of management measures. • Continual improvement mechanisms are to be included in management planning to account for the uncertainty of offset condition improvement performance.	Management framework
Uncertainty in the ecological system	• Recommendations on monitoring and evaluation have been included to determine the effectiveness of management measures. This is in response to uncertainty in the ecological system on the impact and offset sites. • Continual improvement mechanisms are to be included in management planning.	Management framework Offset metric
Uncertainty in offset implementation success	• Gains in condition from management have been conservatively set based on long management time frames (up to 30 years). • Recommendations on monitoring and evaluation have been included to determine the effectiveness of management measures. • Continual improvement mechanisms are to be included in management planning.	Offset Metric Management framework
Time delays in offset delivery	• It is recommended that active management of offset sites start as soon as possible following project commencement.	Management framework

5.2 *OFFSET RULES*

For the purposes of this offsetting analysis, the following no-net-loss biodiversity offset rules apply:

1. Offsets should be "like for like" where possible (trading is only allowed within the same land class type);

2. Environmental contributions for specific programs can be used to substitute for the direct management of biodiversity;
3. Incremental loss and fragmentation of biodiversity values should be avoided;
4. Management of offset sites can be used to improve biodiversity values however this should not take the place of actions that are already funded;
5. Areas with existing or potential land uses that are likely to be in conflict with biodiversity offsets will be avoided (mining, forestry leases, hydro power projects);
6. Location of offsets in the landscape that facilitate connectivity with adjacent habitats will be of preference;
7. Large offset sites that are connected to existing protected areas will be of preference;
8. Sites that are similarly used by comparable ethnic groups sharing similar cultural values will be of preference
9. Fairness and equity should be applied with affected stakeholders; and
10. Offsets chosen should be permanent and ongoing.

5.3 BIODIVERSITY OFFSET METRIC

The biodiversity offset metric is based on the Habitat Hectare model (BBOP 2012a). This model captures the *type* (habitat and species), *amount* and *condition* of the biodiversity values present on the impacted site and candidate offset sites. The approach is designed to create a "*balance sheet*" to compare the biodiversity losses at the impact site with the gains available from candidate offset sites. The basis of the analysis is calculating the change in condition (*loss*) at the impact site compared to the change in condition (*gains*) at candidate offsets sites over time from management. The application of the offset rules (see *4.4 Offset Rules*) enables the most appropriate candidate offset sites to be chosen to achieve a no-net-loss of biodiversity values. Offset metrics have been designed for both terrestrial and aquatic biodiversity values using data on:

- disaggregated classification of land classes in the impacted area (*Type*);
- area of land classes from spatial analysis (*Amount*); and
- land class condition assessment from field data (*Condition*).

5.3.1 Terrestrial Biodiversity Offset Metric Formula (Impact Site)

Using the "Habitat Hectares" model, the biodiversity offset metric formula creates a fungible currency to enable trading between the impacted and offset site(s) across the balance sheet. The number of Habitat Hectares represents the quantum of offset required based on the *Type, Amount* and *Condition* of the biodiversity values identified. Calculations are required for each land class type to satisfy the "like for like" offset rule.

Calculations of the quantum of biodiversity values requiring offsetting are calculated using the following formula for the impact site (*loss*):

Land Class Condition (A) x Area of Land Class (B) = Habitat Hectares

This formula assumes that all biodiversity values at the impact site will be lost, as it accounts only for the direct impacts of the Project. No "gains" in biodiversity values have been calculated as being attained from mitigation or management.

Definitions for the categories and classifications used in the formula are as follows:

Land Class Condition (A)

The condition assessment was undertaken using remote sensing of RapidEye satellite imagery (dated October 2012) to calculate a Normalized Difference Vegetation Index (NDVI) for the Project Area and candidate offset areas.

The NDVI was used to classify the forest cover according to the range of NDVI Index values. These values are outlined in *Table 6.2* and give an indication of "greenness" of the forest and hence relative density and health of vegetation (USGS 2013). Similar analysis of forest condition has been undertaken in Lao PDR by the University of Bern in Switzerland. This analysis used NDVI to determine the disturbance of forests by mapping forest succession stages using the NDVI reflective indices (Hett et al, 2011).

It should be noted that the RapidEye Satellite imagery was taken between October 2012 to February 2013 (dry season). The difference in NDVI indices due to seasonal changes in leaf phenology is 10% of the maximum NDVI value during this time of year (FAO, 2013). The NDVI values have been adjusted to reflect the seasonal change in NDVI value relative to the date the imagery was taken.

Using the DFRM 2010 mapping, only Current Forest types (See *Table 6.3*) were analysed using NDVI to determine their current condition (disturbance) as these forest types represent "natural" vegetation. All Potential Forest (old and new fallow agricultural land; slash and burn land) was categorised as low condition as a default.

Land class condition categories have been determined for the Current Forest types as mapped by DFRM within the study area and candidate offset sites using information from NDVI values.

Table 6.2 outlines the condition classes, the NDVI ranges and the value used for condition (A) in the offset metric.

Table 6.2 Land Class Condition Categories (A)

Condition	Definition	NDVI Value Range	Value
High	Represents high values of reflective greenness and hence a relatively intact canopy cover.	0.6 to 0.8	0.8
Moderate	Represents moderate reflective greenness, representing disturbed canopy cover	0.4 to 0.6	0.6
Low	Represents low reflective greenness and hence highly disturbed canopy cover.	0 to 0.4	0.4
Impacted	Urban land and barren land.	-ve to 0	0

Area of land class (B)

Land classes in the project area have been based on a dataset produced in 2010 supplied by DFRM. This data is based on classification of data at 5m resolution.

The potential impact of the project on forest and land use cover was analysed by overlaying the spatial data for the project components on the DFRM (2010) dataset. The two dimensional output provided the area in hectares of impact to each of the land use categories as a result of each of the Project components. This approach provides a snapshot of the direct impacts to the land use classifications as a result of the Project.

The land classes identified as part of this analysis are outlined in *Table 6.3*.

Table 6.3 Land Class Classifications

Class Group	Class Items	Code
Current Forest	Evergreen Forest	EF
	Deciduous Forest	DF
	Mixed Evergreen/Deciduous Forest	MED
	Dry Dipterocarp Forest	DD
	Coniferous Forest	CF
	Mixed coniferous/Broadleaved Forest	MCB
	Evergreen Forest Plantation	EP
	Deciduous Forest Plantation	DP
Potential Forest	Bamboo	B
	Old Fallow Land	OF
	Young Fallow Land	YF
	Slash and Burn Land	SB
Other Wooded Area	Savannah/Open Woodland	SA
	Scrub, Heath	SR
Permanent Agriculture Land	Rice Paddy	RP

Class Group	Class Items	Code
	Agriculture Plantation	AP
	Other Agriculture Area	OA
Other Non-Forest Area	Grassland	G
	Swamp	SW
	Rock	RP
	Barren Land	BL
	Urban Area	A,U
Water	Water	W
Other Land	Other Land	O
Other	Cloud	CL
	Shadow	SH

Source: DFRM 2010

5.3.2 *Biodiversity Offset Metric Formulae (Candidate Offset Sites)*

The following formulae have been developed for the candidate offset sites to test their suitability to adequately offset the biodiversity values identified requiring offset from the impact sites.

Calculations are required for each land class type to satisfy the "like for like" offset rule.

Calculations of biodiversity offset values have used the following formulas for the candidate offset sites:

1. Calculation of Baseline Habitat Hectares:

Candidate Offset Land Class Condition (A1) x Area of Land Class (B1) = Candidate Offset Habitat Hectares (W)

2. Calculation of Habitat Hectare Gains:

[Candidate Offset Land Class Condition (A1) + Candidate Offset Land Class Condition (Gain) (C1)] x Area of Land Class (B1) = Candidate Offset Habitat Hectares Gain (X)

3. Calculation of Habitat Hectares:

Candidate Offset Habitat Hectares Gain (X) - Candidate Offset Baseline Habitat Hectares (W) = Candidate Offset Habitat Hectares (Y)

Definitions for the categories and classifications used in the formula are as follows:

Candidate Offset Land Class Condition (A1) – See *Table 6.2.*

Candidate Offset Land Class Condition (Gain) (C1)

The management of the offset site provides the ability to record biodiversity value "gains" and hence offset the impacts of the project (losses). This is calculated based on positive interventions from management actions at the offset site to improve biodiversity values.

Standard Offset Management Actions

For this analysis, the standard management actions outlined in *Table 6.4* are designed to improve biodiversity values at the candidate offset sites. These standard management actions have been derived based on work undertaken in Lao PDR by the Wildlife Conservation Society (WCS) (WCS, 2002; 2009) the SuFORD and FORCAP projects on sustainable forestry (Chanhsamone P et al, 2007); projects undertaken by MoNRE for species management (MoNRE, 2011) aquatic and Mekong River projects (Baird I 2007; Sharma N 1992; and MRC (MRC, 2011) and offset management approaches developed in Australia (DECCW 2007).

Further discussion on the management actions proposed for offset sites is discussed in *Section 4*.

Table 6.4 Standard Offset Management Actions

Standard Management Actions	
Terrestrial	*Aquatic*
Management Plan	Management Plan
Monitoring and evaluation	Monitoring and evaluation
Management of hunting	Sediment and erosion control
Sustainable forestry management	Management of fish habitat
Sustainable forest product use (NTFP)	Riparian area protection
Management of weeds and pests	Community engagement and development
Fire Management	Education and awareness
Sediment and erosion control	
Assisted natural regeneration	
Habitat installation (nest boxes)	
Community engagement and development	
Education and awareness	
Threatened species management	

Offset gain score

A condition improvement (gain) score has been applied for the application of management actions at the offset site. Given the limited evidence on the success or otherwise of existing conservation management actions undertaken on offsets in Lao PDR, a conservative approach has been used to measure the likely gain in terrestrial biodiversity values.

Information was available on active management of forests in Lao PDR undertaken by the Faculty of Forest Sciences, Southern Swedish Forest Research Centre for forested lands in Northern Lao PDR. This research provides evidence that restoration activity undertaken on diptocarp and mixed deciduous forests regenerating from previously logged forest (low condition) show a 29% improvement in species richness and an 18% increase in basal area over a 20 year period following active management (Sovu, M. 2011). This active management included assisted natural regeneration of regrowth forests.

The gains in condition value are relative to the existing condition of the site and the application of the management measures. Sites with an existing high condition are likely to mitigate future biodiversity losses and have an incrementally smaller improvement in biodiversity condition values through management. Sites with a lower baseline condition have a greater capacity to improve from conservation management (Sayer, J et al 2004).

Given the likely increase in biodiversity values through active management and the relative management gain available from existing low and moderate condition forests, offset land class condition gain values have been determined based on the information available. These values assume a conservative 20% gain in condition value over 20 years from low condition forest (based on gains in species richness and basal area). The relative gains in condition available over time from management outlined in *Table 6.5* are based on a proportional reduction in likely gain values at 10, 20 and 30 year intervals relative to the base condition value. Baseline condition values also influence the likely gain in condition values with higher condition forests deriving smaller responses to gain from management.

Table 6.5 Candidate Offset Land Class Condition Gain (C1) Values

Existing Site Condition	Base Condition Value	Gain (10 Years)	Gain (20 years)	Gain (30 years)
Benchmark	1	0	0	0
High	0.8	0.0844	0.1125	0.15
Moderate	0.6	0.1125	0.15	0.2
Low	0.2	0.15	0.2	0.275
Impacted	0	-	-	-

Increases in condition value are a crucial component to the offsetting metric. Inherent inaccuracies in predicted improvements in condition value need to be managed. Therefore, a robust management framework is essential to minimise the risk of management failure and hence further biodiversity decline.

Management of the offset sites, including appropriate monitoring, verification and continual improvements in management strategies is required. This management framework will limit risks if performance management failures are identified and management regimes altered to respond to these failures. The proposed management framework for implementing management actions at the candidate offset sites is discussed in *Section 4*.

5.3.3 Species offsets

Offsetting impacts on the residual impacts on species require consideration of impacts on the available habitats for those species as well as species specific assessment of the impacts on the species lifecycle from the project and an analysis of the impacts remaining post mitigation.

Measuring losses and gains for species values is difficult without detailed population information on the species impacted and populations at candidate offset areas. Most information collected in the baseline data for the NNP1 project and offset areas related to presence of the species rather than detailed assessment of population sizes. This is therefore a constraint in designing an offset metric based on quantified losses and gains.

Distribution information however is available for the species identified. ERM have therefore classified the species that are candidates for offsets into two categories:

- Category 1 species are more restricted in their range or impacts on specific lifecycle elements indicate that the residual impacts remaining after mitigation on habitats for the species is likely to be more significant than for category 2 species.

- Category 2 species have a wide distribution and the residual impacts remaining after mitigation on habitats for the species from the project is a relatively small proportion of the total distribution of habitat for the species; and

Species specific offsets measures have therefore been chosen by a process of:

1. determining the known presence (or likely presence) of that species within an offset area;
2. design of management measures to recover and manage the populations identified;
3. monitoring and evaluation framework to determine the base population size and changes over time from management;
4. implementation of species specific management actions; and
5. continual feedback of the management approach to refine management methods.

5.3.4 *Aquatic Biodiversity Offsets*

There are a number of case studies undertaken by BBOP for the application of biodiversity offsets for aquatic ecosystems (BBOP 2012a). Further work has also been undertaken in South America on hydroelectric schemes to determine impacts and potential offsets (IAIA 2013). The literature search undertaken has highlighted that the design criteria and metrics to apply to aquatic ecosystems is not as advanced as those designed for terrestrial ecosystems.

Additionally, measuring gains from managing aquatic biodiversity values are not easily quantifiable. There is no current literature available for Lao PDR that indicates gains in biodiversity values from managing aquatic habitats. Field data also indicates that the condition of habitats in the Nam Ngiep River is relatively uniform along the length of the river. Using a metric designed to calculate offsets based on gains in biodiversity values available from management at a candidate offset site would not be robust or justifiable.

The residual impacts identified for aquatic habitats relate mainly to changes in fish migratory patterns from the dam wall and habitat changes from the impoundment lake. Environmental flows restored in the lower Nam Ngiep will likely mitigate impacts derived from the river flow regime.

Offsets therefore are proposed based on the management of aquatic habitats to enhance biodiversity values through watershed management activities and environmental flows. It is also recommended that a monitoring regime be implemented to determine the impact on aquatic biodiversity values on habitats and species to better inform offset decision making.

Applying an evaluation framework to this approach will be essential given the uncertainty in proving gains in biodiversity values from these management actions. Threats to the biodiversity values from other point and non-point pollution sources that are within the watershed will need to be considered during offset design.

5.3.5 *Human Use and Cultural Value Offsets*

The environmental assessment observations indicate that the Project will not result in the loss of biodiversity with significance for human use and cultural value that is highly irreplaceable (ERM 2013a). The Project will impact only common human use practices involving terrestrial and aquatic species that are broadly available throughout the region. This being said, provisioning elements of the forest ecosystems are important for local-level subsistence and income generation, and for the maintenance of cultural traditions. These will require an offset measured in equivalence in type and location if the impact produces residual losses after mitigation measures are applied.

A 'like for like' calculation will be used to identify human use and cultural value offsets between the Project impacts and candidate offset sites. For example, loss of human access to a certain species at the Project site, if not provided elsewhere such as at the relocation site, will be preserved at an offset site. Measurement of the effectiveness of the offset would be undertaken by regular assessment of continued human access to and abundance of the resource at the offset site. Specific measurements of gains in offset site communities could be taken against such indicators as: increased participation in cultural practices with a dependence on ecosystem goods and services; changes in health seeking behaviour in which ecosystem goods and services play a primary role; or quantifiable developments in the commercialisation of ecosystem goods and services.

Quantification of residual impacts on biodiversity human use and cultural values is challenging, especially in the context of community resettlement. The approach will therefore need to take account of losses due to impacts within the immediate project area but also the relocation site(s). The ESIA and ERM observations indicate that there are two primary types of biodiversity at risk of impact in this Project: (1) tangible human use provisioning services (i.e. terrestrial and aquatic products) and material cultural artefacts; and (2) intangible cultural values.

Tangible human use for provisioning services is typically characterised by non-timber forest products (NTFP) used in subsistence and income generation activities. This includes usage of aquatic and terrestrial species for traditional practices, medicines and housing materials. Moveable cultural artefacts are also included in this type as they are often derived from or sourced within nearby or distant ecosystems. The primary measure for quantification is dependence for human livelihoods. Dependence is measured by the degree to which the ecosystem product or service can be substituted by another in the sustenance of livelihoods.

Intangible cultural values are typically characterised by sites and areas that are valued for the sacred or spiritual significance, enjoyment for recreation or role in the inter-generational transmission of traditional knowledge. It may not be possible to achieve no net loss with regards to such sites and areas due to their high irreplaceability. Indeed, some cultural values will be immeasurable and will therefore be unable to be included in any calculation of offsetable impacts. Nonetheless, the primary measure for quantification is dependence for human cultural continuity. Cultural continuity is measured by the vulnerability of a cultural practice to extinction due to its direct dependence on a specific ecosystem good or service.

The approach to offsetting the human and cultural residual "losses" will be undertaken in the balance sheet analysis. This will include defining the use and cultural values at the impact site as they relate to the places and values that will be impacted (residual values) by the project.

6 APPLICATION OF THE BIODIVERSITY OFFSET METRIC

6.1 RESIDUAL BIODIVERSITY VALUES REQUIRED TO BE OFFSET

The revised Environmental Impact Assessment (EIA) undertaken on the NNP1 project (ERM 2013) has identified the following residual biodiversity values impacted following the application of the mitigation hierarchy:

- Inundation area of the main dam;
- Transmission line;
- Re-regulation dam and facilities; and
- Minor clearing for the access road.

These activities will have a direct impact on biodiversity values and it is anticipated that the values will be altered in these areas following construction of the project. Hence, it is not necessary for the biodiversity offset metric to consider the condition of biodiversity values remaining following construction as little, if any of these values will remain.

6.2 APPLICATION OF BIODIVERSITY OFFSET METRIC – IMPACT SITE

6.2.1 Habitat Values

Table 7.1 outlines the combined Habitat Hectare Calculations for the biodiversity values of the impact sites.

Table 7.1 Impact Site Habitat Hectare Calculations

Land Class type	Land Class Condition (A)	Area of Land Class (C)	*Residual Impact Habitat Hectares*
Deciduous Forest	High	1,456.1	1,164.9
Deciduous Forest	Moderate	1,137.6	682.6
Deciduous Forest	Low	162.8	65.1
Evergreen Forest	High	183.7	147.0
Evergreen Forest	Moderate	266.3	159.8
Evergreen Forest	Low	37.8	15.1
Bamboo	Moderate	373.5	224.1
Grassland	Moderate	108.3	65.0
Old Fallow Land	Low	1,488.8	595.5
Young Fallow Land	Low	1,117.7	447.1
Rice Paddy	Impacted	122.8	-
Rock	High	1.3	1.1
Slash and Burn Land	Low	347.7	139.1
Shadow	High	16.5	13.2
Urban	Impacted	38.2	-
Water	-	368.2	-
Cloud	High	5.0	4
	Total	**7,595.91**	

6.2.2 *Species Values*

The residual values on species are outlined in T*able 6.2*. These residual values have been identified from the application of the mitigation hierarchy in the project EIA.

Table 7.2 Species values requiring offsets

	Species	
Category 1 species where the species are more restricted in their range or specific lifecycle elements indicate that the residual impacts remaining after mitigation on habitats for the species is likely to be more significant than for Category 2 species.		
Mammals	Asian small clawed otter	Tiger
	Asian elephant	Fishing cat
	Smooth coated otter	Phayre's leaf monkey
	Sunda pangolin	White-cheeked gibbon
	Leopard	
Birds	Green peafowl	
Reptiles	Elongated tortoise	Big-headed turtle
Category 2 species have a wide distribution and the residual impacts remaining after mitigation on habitats for the species from the project is a relatively small proportion of the total distribution of habitat for the species		
Flora	Dipterocarpus turbinatus	Afzelia xylocarpa
	Shorea roxburghii	
Mammals	Golden jackal	Pygmy slow loris
	Southwest China serow	Asiatic golden cat
	Dhole	Leopard cat
	Sun bear	Sambar
	Bengal slow loris	Himalayan black bear
Birds	Wreathed hornbill	Red-collared woodpecker
	Great hornbill	Hoopoe
	White winged duck	Grey peacock pheasant
	Greater coucal	Red-breasted parakeet
	Siamese fireback	Darter
	Silver pheasant	Rufous necked hornbill
	Spot-bellied eagle owl	Crested argus
Reptiles	Reticulated python	King cobra

6.2.3 *Aquatic Biodiversity Values*

The residual impacts to aquatic biodiversity relate to the loss of lotic habitat (flowing water) which is transitioned to lentic habitat (relatively still water) and barrier to aquatic fauna movement as a result of the dam walls. The Baseline Biodiversity Report identified a number of migratory aquatic species that inhabit the Nam Ngiep River and migrate to upstream reaches for spawning and other behaviours. Interruption of this important lifecycle component has potential to lead to population declines locally and in the downstream watershed. The impact of barrier to movement cannot be

quantified rather it is a residual impact to an ecosystem function that has potential to interrupt the lifecycle for aquatic biota. These impacts are permanent and ongoing and will impact on the lifecycle of aquatic species within the Nam Ngiep watershed.

6.2.4 Human and Cultural Values

It is evident that villagers in the Project area regularly use local terrestrial and aquatic biodiversity – e.g. as a food source – largely for subsistence purposes. However, the dependence on natural resources varies by village and is primarily associated with accessibility. For example, remote villages tend to rely more heavily on biodiversity (e.g. medicinal plants as access to pharmaceuticals is limited).

Development of the project will likely impact the ability of villagers to access both tangible human use provisioning services. This includes:

- Hunting, gathering and fishing. This typically includes small animals, such as squirrels and rats, and flora species, such as bamboo and mushrooms. The flora and fauna are primarily consumed within the household;
- Collection and use of medicinal plants;
- Use of waterways, for activities such as navigation, household drinking water, and bathing;
- Cultural heritage, such as cemeteries. In most cases, villagers did not identify intangible cultural heritage values, which may be attributed to relatively recent settlement of the local villages; and
- Collection of timber products to be used as fuel or in construction.

6.3 APPLICATION OF BIODIVERSITY OFFSET METRIC - OFFSET SITES

6.3.1 Habitat Values

Table 6.3 outlines the habitat values available at Phou Khao Khouay NPA from application of the offset metric. *Table 6.4* outlines the habitat values available in the Protection Forest Areas of the Nam Ngiep Watershed from the application of the offset metric.

Table 7.3 Habitat Values Available at Phou Khao Khouay NPA

Land Class Type	Candidate Offset Land Class Condition (A1)	Area of Land Class (C1)	*Candidate Offset Habitat Hectares (W)*	Candidate Offset Land Class Condition (Gain) (D1)	*Candidate Offset Habitat Hectares Gain (X)*	*Candidate Offset Habitat Hectares (Y)*
Evergreen Forest	High	4498.2	3598.6	0.15	4273.3	674.7
Evergreen Forest	Moderate	1141.0	684.6	0.2	912.8	228.2
Evergreen Forest	Low	0.2	0.1	0.275	0.1	0.1
Deciduous Forest	High	21.8	21.8	0.15	20.7	1.1
Deciduous Forest	Moderate	73.8	73.8	0.2	59.0	14.8
Deciduous Forest	Low	14.8	14.8	0.275	10.0	4.8
Coniferous Forest	High	329.2	263.4	0.15	312.8	49.4
Coniferous Forest	Moderate	502.0	301.2	0.2	401.6	100.4
Coniferous Forest	Low	468.5	187.4	0.275	316.2	128.8
Mixed coniferous/ Broadleaved Forest	High	34272.0	27417.6	0.15	32558.4	5140.8
Mixed coniferous/ Broadleaved Forest	Moderate	6647.1	3988.2	0.2	5317.7	1329.4
Mixed coniferous/ Broadleaved Forest	Low	0.4	0.1	0.275	0.2	0.1
Bamboo	Low	1938.8	775.5	0.275	1308.7	533.2
Old Fallow Land	Low	438.9	175.5	0.275	296.2	120.7
Young Fallow Land	Low	26.4	10.5	0.275	17.8	7.3
Slash and Burn Land	Low	2551.9	1020.8	0.275	1722.6	701.8
Scrub, Heath	Moderate	31139.5	18683.7	0.2	24911.6	6227.9
Rice Paddy	Impacted	7862.3	0	0	0	0

Land Class Type	Candidate Offset Land Class Condition (A1)	Area of Land Class (C1)	*Candidate Offset Habitat Hectares (W)*	Candidate Offset Land Class Condition (Gain) (D1)	*Candidate Offset Habitat Hectares Gain (X)*	*Candidate Offset Habitat Hectares (Y)*
Agriculture Plantation	Impacted	116.6	0	0	0	0
Grassland	Moderate	482.1	0	0.2	96.4	96.4
Swamp	Moderate	1809.1	0	0.2	361.8	361.8
Rock	Moderate	2500.1	0	0.2	0	0
Barren Land	Impacted	1821.2	0	0	0	0
Urban Area	Impacted	5364.5	0	0	0	0
Water	Impacted	51692.8	0	0	0	0
Other Land	Impacted	22195.2	0	0	0	0
Cloud	High	197.4	158	0.15	187.6	29.6
Shadow	High	2642.6	2114.1	0.15	2510.5	396.4

Table 7.4 Habitat Values Available in the Protection Forest Areas of the Nam Ngiep Watershed

Land Class Type	Candidate Offset Land Class Condition (A1)	Area of Land Class (C1)	*Candidate Offset Habitat Hectares (W)*	Candidate Offset Land Class Condition (Gain) (D1)	*Candidate Offset Habitat Hectares Gain (X)*	*Candidate Offset Habitat Hectares (Y)*
Evergreen Forest	High	14676.6	4373.2	0.15	5193.2	820.0
Evergreen Forest	Moderate	10364.0	1192.8	0.2	1590.4	397.6
Evergreen Forest	Low	734.0	80.3	0.275	135.5	55.2
Deciduous Forest	High	14755.2	14772.8	0.15	17542.6	2769.9
Deciduous Forest	Moderate	5730.6	6013.1	0.2	8017.5	2004.4
Deciduous Forest	Low	456.3	186.4	0.275	314.6	128.2
Bamboo	Low	2933.4	510.2	0.275	860.9	350.8
Old Fallow Land	Low	4125.6	2753.7	0.275	4646.9	1893.2
Young Fallow Land	Low	1650.3	109.1	0.275	184.1	75.0
Slash and Burn Land	Low	681.6	180.8	0.275	305.1	124.3
Grassland	Moderate	507.2	0.0	0.2	0.0	0.0
Rock	Moderate	145.1	0.0	0.2	261.4	261.4
Barren Land	Impacted	0.0	0.0	0	0.1	0.1
Urban Area	Impacted	6.6	0.0	0	0	0
Water	Impacted	62.0	36.7	0	43.6	6.9
Other Land	Impacted	0.0	4373.2	0	5193.2	820.0
Cloud	High	4.5	1192.8	0.15	1590.4	397.6
Shadow	High	92.7	80.3	0.15	135.5	55.2

6.3.2 *Species Values*

Table 6.5 outlines the presence of species values within offset sites and the management program required for those species to manage and recover those populations. It should be noted that species presence is based on results of literature and surveys undertaken for this report. The likelihood of habitat for species not identified through literature search or survey is also noted in the table.

Table 7.5 Species Presence within Offset Sites

	Species	PKK NPA	Nam Ngiep	Offset Management Required
Category 1				
Mammals	Asian small clawed otter	*	✓	• Survey and monitoring of species presence within offset areas. • Identification of core habitat and management of identified populations • Species specific management actions identified to manage identified populations. • Targeted campaigns to manage key threats (eg. education and awareness activities for individual species). • Alignment of conservation priorities to National and International management plans and requirements • Monitoring the effectiveness of offset management activities on species populations
	Asian elephant	✓	✓	
	Smooth coated otter	✓	✓	
	Sunda pangolin	✓	✓	
	Leopard	*	-	
	Tiger	*	✓	
	Fishing cat	*	✓	
	Phayre's leaf monkey	✓	✓	
	White-cheeked gibbon	✓	✓	
Birds	Green peafowl	*	*	
Reptiles	Elongated tortoise	*	*	
	Big-headed turtle	*	✓	
Category 2				
Flora	Dipterocarpus turbinatus	-	✓	• Supplementary planting of individuals.
	Shorea roxburghii	-	✓	
	Afzelia xylocarpa	-	✓	
Mammals	Golden jackal	*	*	• Survey and monitoring of species presence within offset areas. • Targeted survey for species not identified (particularly birds). • Management of key threats.
	Southwest China serow	-	✓	
	Dhole	✓	✓	
	Sun bear	*	✓	
	Bengal slow loris	✓	✓	

	Species	PKK NPA	Nam Ngiep	Offset Management Required
	Pygmy slow loris	*	✓	• Identification of core habitat and management of populations • Monitoring the effectiveness of offset management activities on species populations • Alignment of conservation priorities to National and International management plans and requirements
	Asiatic golden cat	*	*	
	Leopard cat	*	*	
	Sambar	*	✓	
	Himalayan black bear	✓	✓	
Birds	Wreathed hornbill	*	*	
	Great hornbill	*	*	
	White winged duck	*	✓	
	Greater coucal	*	*	
	Siamese fireback	*	*	
	Silver pheasant	*	*	
	Grey peacock pheasant	*	*	
	Red-breasted parakeet	*	*	
	Darter	*	*	
	Rufous necked hornbill	*	✓	
	Crested argus	*	*	
	Spot-bellied eagle owl	*	*	
	Red-collared woodpecker	*	*	
	Hoopoe	*	*	
Reptiles	Reticulated python	*	*	
	King cobra	*	✓	

✓ - Denotes survey or literature has identified the presence of the species

* - Denotes likely habitat present for the species

6.3.3 *Aquatic Biodiversity Values*

Aquatic biodiversity offsets will be managed through a framework designed to improve watershed management activities across the Nam Ngiep watershed (above and below the dam wall) and offset management sites.

The main components of the watershed management activities are outlined in *Section 4*. These include:

- Research;
- Management planning;
- Monitoring and evaluation;

- Sediment and erosion control;
- Riparian area protection;
- Management of fish habitat;
- Community engagement and development; and
- Education and awareness.

Monitoring and evaluation of the effectiveness of these activities will be essential to adjust techniques based on the threats identified.

6.3.4 Human Use and Cultural Values

The following section provides an overview of the tangible human use provisioning services and intangible cultural heritage values that exist within the potential offset sites. This summary is based on field surveys of local villages and markets.

Hunting and Gathering

Hunting and gathering occurs in the offset areas. Hunting is generally done for household consumption; while any surplus is sold to intermediaries. It is typically the smaller species that are consumed within the household, while the larger animals are sold.

Frequently caught species include small animals such as squirrels, birds, bamboo rats and the lesser mouse deer; however, once in a while larger animals such as the Rusar Unicolor, Southern Red Munjak and Pangolin are caught. According to villagers, the most prized mammal species is the Pangolin. This is because of its rarity and medicinal uses – it is believed to have sexual stimulation powers.

In addition to fauna, a variety of flora species are collected, including mushrooms and bamboo shoots. Flora species were, again, primarily used for household consumption with surplus being sold to intermediaries. Instead of selling the materials collected, females typically engage in other activities, such as rice or textile production, in order to provide family income.

Fishing

Fishing occurs in the offset areas. The majority of fish caught are consumed within the household. Only surplus or the prized species are sold to intermediaries. Hence, family income derived from selling fish is relatively low.

Females indicated that they go fishing more often during the rainy season as species that dwell in Mekong River flow downstream to the Nam Ngiep and Nam Xan rivers during this period. In other words access during the rainy season is important.

Cultural Services

Cultural heritage values exist within the offset sites. Villagers identified two specific cultural aspects - village temples and cremation sites. However, in relation to intangible cultural heritage values, no significant sites were identified. This is partly due to the fact that the village residences were largely lowland Laos who are Buddhist; accordingly, religious ceremonies are conducted in village temples. Another possible underlying factor is that the villagers did not settle in the area until after the Laotian Civil War (1953 – 1975).

The summary indicates that the ecosystems services provided by the candidate offset areas largely align with those that will be impacted at the project site. However, villagers indicated that future access to these services may be an issue, due to declining presence of flora and fauna.

The management frameworks to offset impacts on human cultural and heritage values are outlined in *Section 4*.

Issues to Consider

The offset sites appear to meet existing demands. However, during the survey, villagers expressed concern about declining numbers and future availability of fauna and flora species.

Villagers also noted that the local population has experienced a number of changes – e.g. through the Lao PDR government's decision to consolidate villagers. In some instances, this has meant an increase in the village population, while in other instances there has been a decrease in population. An increase in population can increase pressure on the surrounding natural environment.

The village consolidation has been done, in part, to enhance the provision of services available to villagers. The Project area surveys indicate that an improvement in service availability can (but not always) lead to a decrease in dependence on ecosystem services (such as medicinal plants).

In addition, villagers engaged as part of the survey indicated a strong preference for Lao PDR government involvement in any decision-making and management of offsets.

6.4 BIODIVERSITY OFFSET PACKAGE BALANCE SHEET ANALYSIS

Table 6.6 summarises the results of the application of the biodiversity offset metric for the impact site and candidate biodiversity offset sites in relation to habitat. Habitat hectare values are able to be offset for all of the values lost, enabling a no-net-loss to be achieved for all land classes impacted.

Table 7.6 Biodiversity offset balance sheet analysis (Habitats)

		Candidate Offset Sites (Available Gains) Habitat Hectare Values		
Land Class	**Impact Site (Loss)**	**Phou Khao Khouay NPA**	**Protection forest in the Nam Ngiep Watershed**	**Loss/Gain**
Evergreen Forest	321.9	903	3473.1	**+4054.2**
Deciduous Forest	1,912.6	20.7	4487.9	**+2596**
Coniferous Forest	-	278.6	-	**+278.6**
Mixed coniferous/ Broadleaved Forest	-	6470.3	-	**+6470.3**
Bamboo	224.1	661.2	1146.1	**+1583.2**
Old Fallow Land	595.5	533.2	125.5	**+63.2**
Young Fallow Land	447.1	120.7	806.7	**+480.3**
Slash and Burn Land	139.1	7.3	1134.5	**+1002.7**
Scrub, Heath	-	701.8	-	**+701.8**
Grassland	65.0	6227.9	453.8	**+6616.7**
Swamp	-	96.4	-	**+96.4**
Rock	1.1	361.8	187.4	**+548.1**
Cloud	4.0	29.6	0.8	**+26.4**
Shadow	13.2	396.4	13.9	**+397.1**

In relation to species values, it is noted that not all species are currently surveyed as present within the offset sites. These species are outlined in *Table 6.7*. Habitat for these species is likely present for these species in the offset areas and their presence is required to be confirmed.

As a contingency measure, it is recommended that if these species are not found present in the offset areas within the first two seasons of monitoring, further assessment and allocation of resources is required to identify the location of the species in alternative offset sites and the development of management actions and allocation of funding required for those species.

Table 7.7 Species not currently surveyed as present within offset areas

	Species	PKK NPA	Protection Forest Areas of the Nam Ngiep Watershed
Category 1			
Birds	Green peafowl	*	*
Reptiles	Elongated tortoise	*	*
Category 2			
Mammals	Golden jackal	*	*
	Asiatic golden cat	*	*
	Leopard cat	*	*
Birds	Wreathed hornbill	*	*
	Great hornbill	*	*
	Greater coucal	*	*
	Siamese fireback	*	*
	Silver pheasant	*	*
	Grey peacock pheasant	*	*
	Red-breasted parakeet	*	*
	Darter	*	*
	Crested argus	*	*
	Spot-bellied eagle owl	*	*
	Red-collared woodpecker	*	*
	Hoopoe	*	*
Reptiles	Reticulated python	*	*

* Denotes likely habitat for the species but the species has not been identified by survey

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Annex A

Results of Consultation

A.1 RESULTS OF STAKEHOLDER ENGAGEMENT

ERM conducted stakeholder engagement with Regional Agencies, Lao PDR Government Departments, local officials and Non-Government Organisations (NGO) from 20 – 21 February and 26 February – 1 March 2013. A follow up consultation was undertaken between 11 November and 16 November 2013 to discuss the proposed offset framework.

The consultation occurred in Vientiane as well as villages within the Nam Ngiep (impacted area) and the Nam Xan catchment.

The following individuals and organisations were involved in the stakeholder engagement:

Independent Advisory Panel

- Ms Kathy MacKinnon
- Dr Charly Mehl

Non-Government Organisations

- Mr Alex McWilliam and Mr Troy Hansel, Wildlife Conservation Society (WCS) (Lao PDR Program)
- Mr Vene Vongphet, International Union for the Conservation of Nature (IUCN) (Vientiane Office)

Regional Administrative Agencies

- Mr Amphavanh Sisouvanh, Mr Simon Krohn, Mr Piseth Chea, and Mr Henrik Larsen Mekong River Commission (Vientiane Office)

Lao PDR Government Departments

- Mr Viengkeo Souksavadty, Deputy Director General, Ministry of Information, Culture and Tourism (MICT)
- Outakeo Keoduangsing, Director of Legal Division, Investment Promotion Department, Ministry of Planning and Investment (MPI)
- Mr Saysomone Phothisat Deputy Director General and Mr Lampanh Kommadam Director of Conservation Forest Management, Department of Forest Resource Management (DFRM)
- Mr Aengphone Phaengsuwan, Director of Centre – EIA Review of Hydropower Projects, DESIA and Peter G. Jensen, Chief Technical Advisor, Ministry of Natural Resources and Environment (MoNRE)

Local Officials

- Phou Khao Kouay NPA, Lieutenant Colonel That Keoathone

Discussions were also held with the following individuals:

- Mr Robert Allen, Theun-Hinboun Power Company Ltd
- Mr Martin Hollands, Conservation Policy and Practice Ltd. (Former Lao PDR Program Manager, WWF)
- Ms Marion Ravenscroft, Lao National Museum (see MICT section)

The following agencies declined or were not available for interview:

- World Wide Fund for Nature, Vientiane Office
- IUCN Regional representatives in Bangkok
- Lao PDR Department of Minerals and Energy

A.2 APPROACH

ERM designed the stakeholder consultation approach in accordance with guidance from the *Business and Biodiversity Offset Program* (BBOP) (BBOP 2009).

The structure of the interviews was informal meetings according to the topics as outlined in *Table B.1*. A range of questions were asked in accordance with the themes and questions as outlined in *Annex X* (see ERM 2013). Particular lines of questions were modified based on the conversations, focussing on relevant topics.

The conversations that occurred with stakeholders were recorded through handwritten notes and emails. This data was transcribed, collated and analysed. The results are presented below and serve as a representation of the views and opinions of stakeholders.

Table A.1 Outline of key topics for discussion

Topic	Outline
Legal	Relevant International and Lao PDR Laws and regulations in relation to: • environment protection; • biodiversity conservation; • forestry; • water and water resources; • land use and planning; • human rights; & • legal arrangements for securing biodiversity conservation on public and private land.

Topic	Outline
Institutional	Roles and responsibilities for land use and biodiversity conservation of: • international agencies and bodies; • Lao PDR Government Departments; • agencies; • NGOs; & • local Governments and officials.
Financial	Financial mechanisms to support biodiversity conservation, including: • market mechanisms; • monetary values of natural resources and ecosystem services; • financial trusts for biodiversity conservation; • funding arrangements for biodiversity conservation and NBCAs; & • NGO funding arrangements.
Management arrangements	Current management arrangements for land use planning and biodiversity conservation for: • mining concessions; • private lands; • public lands (other than NBCAs); • conservation community partnerships; • forestry; • NBCAs; • existing biodiversity offsets; • fisheries; and • water resources.
Current and future land uses	Land uses, including potential encumbrances to biodiversity offset establishment, including: • mining concessions; • hydro-schemes; • industrial and commercial development; • villages; • farming and agriculture; • cultural significance; • forestry; • tourism; • additionality (current biodiversity offsets); & • land capability
Threats	Any threats to biodiversity offset establishment, including: • environmental threats (weed and pests); • natural disasters; • climate change; • socio-economic; • agricultural expansion; • illegal forestry; & • illegal land uses.

A.3 RESULTS

The following sections document the results of discussions with stakeholders based on their responses during interviews, emails, telephone conversations and written responses.

A.3.1 Independent Advisory Panel (IAP)

The IAP provided comments on the ERM inception report (ERM 2013). These comments provided are summarised as follows:

Institutional and Management Arrangements

- **Scope of the study.** The scope should be expanded to include identification of some existing protected areas in place of Nam Xan River.

- **Like for like offsets.** "Fish for fish" or "river for river" biodiversity offset does not seem viable, since there are no pristine rivers in the country. Nam Xan River catchment already has 3 small hydropower projects planned - and there is mining, logging, and considerable other human activity, including some resettlement sites. Trying to use this or any other river in the country, as a biodiversity offset would be throwing away money. Therefore, the ADB concept of offset as "site for site" or "river for river" is not standard practice and may well not be practical.

- **New protected areas.** Establishment of a new conservation area in natural forest adjacent or connected to secure protected natural forest should be considered as an option. The expansion of existing conservation areas and/or establishment/protection/reforestation of forest corridors between conservation areas and standing forest to allow wildlife movement.

- **Strengthen existing protected area management.** Options to strengthen protection and management of existing conservation areas, which currently lack staff, capacity and resources. Houy Ngua already has a management plan with proposed activities prepared in 2011. Phou Khao Khoay is managed by the Ministry of Defence.

Financial

- **Environmental contributions** to a conservation fund to support management of existing conservation areas (DFRM-MONRE are already considering a sinking fund for this purpose).

- **Establishment of a biodiversity offset fund.** DG of DFRM has clear ideas for the establishment of a biodiversity offset fund, which would be used for the support of existing protected areas throughout the country.

A.3.2 Non-Government Organisations

Wildlife Conservation Society (WCS)

The research team met with Mr Troy Hansel, WCS Lao PDR Program Director and Mr Alex McWilliam, Operations Manager for WCS on 22 February 2013. A second meeting with Mr Alex McWilliam was held on 27 February 2013.

Legal

The team discussed with WCS the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **Forest protection law.** The discussion highlighted forestry activities that occurred in the Nam Ngiep and Nam Xan catchments and the creation of the forest zoning system. WCS identified that the Protected Area network is the primary legal mechanism for conservation management in Lao, as designated under the Forestry Law. The lack of funding and institutional capability in Lao PDR is an ongoing concern and a major threat to biodiversity security, despite the designation of NPAs and conservation forest. Mr McWilliam discussed the potential for changing forest zoning to facilitate conservation.

- **Legal mechanisms to secure offsets.** The discussion highlighted a lack of legal mechanisms to secure offsets in Lao PDR. The projects which are currently known to have biodiversity offsets in Lao include Nam Theun 2, Nam Theun Hinboun Expansion, Sepon Mine (MMG) and Nam Leuk Dam, although there's no transparency with Nam Leuk and no information is forthcoming. WCS indicated their involvement in the current offset strategies being developed by MMG Sepon and Theun-Hinboun Power Company. Mr McWilliam discussed the importance of having a secure legal mechanism to provide clarity on the actions required. He also discussed ensuring that the legal, financial and governance arrangements were included as part of the legal agreements.

- **Forest Law Enforcement, Governance and Trade** (FLEGT) project being conducted in conjunction between the government of Lao PDR and the European Union to develop a Voluntary partnership Agreement that licences the legality of timber entering the European Union from Lao PDR. WCS mentioned that this project operated successfully in the Southern provinces of Lao PDR.

Institutional and Management Arrangements

The team discussed with WCS the range of institutional and management arrangements used by WCS and the Government of Lao PDR in relation to the discussion topics. We discussed:

- **Current mechanisms used by WCS to manage conservation offsets**, including focussing on conservation planning, landuse planning, monitoring and indicators, community engagement and management of non-timber forest products.

- **Governance and accountability of projects run by WCS.** This included reports on achieving milestones for offset projects, including those currently being undertaken for MMG Sepon and Theun-Hinboun Power Company.

- **Long term view on the management of protected areas.** Discussed the underfunding of reserve management in Lao PDR and the requirements to boost funding to achieve conservation outcomes.

- **Benefit sharing and community engagement.** We discussed the importance of engaging the community in conservation and building capacity within the local communities. It was suggested by WCS that any proposed offset involving conservation of cultural values be framed as developing people's adaptive capacity and focussed on measures that do not limit the progress of rural people.

- **NGO involvement in offsets.** WCS have been involved with the Nam Theun 2 project, Nam Theun Hinboun project, and MMG's Sepon Mine, all of which have had biodiversity offsets considered. WCS supported the NT2 project on the basis of the offset strategy which included an annual $1M of funding for the Watershed Management Planning Authority (WMPA). WCS are actively engaged with MMG to support the offset development in Laving Lavern NPA which was upgraded from PPA to NPA as a result of the process. There is a lack of certainty about long term management of all of these offsets beyond the 25 year commitment of most projects, which is a concern for WCS.

Financial

The team discussed with WCS the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Laos PDR Environment Protection Fund.** We discussed the importance of the Environment Protection Fund in providing a resource to facilitate conservation. Mr McWilliam discussed the lack of appropriate governance mechanism to support the Fund as an issue that restricted its use. This fund is currently administered by MoNRE.

- **Sustainable Forestry and Rural Development (SuFoRD) project.** We discussed this project that aimed to support sustainable forestry management. The project is a joint project with the World Bank and the government of Finland.

- **Convention on Biological Diversity (CBD) projects.** We discussed current CBD focal point projects currently costed for protected area management proposed by WCS in Bolikhamxay Province and the Nam Kading NPA. WCS has facilitated these projects but no funding has been forthcoming and proposed projects are now around 4 years old and would require updating.

Current and Future Land Uses

The team discussed with WCS the current and future land uses in relation to the discussion topics. We discussed:

- **Forestry activities.** We discussed forestry activities within Lao PDR and the involvement of local and international logging companies in forest resource management. Mr McWilliam discussed anecdotal evidence of the considerable amount of timber harvested from production forests and its impacts on biodiversity.

- **Mining.** We discussed current mining concessions within Lao PDR. However, WCS were not aware of any current conflicts between mining concessions and biodiversity protection within the Nam Ngiep or Nam Xan catchments.

- **Hydropower schemes.** We discussed current conflicts with current and proposed hydroelectric schemes, especially within the current protected area system. We discussed the need to ensure that future management of offsets and reserves is not compromised by hydroelectric schemes.

- **Development in protected areas.** WCS indicated that if managed appropriately, there does not appear to be any activities which would be incompatible with a conservation area. As long as the appropriate management measures are put in place, it is conceivable that hydropower projects and mining projects would be compatible in a conservation area.

Threats

The team discussed with WCS the current and future likely threats in relation to the discussion topics. We discussed:

- **Threats to biodiversity.** We discussed current threats to biodiversity from pests, hunting and wildlife trade. WCS was aware of current laws that prohibit trading in wildlife but recalled that localised threats from hunting and wildlife trade exist. WCS consider the major threats to biodiversity in Lao to be harvesting of timber, wildlife and NTFPs. There is a very large and active wildlife trade industry which is a major threat. WCS consider the northern Annamite range as a key area for biodiversity conservation, but it is not necessarily linked to the NNP1 values. A number of prioritisation systems have been used in the past but all have limitations. Without the funding and resources provided by organisations such as NGOs and development organisations in Lao, biodiversity conservation of key areas could not be achieved at this stage.

- **Lack of local capabilities.** The major threats to biodiversity conservation in Lao revolve around are a severe lack of funding, a lack of institutional capability and a lack of enforcement capability to ensure that NPAs are managed effectively. WCS operates many on-ground programs to achieve

conservation objectives. They partner with GoL to deliver conservation, to capacity build, to educate and to raise awareness of conservation issues in Lao.

International Union for the Conservation of Nature (IUCN) (Vientiane Office)

The research team met with the IUCN Protected Area Coordinator, Mr Vene Vongphet in the IUCN Vientiane office on 28 February 2013.

Legal

The team discussed with IUCN the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **Law enforcement.** We discussed the issue of law enforcement in Lao PDR and projects run by IUCN to build capacity to halt wildlife trade and forest protection in NPAs. IUCN commented that these activities were ongoing and required financial commitments.

Institutional and Management Arrangements

The team discussed with IUCN the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **ASEAN Centre for Biodiversity Ecotourism.** We discussed the framework provided and the opportunities to promote ecotourism through ASEAN. This was seen as a way to improve incomes and facilitate conservation.

- **Environment Protection Fund.** We discussed the role of the EPF in facilitating conservation and the requirements for improved governance arrangements to be designed to improve how the fund operates.

- **National Protected Area Management Plans**. We discussed the current management planning framework and the requirement to update management plans for the existing NPAs to ensure that future funding and management was appropriately targeted.

- **Current conservation initiatives of the IUCN**. We discussed the current focus of the IUCN in delivering management on the ground, including Gibbon conservation and law enforcement activities at Nam Ha NPA. IUCN highlighted that these conservation activities had been successful but required ongoing funding. IUCN also expressed interest in undertaking future management of biodiversity from developer contributions to offset impacts of development.

- **Military management of Phou Khao Khoay NPA.** IUCN commented that the military managed the reserve for the purposes of military operations and were not funded to manage the NPA for conservation.

Financial

The team discussed with IUCN the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Lack of funding for the National Protected Areas**. We discussed the general issue of funding for NPA management and that this was not available. Discussion focussed on potential sources, including working with WCS and developers to pay for improved management of NPAs.

- **Joint Flora and Fauna International Funding.** We discussed the jointly funded projects between IUCN and FFI, including the community conservation in Phou Hin Phou NPA focussed on preserving the southern white cheeked crested gibbon. FFI and IUCN are also working on a Gibbon Conservation Action Plan for Lao PDR.

- **Opportunities for funding through REDD+.** We discussed the current opportunities to link carbon and forestry activities under the REDD+ mechanism. IUCN was aware that the Lao Biodiversity Association was active in this area.

Current and Future Land Uses

The team discussed with IUCN the current and future land uses in relation to the discussion topics. We discussed:

- **Hydro-electric projects.** We discussed the current pressures with NPAs with current and future hydro schemes proposed within the NPA network, including at Nam Kading and Phou Khao Khouy NPAs. This was seen as a threat to the integrity of these NPAs.

Threats

The team discussed with IUCN the current and future likely threats in relation to the discussion topics. We discussed:

- **Wildlife trade and poaching.** We discussed the current threats to biodiversity from wildlife trade and poaching. We discussed links between officials and illegal trades, especially within NPAs. This was perceived by the IUCN as a major impediment to conservation of birds and mammals.

A.3.3 Regional Administrative Agencies

Mekong River Commission (Vientiane Office)

The research team met with Mr Amphavanh Sisouvanh, Mr Simon Krohn, Mr Piseth Chea, and Mr Henrik Larsen Mekong River Commission from the Mekong River Commission's Vientiane office on 1 March 2013.

Legal

The team discussed with MRC the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **MRC Jurisdiction.** We discussed the legal responsibilities of member countries of the MRC. The MRC has an influencing role but implementation of management and development decisions is the responsibility of member countries. MRC provides comments on hydro-electric schemes proposed along the main channel of the Mekong River and can only influence project outcomes through member countries.

Institutional and Management Arrangements

The team discussed with MRC the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **Discussion with member countries on biodiversity management.** We discussed the role of the MRC in biodiversity management. The MRC's role is primarily management of the main channel of the Mekong River. Tributaries are the jurisdiction of member countries. However, the MRC has started dialogue with member countries on biodiversity management.

- **Promotion of watershed management.** We discussed the role of the MRC in promoting watershed management. The MRC is interested in managing activities within watersheds to improve water quality. This involves providing comments on development proposals (including hydroelectric schemes) on tributaries of the Mekong.

- **Data accessibility.** We discussed the availability of data and whether the MRC could have access to information from the proposed Nam Ngiep Project.

- **Payment for Ecosystem Service (PES) case study.** We discussed that the MRC would be interested in undertaking a PES case study for activities undertaken as part of the biodiversity offset for the Nam Ngiep project**.**

Financial

The team discussed with MRC the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Benefit Sharing between jurisdictions.** We discussed benefit sharing between institutions and the ability for Lao PDR Government agencies to learn and build upon the work being undertaken. This involved sharing the financial burden to improve the capacity of NGOs and Lao PDR Government agencies.

Current and Future Land Uses

The team discussed with MRC the current and future land uses in relation to the discussion topics. We discussed:

- **Cumulative impacts from developments.** We discussed the cumulative impacts from a rapidly changing environment. Pressure from numerous hydroelectric schemes, mining, agriculture and other human population pressures were having a cumulative impact on water flows and quality within the Mekong and its tributaries.

Threats

The team discussed with MRC the current and future likely threats in relation to the discussion topics. We discussed:

- **Agriculture.** We discussed the density of agricultural activities in the catchments and the impacts on downstream water quality, mainly from erosion and sedimentation.

- **Transport**. We discussed river transport and the impacts on banks of rivers (although this mainly applies to the mainstream of the Mekong River).

- **Habitat fragmentation**. We discussed that development was fragmenting habitats across the landscape and without appropriate corridors, wildlife would be restricted in their movement within the landscape.

Ministry of Information, Culture and Tourism (MICT)

The research team meet with Mr Viengkeo Souksavatdy, Deputy Head of the Archaeology Department, MICT on 28 February 2013. Early in the meeting, Mr Souksavatdy revealed that he had personally undertaken an archaeological investigation as part of the impact assessment process for the Project. He was able to supply the team with a draft version of the report he wrote in October 2007.

Legal

The team discussed with MICT the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **Jurisdiction**. The Department of Heritage within the MICT is responsible for the management and preservation of physical cultural heritage in Lao PDR. Any offset that would include preservation of physical cultural heritage would require the department's input.

- **Protection of cultural values**. The Law on National Heritage (2005) is the primary legislative instrument for the protection and preservation of tangible and intangible cultural heritage and values. This law also covers natural heritage that has scientific or ecological value (*see articles 47-56*).

Institutional And Management Arrangements

The team discussed with MICT the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **Past precedent.** Mr Souksavatdy could not recall any past biodiversity offset projects that involved offsetting national cultural heritage.

- **MMG Sepon model**. Mr Souksavatdy suggested that the research model developed by MMG at its Sepon gold mine approximated the type of activity a cultural heritage offset might look like, though he acknowledged that this was in place as an impact mitigation measure. The model includes a research agreement with funding between the company, the department and a research team from James Cook University (Australia). MMG Sepon has also funded and built a small cultural heritage museum on behalf of Sepon District, which will be used to display artefacts excavated from the mine site.

Financial

The team discussed with MICT the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Limited operational budget**. The department has a limited operational budget, which is focussed primarily on meeting staffing requirements. Any additional projects, such as that by MMG, need to be funded from external sources.

- **National Heritage Fund**. The Law on National Heritage allows for the establishment of a National Heritage Fund, which would be administered by the MICT. Sources for this fund include compensation from activities that affect the national heritage.

Current And Future Land Uses

The team discussed with MICT the current and future land uses in relation to the discussion topics. We discussed:

- **Sites and artefacts are regularly discovered due to developments**. As found at Sepon and elsewhere in the country, sites and artefacts of national importance are regularly discovered, especially during construction activity for major projects. Mr Souksavatdy's investigations in 2007 found that sites of significance will be lost due to the Project and recommended appropriate mitigation and management measures. There was no suggestion however that current and future developments in both the Nam Ngiep and Nam Xan catchments were about to jeopardise or destroy cultural site types or values that were only located in these areas.

Threats

The team discussed with MICT the current and future likely threats in relation to the discussion topics. We discussed:

- **Scope of cultural heritage offset should be clearly defined so as to avoid threats**. Mr Souksavatdy stated that should it be assessed that an offset is required to compensate for loss of irreplaceable cultural values, whatever is proposed should be clearly defined, concrete and not be overly ambitious. He suggested that supporting the Office of Information and Culture of Borikhan District in intangible and tangible cultural heritage preservation activities would be an appropriate starting point.

In addition to Mr Souksavatdy time was spent with Ms Marion Ravenscroft, Director of Conservation at the Lao National Museum. Ms Ravenscroft provided personal insights based primarily on her experiences as a consulting archaeologist over two decades in-country.

- **Legal mechanisms unclear but conservation is practiced by some developers**. Ms Ravenscroft was unaware of any mechanisms that might aid in securing biodiversity offsets in the country but noted positively the tangible and intangible cultural heritage conservation programs at Sepon (MMG), Nam Theun 2 (NTPC), Theun Hinboun (THPC) and Phu Bia Mining's operations at Phu Kham and Ban Houayxai.

- **Offset measure should directly benefit PAP**. Ms Ravenscroft questioned the viability of offsetting any loss of cultural heritage in one area in another, suggesting that any conservation measure should directly benefit project-affected people (PAP). To her, the concept of offsetting like-for-like did not fit well with socio-cultural values in Lao PDR, especially in light of the country's ethnic diversity. Instead, given that the majority of PAP are Hmong, she suggested that Kansai could work with the Japan International Cooperation Agency (JICA) to fund a cultural centre at the district level.

- **Offset measure should account for unknown yet expected losses**. While cultural heritage investigations to date have focussed primarily on tangible heritage, objects shown to investigators are common throughout the country. Ms. Ravesncroft suggested however, that it is highly likely that any construction work will unearth artefacts of national significance. This likelihood assessment is based on her past experience, especially at Sepon. Therefore any proposed offset should include a measure to account for the likelihood of as yet undetermined tangible heritage of national significance.

Department of Environmental and Social Impact Assessment (DESIA), Ministry of Natural Resources and Environment (MoNRE)

The research team met Mr Aengphone Phangsuwan, Director of Centre – EIA Review of Hydropower Projects, and Mr Peter Jensen, Chief Technical Advisor, Environmental Management Support Programme (seconded to MoNRE from Danish engineering company Grontmij) on 28 February 2013.

Legal

The team discussed with DESIA representatives the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **Annex.** We discussed the NNP1 Project conditions which outline the Environmental and Social obligations for the NNP1 Project. It also specifies that a biodiversity offset will be required to compensate for the impacts of the Project, potentially including Nam Xan River.

- **Lack of legal mechanisms.** We discussed a lack of legal mechanisms in place to manage offsets in Lao PDR. The NNP1 project is the first project which will require an offset as a condition of the Project approval, according to DESIA.

- **Offsets in development.** We discussed the other projects in Lao PDR which are pursuing offsets as a requirement/component of their funding arrangements with either the IFC or ADB. These include Phou Bia Mine, Sepon Mine and Nam-Theun 2 Project.

Institutional And Management Arrangements

The team discussed with DESIA the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **Management Options.** We discussed the diversity of options that should be considered as constituting an "offset". Components included Protected Area management, research funding, education programs, captive breeding and release programs and ecotourism programs. Mr Aenphone and Mr Jensen agreed that all of these options could be considered appropriate and that a combination of each of these measures would be preferable if applied correctly. They confirmed that while developers must propose offset options, the final decision would be made by government.

- **Local knowledge and global expertise.** We discussed the need to bring global standards to the development of the offsets, but that local knowledge will be required for successful implementation of the offset. Provinces, Districts and Villages will all need to be consulted during development of the offset. Mr Jensen stated that it was essential that any proposed offset benefit people directly affected by the Project.

Financial

The team discussed with DESIA the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Lack of financial structures.** We discussed a lack of financial mechanisms in Lao PDR in place to adequately manage offsets in the long term. There was no discussion of the Lao PDR Environmental Protection Fund during this meeting.

Current and Future Land Uses

The team discussed with DESIA the current and future land uses in relation to the discussion topics. We discussed:

- **NTFPs.** We discussed the current status of land use in the Project Area as subsistence farming and the importance of NTFPs in maintaining local livelihoods.

- **Regional Biodiversity Planning.** We discussed range of current and future land use projects and groups including The Agrobiodiversity Initiative (TABI), the Biodiversity Conservation Corridor Project (BCC) administered by the ADB, the Lao Aquatic Resources Research Centre (LARRC) and the National Protected Area (NPA) system. Mr Jensen indicated that the Project may benefit from partnering with these initiatives to achieve the offset requirements of the Project.

Threats

The team discussed with DESIA the current and future likely threats in relation to the discussion topics. We discussed:

- **Biodiversity threats.** There was brief discussion of the biodiversity threats in Lao PDR, which were broadly identified as a result of a lack in coordinated management and poor funding circumstances.

Department Of Forest Resource Management (DFRM)

The research team met with Mr Saysomone Phothisat Deputy Director General and Mr Lampanh Kommadam Director of Conservation Forest Management, Department of Forest Resource Management (DFRM). Mr Khamphanh Nanthavong, Director General of DFRM was unavailable. The meeting occurred on 28 February 2013.

Legal

The team discussed with DFRM the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **Forest Law.** We discussed the application of the Lao PDR Forest Law. This included the ability to change forest classifications from "Production Forest" to "Protection Forest". This is allowed by the legislation under Article 44. The Prime Minister of Lao PDR can approve the change in classification.

Institutional and Management Arrangements

The team discussed with DFRM the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **Forest resource access.** We discussed the process for access to resources. This involves a public tender process on a rotation of 25 years to private companies. This involves the government determining the yield (volume) and auctioning the volume of timber. There is local and regional participation in the tender process.

- **Environment Protection Fund.** We discussed the application of the Fund and its administration. DFRM are of the view that improvements need to be made in the administration and governance of the fund to make it effective.

- **Water Shed Management Committees.** We discussed how these Committees operate to improve water quality protection. DFRM work with these Committee to protect forest and ensure the adequate management of soil and water resources.

- **Compensation for impacts on forest resources.** We discussed the compensation requirements for impacts on forest resources due to developments. This included both payments and additional areas from developers due to a reduction in the productive area of forests. This process also involved ensuring that forestry activities also removed resources from areas to be impacted (such as inundation areas from hydroelectric dams).

- **Sustainable Forestry and Rural Development (SuFoRD) project.** We discussed the SuFoRD program and ongoing projects. DFRM mentioned there was an ability to create new sustainable forestry projects as part of the SuFoRD package of activities.

- **Phou Khao Khoay NPA Management.** We discussed the ongoing management of PKK by the military. This included the ability of the military to manage the protected area with their limited resources and conflicts between military use and conservation. DFRM cooperates with the army to deliver management of the protected area.

Financial

The team discussed with DFRM the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Payment for Ecosystem Services.** We discussed the pilot project for PES for Nam Ngeum 3 Hydropower Scheme. DFRM expressed that this project was a pilot and payments had been made to facilitate forest conservation. DFRM expressed the view that they would like to see the outcomes of the PES pilot project prior to committing to future projects.

- **KfW Entwicklungsbank Bank Forest Protection Program.** We discussed the current work being undertaken by KfW Bank in terms of supporting rural development and aiding climate relevant environment and resource management in Lao PDR. KfW Bank has also worked with DFRM to cooperate and assist in the management of protected areas in Lao PDR.

Current And Future Land Uses

The team discussed with DFRM the current and future land uses in relation to the discussion topics. We discussed:

- **Hydropower Schemes**. We discussed the impacts on forest resources from hydropower schemes and the reduction in available production forest. DFRM expressed the view that adequate compensation was necessary equivalent to the likely impact on forest resources.

Threats

The team discussed with DFRM the current and future likely threats in relation to the discussion topics. We discussed:

- **Ongoing funding for NPAs.** We discussed the lack of resources (both in terms of manpower and finances) to support the protected area system. DFRM acknowledged this as an issue and highlighted that they sought partnerships with WCS and IUCN to deliver on the ground management of protected areas.

A.3.4 Local Officials

Phou Khao Kouay (PKK) National Protected Area Management

The research team met with Lieutenant Colonel That Keoathone at the Phou Khao Khouay (PKK) NPA on 22 February 2013.

Legal

The team discussed with the PKK management the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **PKK NPA.** We discussed the NPA and its management structure, and briefly touched on the NPA system as a whole. Lt Col. Keoathone was not aware of any other legal mechanisms available for conservation management in Lao PDR.

- **Role of the military.** We discussed the role of the military in conservation. Lt. Col. Keoathone indicated that while conservation was not the primary aim of the military, it was a secondary mission which was considered important in managing PKK NPA and Phou Phanang NPA to the west. This was particularly important during non-war times, when the military had the man power to contribute to protected area management. He referred to the military's conservation management role at PKK as a pilot project. It is possible that the presence of the military serves a strategic defence purpose, though this was not discussed with Lt. Col. Keoathone.

Institutional and Management Arrangements

The team discussed with PKK management the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **NPA Management.** The military is responsible for management of the NPA, as advised by the NPA Management Committee. The committee is made up of representatives from the NPA, Province, District, DFRM (MoNRE) and the village organisation administration.

- **NPA Staff capabilities.** There are approximately 170 military officers involved in management of the 200 000 hectare NPA. Their roles are primarily related to manning the gates (called sub-stations) and border patrol, although the latter border patrol is not undertaken regularly enough to have a significant impact on poaching and wildlife harvesting.

- **The NPA Management Plan and current activities.** An NPA Management Plan has been prepared (with the support of the IUCN in 2010) and the boundary of the NPA has been surveyed. Approximately 10% of the boundary markers have been put in place to date. There has been a baseline biodiversity study undertaken for the park, and WCS have been involved in this initial study. Lt. Col. Keoathone confirmed that his staff conducts enforcement activity against illegal logging and poaching, though prosecution of violators is managed by civil authorities. He added that they also conduct some training in bordering villages about conservation values

Financial

The team discussed with PKK management the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Lao PDR Government Funding.** PKK NPA receives 100 M LAK (Lao kip) in annual funding which is approximately equivalent to $12,700 USD. The funding is considered insufficient to make any substantial inroads into the NPA Management Plan.

- **Military support.** We discussed the role of the army in providing financial support. Lt Col. Keoathone said that the military provided vehicles, and salaries for the 170 officers.

- **Additional support.** PKK NPA is understood to be entitled to additional funding from offset packages from Nam Leuk hydropower project, and potentially from the Lao PDR Environmental Protection Fund. However, Lt. Col. Keoathone stated that he was unaware of any funding from these sources.

Current and Future Land Uses

The team discussed with PKK management the current and future land uses in relation to the discussion topics. We discussed:

- **Current villages.** We discussed the current population within and around the park. Lt. Col. Keoathone said that there were 72 villages in or near the NPA, including 2 villages within the NPA, and 7 villages on the border.

- **Hydropower.** We discussed the presence of two hydropower projects which have recently been constructed, or are under construction in the NPA. These include large dams on the Nam Mang and Nam Leuk rivers. The project on the Nam Leuk and its associated roads have changed the PKK's elephant habitat, pushing the elephants outwards towards villages and rice paddies in search of food (noted in threats below).

- **Sections of the NPA.** The NPA is divided into 7 sections, each within a separate province and/or district. Of note were two sections: Section 6, which involves a growing ecotourism operation at Tad Xat waterfall including tours and homestays; and Section 7, which is undertaking reforestation projects for conservation.

Threats

The team discussed with PKK management the current and future likely threats in relation to the discussion topics. We discussed:

- **Hunting and poaching of wildlife.** We discussed the major threat to biodiversity in the NPA as being hunting from illegal poachers who target large fauna and transport the meat to markets in Vientiane. The hunters are generally not local villagers according to Lt. Col. Keoathone. The major highway, which passes close to the NPA, and easy road access into the centre of the NPA facilitate poaching and hunting.

- **Illegal timber harvesting.** We discussed the significance of illegal timber harvesting in PKK NPA as being a major priority for addressing biodiversity conservation.

- **Local elephant population.** There is a local elephant population within PKK which has been displaced by one of the hydropower developments within the NPA. The Elephants have moved to a patch of habitat closer to the border of the NPA which renders them more susceptible to poaching and other threats. This is considered to be a conservation priority for the NPA by Lt Col. Kheoathone.

- **Orchid populations.** Lt Col. Keoathone indicated that a population of threatened Orchids that were being impacted by one of the hydropower developments are due to be relocated to an area near the Nam Mang (river) within PKK NPA. Unfortunately no additional information could be gained on the species or its location during the meeting.

A.3.5 Other Stakeholders

Theun-Hinboun Power Company Ltd

The research team met with Mr Robert Allen, Theun-Hinboun Power Company Ltd on 27 February 2013.

Legal

The team discussed with Theun-Hinboun Power Company the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **Requirements for approvals and offsets in Lao PDR**. We discussed the triggers that required the creation of compensatory measures for biodiversity offsets for the impacts from the development of the Theun-Hinboun project. Robert commented that the main requirements were set by Laos PDR. He said that he had a good working relationship with government agencies.

- **Contractual arrangements**. We discussed the contractual arrangements set with WCS to deliver offsets. This included reporting on performance and measuring biodiversity gains. Robert commented that Theun-Hinboun project had decided to manage WCS directly rather than use the Environment Protection Fund or involve MoNRE or DFRM. This was a conscious choice so that there was greater control over the contractor and the outcomes delivered.

Institutional and Management Arrangements

The team discussed with Theun-Hinboun Power Company the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **Role of WCS in supporting the Theun-Hinboun Power Company**. We discussed the delivery of management by WCS, including the work undertaken on ground. WCS was chosen to support the project on a fee for service basis. Management plans for biodiversity have been prepared, including criteria and indicators and management measures. Management focuses on the Nam Gnouang South Protected Forest Area. The work undertaken by WCS also includes a reforestation program along the edges of the reservoir. Long-term conservation initiatives are planned, including human-elephant conflict, forest protection, enhanced patrolling and road check points, community education, sustainable forestry and data collection.

Financial

The team discussed with Theun-Hinboun Power Company the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Mechanisms for financial support for biodiversity offsets.** We discussed the financial support for the work of WCS in biodiversity conservation. Theun-Hinboun Power chose to fund the work directly rather than contribute money to the Lao PDR Government for offsetting.

Current And Future Land Uses

The team discussed with Theun-Hinboun Power Company Ltd the current and future land uses in relation to the discussion topics. We discussed:

- **Use of areas surrounding the hydroelectric dam for biodiversity (Nam Gnouang Reservoir).** We discussed land uses and the opportunities to achieve biodiversity offsets. Theun-Hinboun Power recalled that they had chosen areas around the reservoir as an offset site as it would have the added benefit of providing watershed protection to the dam.

Threats

The team discussed with Theun-Hinboun Power Company the current and future likely threats in relation to the discussion topics. No threats were identified and discussed.

Mr Martin Hollands, Conservation Policy and Practice Ltd.

Mr Martin Hollands, Conservation Policy and Practice Ltd. (Former Lao PDR Program Manager, WWF)

Legal

The team discussed with Martin the range of legal mechanisms available in Lao PDR in relation to the discussion topics. We discussed:

- **Environment Protection Fund**. We discussed the suitability of this fund to facilitate conservation. Martin mentioned that the administrative structure of the fund required support to ensure that environmental outcomes can be delivered and measured on the ground.

- **Forestry Operations.** We discussed the legal requirements for forestry operations and the quota system designed to distribute logging quotas to private companies. Martin discussed that this system may make it difficult to secure changes in forest classification to create protected areas or protection forests.

Institutional and Management Arrangements

The team discussed with Martin the range of institutional and management arrangements in relation to the discussion topics. We discussed:

- **WCS and IUCN management of protected areas**. We discussed the merits and outcomes achieved through privately contracting conservation activities to manage offsets. Martin described the importance to oversee and have clear objectives, funding and governance. We discussed the issue of what happens in the long term once funding runs out and the lack of government funding to support conservation.

- **Funding of protected areas.** We discussed ongoing funding of protected areas and the need to ensure that the funding was focussed and was not compromised by future developments or reductions in funding. We also discussed knowledge sharing and responsibilities with the private sector doing the work of DFRM in facilitating protected area management. This may cause longer term problems if private sector funding isn't forthcoming,

- **Operation of Lao PDR Government agencies.** We discussed communication between Lo PDR government agencies and the relative "silo" nature of their operation. This was seen as a challenge to facilitate communication and collaboration on conservation.

- **Involvement of the local community.** We discussed the importance on involving the local community in conservation, to improve engagement but also to enable them to become custodians of natural resources and reduce pressures those resources.

- **Importance of data.** We discussed the importance of making decisions using good data and the need to make sure that there was ongoing monitoring to test assumptions and adjust management techniques.

- **Strategic approach to district forest protection**. We discussed the importance of approaching protection forest management in a regional sense given the small amounts of forest reserved within the forestry estate. This would create economies of scale to manage these smaller patches of land.

Financial

The team discussed with Martin the current financial arrangements that in Lao PDR that are available in relation to the discussion topics. We discussed:

- **Protection Forest Decree.** We discussed the *Protection Forest Decree* by the Prime Minister of Lao PDR that proposed a way forward to provide economically viable funding for protection forests. The decree sets a 1% fee on commercial users of Protection Forest Services. Martin commented that this was not yet happening.

- **Payments for Ecosystem Services and REDD+.** We discussed the availability of new approaches to fund conservation, mainly through PES and REDD+. We discussed that there were opportunities to support these approaches and had the ability to facilitate sustainable financing of conservation and offsetting.

- **Linking fees to conservation.** We discussed the ability to direct mining fees and income from forestry operations to supplement funding of the protected area system. We discussed the ability of offsetting funds (such as environmental contributions from offsetting) to also contribute financially to conservation.

Current and Future Land Uses

The team discussed with Martin the current and future land uses in relation to the discussion topics. We discussed:

- **Hydropower Schemes.** We discussed the current hydro power schemes in Lao PDR and the pressure that this will have on river basins. This includes changes in hydrology, biodiversity impacts and the pressure to include offsets as part of development consents. Martin saw the requirement for offsets as a positive.

- **Forestry.** We discussed the impacts on forestry activities on the impacts on biodiversity. This was seen as a major current threat. Current projects however were trying to improve the sustainability of forestry operations (such as the SuFoRD project). Martin mentioned that these projects were successful but needed ongoing support to DFRM to make them successful.

Threats

The team discussed with IUCN the current and future likely threats in relation to the discussion topics. We discussed:

- **Wildlife poaching.** Martin mentioned that wildlife poaching was an ongoing issue that needed to be managed appropriately. This included the work that IUCN had been doing to support forest guards at various NPAs.

- **Human pressures.** We discussed ongoing human pressures on the Lao PDR environment, mainly through increased development and population growth. This was seen as the major driver to changes in the environment and impacts on biodiversity. We discussed ensuring a robust reserve system as the major way to improve the conservation of biodiversity and the role that effective offsets have in contributing to conservation.

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