CONSERVATION INTERNATIONAL

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REDD+ in the Prey Long Area

A feasibility study (preliminary results)

Acknowledgments

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Acronyms

AFOLU	Agriculture, Forestry and Other Land Uses
CCBS	Climate, Community, and Biodiversity Standards
CCCSAP	Cambodia Climate Change Strategy and Action Plan
CI	Conservation International
CDM	Clean Development Mechanism
CDP	Commune Development Plans
CER	Certified Emissions Reduction
CF	Community Forestry
CIP	Commune Investment Programs
CLUP	Commune Land-use Plans
CMDGs	Cambodia Millennium Development Goals
COP	Conference of the Parties
CPA	Community Protected Area
GDANCP	General Department of Administration for Nature Conservation and Protection
GDCC	Government Donor Coordination Committee
GHG	Green House Gases
GPG	Good Practice Guidance
ELC	Economic Land Concession
ESIA	Environmental and Social Impact Assessment
FiA	Fisheries Administration
FA	Forestry Administration
IPCC	Intergovernmental Panel on Climate Change
MAFF	Ministry of Agriculture, Forestry and Fisheries
MEF	Ministry of Economy and Finance
MoE	Ministry of Environment
MLMUPC	Ministry of Land Management, Urban Planning and Construction
MoI	Ministry of Interior
MRD	Ministry of Rural Development
MRV	Monitoring, Reporting and Verification
NCCC	National Climate Change Committee
NFP	National Forest Programme
NPD	National Programme Document (for UN-REDD)
NTFPs	Non-Timber Forest Products
NSDP	National Strategic Development Plan
PDD	Project Design Document
REDD-plus	Reducing Emissions from Deforestation and Forest Degradation, plus the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
RL/REL	Reference Level/ Reference Emissions Level
RGC	Royal Government of Cambodia
SFMP	Strategic Forest Management Plan
SLC	Social Land Concessions
TWG-F&E	Technical Working Group on Forestry and Environment
UNFCCC	United Nations Framework Convention on Climate Change
UN-REDD	United Nations REDD Programme
VCS	Verified Carbon Standard

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AIMS OF THE FEASIBILITY STUDY

The purpose of this feasibility study is to provide an assessment of the potential for developing a REDD-plus initiative in the Prey Long area of Cambodia, as a strategy for securing the sustainable use of its forest resources for the future. The analysis is based on a desk-based review of relevant documentation regarding the project area and the national REDD-plus process in Cambodia, complemented by expert input and in-depth interviews during a visit to Cambodia. The technical analysis is based on data sources provided by local experts complemented by available scientific literature, and is aligned with the key requirements of the REDD methodologies currently approved or under approval by the Verified Carbon Standard (VCS)[1]. The study thus provides a preliminary estimation of the carbon benefits, in terms of emissions reduction potential, of establishing a REDD-plus initiative in Prey Long under different reference (baseline) scenarios, and identifies potential strategies for achieving such emissions reductions in line with the National REDD-plus strategy developed by the RGC. The study also examines the relevant social, economic and ecological context that would affect the aims and success of a potential REDD+ initiative in Prey Long, and outlines the potential co-benefits that would result from such an initiative. Overall, the study aims to produce a workable REDD-plus concept for Prey Long.

[1] In 2011, the (previously named) Voluntary Carbon Standard changed its name to Verified Carbon Standard. See the VCS letter to stakeholders: http://us2.campaign-archive2.com/?u=65515b9ef00ff498311fbe3aa&id=476bfe5cc3&e=2a61aa6872

EXECUTIVE SUMMARY

Any attempt to build a strategy for a REDD+ initiative in the Prey Long area has to take into consideration the types of management arrangements being considered under the Cambodia REDD+ Roadmap, and which among those arrangements are best fit to address local realities. The Prey Long initiative therefore should aim to build upon Cambodia's REDD+ strategy and understand how the development of a REDD+ initiative in Prey Long could support the implementation of the National REDD+ Strategy and the existing forest management strategies that REDD+ is envisioned to support.

The preliminary results of this feasibility study indicate that a developing a REDD+ initiative in Prey Long could generate great value in terms of climate change mitigation benefits, in the order of approximately 10 million tCO_2e within a 10-years timeframe, after having discounted for a 20% permanence risk buffer (see table below). This is due to the high rates of unplanned deforestation currently present in the area, mainly driven by encroachment for agricultural and commercial uses. A separate driver that has emerged recently includes the granting of Economic Land Concessions (ELCs) for agro-industrial uses.

Two options are suggested as potential REDD+ strategies for the Prey Long area: 1. Identifying areas under highest threat of unplanned deforestation for implementing local forest protection contracts with the local population through conservation agreements and enhanced law enforcement, building on CI's experience in the Cardamoms Mountains; and 2. Protecting a larger area of forest by designating Prey Long as a Protected Forest or a Conservation Concession for REDD+ management, in order to prevent the granting of further ELCs within the area, while implementing local forest protection contracts with the local population to reduce the rate of unplanned deforestation. These strategies produce similar benefits in terms of REDD+, however, further research and consultation with stakeholders and government institutions is needed in order to have a more complete picture of the dynamics of deforestation in the area, particularly with regards to the threat of future ELCs, that would allow to construct a planned baseline that would more accurately reflect the future of Prey Long and thus recognize the real efforts of protecting its forests.

Ex Ante REDD benefit estimate, CO2e (tCO2e) minus 20% permanence risk buffer			
Years	**SCENARIO 1a: UNPLANNED DEFORESTATION**	**SCENARIO 1b: UPLANNED PLUS ALLOCATION ADJUSTMENT FACTOR**	**SCENARIO 2: UNPLANNED PLUS PLANNED**
1-5	4,074,791	3,901,382	4,222,454
6-10	10,599,678	9,744,669	10,837,518

A REDD+ initiative in Prey Long could provide several co-benefits. It would be the first of its kind to address post-concession management. It would contribute to avoid further ecological and biological losses from the country's lowland evergreen forests and to conserve the unique wildlife of the region. If designed properly, it has the potential to provide socio-economic development to local communities and at the same time preserve a forest which is an integral part of their lives.

1. NATIONAL CONTEXT

The Royal Government of Cambodia (hereafter, RGC) has recently achieved great progress with its REDD+ readiness process. During its fifth Policy Board meeting in Washington, D.C. from 4-5 November 2010, the UN-REDD Programme approved US$3 million in funding to support the Cambodian government to prepare and implement its national REDD+ strategy. The National Programme Document (NPD) presented by the RGC lays out its full REDD+ readiness plan, including a draft REDD+ Strategy and Implementation Framework and further guidance for establishing its Monitoring, Reporting and Verification (MRV) system, Reference Level/ Reference Emissions Level (RL/REL), and Stakeholder consultation process[2].

As such, any attempt to establish a REDD+ initiative in Prey Long has to be understood in the context of the emerging national REDD+ strategy. Outlining the main elements of such strategy, and the national context under which it has been designed, is thus necessary in order to provide an understanding of the foundations upon which a REDD+ initiative in Prey Long would have to build upon.

1.1 Forests in Cambodia

Cambodia has one of the highest levels of forest cover in Southeast Asia, with approximately 10.7 million hectares of forest in 2006, or 58.9% of Cambodia's land area (FA, 2007). Based on the FAO 2005 Forest Resources Assessment, Cambodia has the 30th largest area of tropical forest in the world, but is the 13th most forested country by percentage of land area (FAO, 2005). Cambodia also has a relatively high rate of land-use change with Forestry Administration statistics showing that 379,485 hectares of forest were lost between 2002 and 2005/6 (FA, 2007), equivalent to a deforestation rate of 0.8% per year. As a consequence Cambodia has been classified as a "high forest cover, high deforestation" country for the purposes of REDD+ (Griscom, et al., 2009).

Cambodia's total population in 2004 was 13.4 million, with 85% of the population living in rural areas. Forests play an important role in meeting the subsistence and income needs of many of these households. Poor rural households, in particular, are known to have high levels of forest dependence, through the extraction, consumption and sale of non-timber forest products (NTFPs). Recent research indicates that 41% of rural households in Cambodia derive between 20 to 50% of their total livelihood value from forest use, while 15% of households derive more than half of their total livelihoods from forest use and harvesting (Heov, et al., 2006).

1.2 Forest Land Management

Forests in Cambodia are for the vast majority state property. Management and regulatory authority over forest land falls under different government agencies, depending on how the forest is classified. The two main laws for the classification and management of land in Cambodia are the Land Law (2001) and the Forest Law (2002).

The Land Law (2001) classifies land into four main categories: i) *State Public Property*: land that carries a public interest and is held by the state in public trust; it cannot be sold or transferred to another entity. Prey Long falls under this category. ii) *State Private Property*: state land that does not carry a public

[2] The full UN-REDD National Programme Document of Cambodia is available here: http://www.unredd.net/index.php?option=com_docman&task=doc_download&gid=3467&Itemid=53

interest and can be sold and transferred to another entity; this includes degraded forest and all land that ELCs are on; iii) *Indigenous Land*: land where indigenous communities have established their residence and where they carry out traditional agriculture; in order to receive collective ownership communities must go through a process of registering with the Ministry of Interior; iv) *Private Land*: part of a project of the RGC aiming to provide secure land tenure to urban and rural residents of Cambodia that lack official land titles.

The Forestry Law (2002) defines the *Permanent Forest Estate*, which is divided between the Permanent Forest Reserve and private forest areas. The *Permanent Forest Reserve*, amounting to around 70% of Cambodia's forests, is considered State Public Land and falls under the regulatory *and* management jurisdictional authority of the Forestry Administration (FA) of the Ministry of Agriculture, Forestry and Fisheries (MAFF). It is further divided into *Production Forests* (Forest Concessions and Community Forests; forest areas with the primary purpose for the sustainable production of timber and NTFPs); *Protected Forests* (with the primary function of protecting forest ecosystems, conserving biodiversity and regulating water and soil resources); and *Conversion Forests* (forests which have not yet been classified; considered as heavily degraded idle forest lands that have yet to be determined for a non-forestry use, but that can be reclassified by the RGC through Sub-Decree as State Private Land and used for other development purposes, such as Economic or Social Land Concessions). *Private forest areas* are non-State Private Lands with forest resources on them[3], including forest lands transferred to local indigenous peoples through indigenous communal land titling and registration procedures. They also fall under the regulatory authority of the FA. *Protected Areas* (currently around 3.1 million hectares) represent another category of State Public Property and fall under the jurisdiction of the Ministry of Environment (MoE), while flooded forests and mangrove areas fall under the jurisdiction of the Fisheries Administration (FiA) of the MAFF. (See Annex 1 for a detailed classification of forestland in Cambodia.)

Before 2002, the predominant form of forest management in Cambodia was commercial forestry concessions. Over four years (1994-1997) the RGC granted 36 forest concessions covering 7 million hectares, or close to 70% of the forestlands in the country. Motivated by the high incidence of illegal activities that led to the plundering of its forest resources, the RGC issued a Declaration in 2001 on the Suspension of Forest Concession Logging Activities, which suspended all logging activities in concessions starting from January 2002 until new forest concession management plans could be prepared and approved. While most of the production forestry concession agreements were ultimately cancelled by 2006, all remaining logging concessions, which have been reduced to 3.4 million hectares of the Permanent Forest Reserve, remain at a halt (UNREDD NPD, 2010). Through the 2002 Forestry Law, the RGC undertook a comprehensive reform of the forestry sector. The Forestry Administration was established with responsibility for the Permanent Forest Reserve. Concession management was reformed by introducing mandatory compliance requirements such as Strategic Forest Management Plans (SFMPs) and Environmental and Social Impact Assessments (ESIAs), consistent with international standards.

[3] "Forest plantation or trees, whether planted or naturally grown on private land under registration and legal title pursuant to authorized legislation and procedures." (Forestry Law, 2002).

New alternative approaches to forest management have been introduced in Cambodia moving beyond forest concessions, such as Protected Forests and Community Forestry. Community Forestry was introduced in 2003 as a way of encouraging sustainable forest management by decentralizing management responsibility to local communities. Although, the proportion of forest under community forestry activities is currently low (<5%), the FA is planning to set a target of 1,000 community forestry groups registered, covering 2 million hectares, or 19% of the forest estate (UN-REDD NPD, 2010). In the meantime, since the logging moratorium and cancellation of logging concessions, a system has been established to supply domestic wood demand in which annual coupes are auctioned and monitored by the Forestry Administration.

1.3 National drivers of deforestation

Many factors have contributed to deforestation and forest degradation in Cambodia (Poffenberger, 2009). During the 1990s, they were mostly associated with uncontrolled logging in areas opened up by large-scale forest concessions. As forest concession activities have declined in recent years due to the 2002 logging moratorium and the abandonment of the forest concession system, land encroachment and the potentially excessive use of economic land concessions (ELCs) have emerged as major threats to forests and rural livelihoods (Thelaide and Schmidt, 2010; Hansen et al., 2006; Sloth et al. 2005). In addition, the lack of alternative forest management systems has left Cambodia in a situation in which large areas of forests outside protected areas are currently in a management vacuum. Post-concession areas (such as the forests of Prey Long) are therefore at present unmanaged and at increasing risk of forest conversion.

Deforestation hotspots in Cambodia are located on the edges of the lowland rice-growing zone where the majority of the country's people live, in hilly regions and on good quality "red" soils that are very productive for agriculture (such as Ratanakiri province) and in areas bordering Lao PDR, Vietnam and Thailand (Stibig et al., 2007). The UN-REDD NPD (2010, pg.14) provides an extensive analysis of the drivers of deforestation in Cambodia distinguishing between direct and indirect drivers, with the most relevant ones stemming from outside the forest sector:

Drivers from inside the forestry sector:

- **Unsustainable logging**: illegal logging continues at unknown levels despite the logging moratorium and cancellation of logging concessions;
- **Fire**: the role of fire has been discussed extensively in Cambodia and its role in driving land-use change is unclear;
- **Unsustainable woodfuel collection**: Current and future demand for woodfuel (fuelwood and charcoal) is seen as a potential cause of forest degradation and deforestation. Woodfuel provides the primary energy source for most rural and some urban households in Cambodia and is also a major source of energy for some industries (brick making and garment manufacturing). The contribution of woodfuel burning to overall emissions however is unclear, since it depends on the source of the woodfuel (i.e. whether or not the wood would have been burnt anyway), and how sustainable the source is[4].

[4] Although domestic use of woodfuel is not usually associated with deforestation, high levels of commercial demand and the lack of alternative energy sources is causing some concern (Top et al., 2004; 2006). Currently, a significant proportion of commercial woodfuel supply is in the form of wood residues derived from the clearance

Drivers from outside the forestry sector:

- **Clearance for agriculture**: production of rubber, sugar cane and more recently biofuel crops has been a major cause of forest conversion. Land privatization for cultivation and granting of ELCs– mostly for wood, agro-fuel and food production – has been closely related to deforestation (UN-REDD NPD, 2010).
- **Expansion of settlements**: In many forested areas in Cambodia, in-migration is having major impacts on demand for land and resources and is driving deforestation and degradation. In some provinces in-migration has been encouraged by the opportunity of secure land being offered. Migrants generally clear farm land for themselves and may also open forest land to sell on (land speculation).
- **Infrastructure development**: increased access to forestland resources, which is primarily due to road development, is a major driver behind land encroachment, especially in Protected Areas and Protection Forests.

The analysis of drivers of deforestation provided in the UN-REDD NPD identifies in addition a significant number of *underlying factors*, both from inside and outside the forestry sector, that drive large-scale land use change. These include weak forest law enforcement and governance, including lack of transparency and accountability, and low level of stakeholder involvement; low institutional capacity and weak policy implementation; weak forestland tenure; insufficient implementation of land use planning and land registration; social norms; population increase; widespread rural poverty; migration; low agricultural yields; increased regional and global demand for resources; poor ESIA regulations; high opportunity costs of alternative land uses; lack of demarcation of forest areas; lack of incentives for sustainable management of forests; lack of alternative energy sources; among others. Suggesting REDD+ strategies to address these drivers is challenging due to the factors involved. As such, the REDD+ Roadmap indicates that a bottom-up approach to REDD+ that focuses on site-based efforts may be the most effective REDD+ strategy.

A major threat to forest resources that deserves particular attention has recently emerged through the development of large-scale Economic Land Concessions. ELCs are blocks of land -up to 10,000 ha- designated by the state and leased to third parties (concessionaires) -for up to 99 years- for the purposes of agro-industrial development. According to UNEP WCMC, Cambodia has over 160 Economic Land Concessions, located mostly in the Northeast and Southwest regions, covering an area of 17,770 km^2 and representing 10% of total land area (Leng et al., 2010). In 2005, the main crops to be planted in land concessions already signed include acacia, eucalyptus, rubber, oil palm, teak, cashews and cassava (Hansen et al., 2006). As reported by the UN Cambodia Office of the High Commissioner for Human Rights, the granting of ELCS has been generally characterized by a lack of transparency, unclear demarcation of boundaries, non-disclosure of benefits to the state treasury and non conformity with legal frameworks (UNHCR 2004). Although legally not allowed to be granted on forest lands, this is not always the case, as it has been observed that ELCs have often been granted on land with existing forest cover or on land used and cultivated by local people (UNHCR, 2004; Hansen et al., 2006). As such, any forest loss related to ELC development would fall under the "planned deforestation" category under the

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of old rubber plantations. Depletion of senescing plantations is likely to result in scarcity of rubberwood in the near future and consumers may turn to natural forest (UN-REDD NPD, 2010).

VCS standard classification system of deforestation typologies (provided that it was legally granted), and would require the application of a relevant methodology (see Annex 2 for further details on ELCs).

1.4 Governance

Forest policy development and implementation in Cambodia is a complex issue, involving different government agencies and also other stakeholder groups such as the private sector, the military, NGOs and international donors. Conflicting interests among these groups and the lack of a coherent policy framework has often led to competition over forest resources, making governance one of the greatest challenges of managing forests in Cambodia (Amariei, 2004).

Widespread illegal behavior is another major challenge for managing forests in Cambodia. Most reports on the forestry sector mention corruption at all levels as one of the most evident patterns of this behavior, such as the anecdotal evidence of widespread illegal payments to supplement salaries and operational budgets, and the evidence of the adverse influence of various interest groups, including the military in the operation of the FA (Amariei, 2004).

While illegal acts continue to represent a major problem for the forestry sector in Cambodia, the Government has taken several actions during the last years to tackle such issues. Through various measures, such as the restructuring of the institutions dealing with forestry issues, including the creation of the new Forestry Administration at the MAFF, the strengthening of civil society involvement and the use of independent forest monitors and observers (such as SGS), the moratorium on logging since 2002 and the reshuffling of the concessions system, and the development of the community forestry sector, the Cambodian Government has shown its commitment to improving governance in the forestry sector (Amariei, 2004).

In early 2010 the Cambodian Prime Minister removed the Director-General of the Forestry Administration (FA) from his position, for failing to take action to stem illegal logging. This was a clear indication that the Cambodian Government is serious in its efforts to tackle illegal forest clearance at all levels in Cambodia. The new Director-General was tasked with not only reducing illegal logging but also with removing FA staff who are engaged in or allow illegal forest clearance. In order to streamline the Forestry Department, the government also reviewed the staffing system to remove 'ghost employees' – forestry staff who sign onto the system in a bid to gain overseas scholarships, but who do not turn up to work and who pay most of their salaries to their superiors. Many 'ghost staff' have been removed from the system. The FA is now working closely with the National Military Police to stop logging at all levels. In April and May 2010 there were several high profile arrests of businessmen and many large-scale confiscations of timber. This continued throughout 2010, with more arrests and crackdowns on illegal logging, and an increased presence in the forests by Forestry staff on the orders of the new Director-General. This is a strong indication of the government's tough new approach to reduce illegal forest clearance. This approach bodes well for REDD+ as it shows government commitment and a willingness to tackle illegal logging at all levels of power, both within government and within the business sector.

A careful consideration of such governance issues, with special attention to the dynamics of powerful interest groups at the local level, should be undertaken prior to investing significant amounts of resources in developing a REDD+ initiative in Prey Long.

1.5 Key Policies relevant to REDD+ in Cambodia

Over the past two years, the RGC has begun to implement a new vision for Cambodia's forest sector, based on the Rectangular Strategy-Phase II, the National Strategic Development Plan (NSDP), the National Forest Programme (NFP) and several new laws and policies.

Cross-sectoral policy in Cambodia is mainly driven by the Rectangular Strategy for Growth, Employment, Equity and Efficiency-Phase II, which is the RCG's over-arching socioeconomic development policy agenda for the Fourth Legislature of the National Assembly (2008-2013). The National Strategic Development Plan (NSDP, 2006-2010) is intended to serve as the roadmap for implementation of the Rectangular Strategy-Phase II. The Updated NSDP (2009-2013) sets a national target of 60% forest cover, 450 approved community forests, and reducing fuelwood dependence by 2013. It also mentions the importance of the new National Forest Programme as the strategic framework for the forestry sector, and the role of protection forests, protected areas (PAs), community forests and improved management of forestry concessions towards achieving the national target of 60% forest cover. Finally, the NSDP recognizes the importance of mobilizing resources, support, and financing to participate in global efforts to address the challenge of climate change, including REDD and greenhouse gas mitigation projects. In addition, the Cambodia Millennium Development Goals (CMDGs), under Goal 7 "Ensure environmental sustainability", also set up indicators (9) with specific targets for the forestry and environment sector.

Cross-sectoral decisions and strategy formulation are the responsibility of the RGC and are made within the Council of Ministers. The Government Donor Coordination Committee (GDCC) and the Technical Working Group on Forestry and Environment (TWG-F&E) also have an important advisory function in the process and can play a supporting role in identifying options and approaches (UN-REDD NPD, 2010). Development and implementation of the National REDD Readiness plan is one of the four key activities for the Forestry sector during 2010-2011 under the Government-Donor Joint Monitoring Indicators. There is therefore strong support from Development Partners for national REDD readiness activities.

Sectoral policies related to the management of forests, and designed to operationalize the NSDP and achieve the CMDGs, are the National Forest Programme (NFP, 2010), which is a long term national forest management plan for the sector (2010-2030), particularly the Permanent Forest Reserve; the planned National Protected Areas Strategic Management Plan for the 3.1 million hectares of Protected Areas (mandated by the 2008 Protected Areas Law but yet to be developed), and the Strategic Planning Framework for Fisheries (2010-2019) for flooded and mangrove forests (UN-REDD NPD, 2010). Other relevant policies include the Declaration on Land Policy (2009), and the planned Cambodia Climate Change Strategy and Action Plan (CCCSAP).

Cambodia has also committed to transferring political, fiscal, administrative, and service delivery powers to sub-national authorities, a process called **decentralization and deconcentration (D&D)**. Of these authorities, only provinces, districts and communes are relevant for REDD+ implementation, because these regional and local governance authorities are located by definition in rural areas that contain forestland resources. Under the Organic Laws[5], regional and local administrative authorities currently

[5]The Organic Laws are the Law on the Administration and Management of the Commune/Sangkat (2001), and the Law on Administrative Management of the Capital, Provinces, Municipalities, and Districts. They set out the roles and responsibilities of these authorities and their organizational/governance arrangements.

have no direct decision making authority over the use and management of most forestland resources in the country, which instead resides primarily within MAFF, MoE and Ministry of Economy and Finance (MEF), but they do have supporting functions. Communes are mandated to protect and preserve environmental and natural resources under existing legislation , and are responsible for developing 5-year Commune Development Plans (CDP), rolling 3-year Commune Investment Programs (CIP) and Commune Land-use Plans (CLUP).

Regarding spatial planning, a first draft of the Spatial Planning Policy was completed in 2010. Although the final form of the policy is not clear, there are already provisions that stress the importance of the sustainable management of natural resources in the country, along with general principles that link CLUPs with District and Provincial Land Use planning processes, and the land use plans of State land trustee authorities, such as the Forestry Administration (Permanent Forest Reserve) and GDANCP (Protected Areas).

1.6 Main elements of the National REDD+ Implementation Framework

Cambodia submitted its R-PIN to the World Bank Forest Carbon Partnership Facility (FCPF) in late 2008 and was accepted into the FCPF in early 2009. On March, 2011 it presented its Readiness Preparation Proposal (R-PP) to the 8th Participants Committee of the FCPF. Cambodia also applied to join the UN-REDD Programme in August 2009, and was granted observer status in October 2009. Following its entrance to UN-REDD, the Country Offices of UNDP and FAO provided support to the Cambodian Government to initiate its REDD+ Readiness planning process, which led to the development of the *Cambodia REDD+ Roadmap*. In November 2010, during the 5th Policy Board meeting in Washington, D.C. the UN-REDD Programme approved US$3 million in funding to support the Cambodian government to prepare and implement its national REDD+ strategy.

The Cambodia REDD+ Roadmap is a national plan for how the RGC wants to move ahead with REDD+ Readiness (UN-REDD NPD, 2010). It was developed by the interim REDD+ Taskforce and stakeholder groups during the period January-September 2010, and forms the basis for the National Programme Document under UN-REDD and for the R-PP under the FCPF. Its structure is similar to that of an R-PP, covering the six main components of REDD+ Readiness: 1. Management of National REDD+ Readiness; 2. Consultation, stakeholder engagement and awareness-raising plan; 3. Development and selection of REDD strategies; 4. Implementation framework (including benefit-sharing and safeguards); 5. Development of the Reference Level/ Reference Emissions Level (RL/REL); 6. Development of the Monitoring, Reporting and Verification (MRV) system.

As set out in the General Principles of the Roadmap, development of Cambodia's national REDD+ strategy will build on existing forest management strategies, rather than initiating new policies, legal structures or governance arrangements. Implementation of REDD+ is therefore expected to follow Government agency jurisdictions, with different Government agencies developing REDD+ implementation strategies for the different forest areas that fall under their jurisdiction, based on the three existing main Government plans described previously: the National Forest Programme (NFP, 2010) for the forestry sector, particularly the Permanent Forest Reserve, the planned National Protected Areas Strategic Management Plan for the Protected Area network, and the Strategic Planning Framework for Fisheries (2010).

Existing management schemes under these frameworks that are considered for implementing the REDD+ strategy include, among others:

- Protection Forest management,
- Community Forestry (CF),
- Community Fisheries (CFi),
- Community Protected Areas (CPAs),
- Management of Fishing Lots,
- Fisheries Protected and Conservation Areas,
- Indigenous Land titling

The Roadmap also indicates that as part of the main strategy, line agencies may decide to investigate additional implementation strategies, such as:

- Conservation Concessions, as a viable alternative to other types of land concessions
- Local forest protection contracts
- Management of timber and wood energy
- Understanding how REDD+ can support implementation of the CBD in Cambodia
- Adopting the nested approach to REDD+ implementation

As indicated in the REDD+ Roadmap, implementation of the national REDD+ strategy would involve working at subnational scales, such as entire provinces or forested regions (e.g. Eastern Plains). One of the key parts of the strategy in fact is the identification and selection of priority areas for implementation at subnational level which could, potentially, include Prey Long (although it is not explicitly indicated as a candidate area). Based on the National REDD+ strategy, subnational implementation will be carried out by line agencies according to their jurisdiction and respective plans, and will have to be linked to a national accounting framework to be aligned with national-level reporting requirements to the UNFCCC. In order to operationalize this approach, Cambodia has explicitly adopted the "nested" approach to REDD+ implementation, linking subnational action to a national framework. This is of particular relevance to the Prey Long REDD+ initiative, because it means that it could be designed at the subnational scale, provided that it is properly aligned with the national REDD+ framework. In fact the Roadmap provides a series of guidelines for how projects should be designed, which are discussed in section 1.8.

1.7 National Responsibilities for REDD+

The National Climate Change Committee (NCCC) is the overall national coordination body responsible for preparing all climate change related policies, strategies and activities of the RGC. The Department of Climate Change, which is part of the General Department of Administration for Nature Conservation and Protection (GDANCP) of the MoE, acts as the secretariat of the NCCC. In addition, the Department is responsible for several functions relevant to REDD+: reporting to the UNFCCC, preparing national greenhouse gas inventories (including the first and second national communications), and coordinating implementation of the Clean Development Mechanism, for which the MoE acts as the interim Designated National Authority.

The *Interim REDD+ Taskforce* is an inter-ministerial coordination body that was formed in January 2010 to lead the REDD+ Readiness planning process in order to ensure a balanced discussion and coordination between Government agencies in the development of the Roadmap. It is chaired by the Forestry Administration of the MAFF, with the GDANCP (MoE) acting as the Deputy chair. Taskforce line agency members include the Fisheries Administration (FiA) of the MAFF, the Ministry of Economy and Finance (MEF), the Ministry of Interior (MoI), the Ministry of Land Management, Urban Planning and Construction (MLMUPC) and the Ministry of Rural Development (MRD). A *REDD+ Advisory Group* of 4-6 people is created to advise the Taskforce, consisting of key experts invited by the Taskforce on an ad-hoc basis. In addition, a *REDD+ Consultation Group* of up to 10 people is also created to represent civil society, indigenous peoples, NGOs, private sector and academic institutions, which meets with the Taskforce on a monthly basis. The Taskforce plans to establish several *Technical Teams* composed of Government and non-Government representatives to develop recommendations on particular technical issues related to REDD+ Readiness. Currently at least four Technical Teams are planned, and more may be required through the Readiness process: 1. REDD+ Projects Technical Team; 2. REDD+ Benefit-sharing and Revenue-distribution Technical Team; 3. MRV/REL Technical Team; 4. Consultation and Safeguards Technical Team. The Taskforce sends reports to National Climate Change Committee, as the main coordination mechanism on climate change (see Annex 3 for a figure of the Management Arrangements for REDD+ in Cambodia as described in the REDD+ Roadmap).

1.8 Guidelines for developing Demonstration activities

Demonstration activities are identified in the Roadmap as an important part of REDD+ implementation and for generating lessons learned in order to build capacity within the various government actors, and to inform the overall national framework development process. Importantly, it is explicitly mentioned in the Roadmap that demonstration activities can include REDD+ projects developed for the voluntary carbon market.

The RGC has currently approved two REDD+ pilot projects, initially to sell carbon credits on the voluntary market: the Oddar Meanchey community forests (FA/PACT/TGC/CFI) and the Seima Protection Forest in Mondulkiri (FA/WCS). One further REDD+ pilot project is under development in the Southern Cardmoms Protection Forest (FA/Wildlife Alliance/ONFI), although it has not yet obtained official approval. In addition, UNDP Cambodia has set aside up to $550,000 to support NGO grants for pilot projects over the period 2010-2012 as part of the Cambodia UN-REDD National Programme. The goal is to support 2-4 REDD+ projects approved by Government agencies (prioritizing existing projects).

Guidelines for the development of demonstration activities are developed by one of the four Technical Teams of the REDD+ Taskforce, called *REDD+ Projects Technical Team*[6]. This team is responsible for developing guidelines to ensure that pilot projects are undertaken in a way that allows them to be nested into the national REDD+ system. Currently, initial guidelines as set out in the UN-REDD NPD (2010) are as follows:

[6] The REDD+ Projects Technical Team is composed of FA, GDANCP, FiA, and other line agencies as appropriate, development partner and civil society representatives.

- For REDD+ demonstration activities tenure over forestlands should be clarified through the development of the project. This isn't a necessary pre-condition for starting a project, but clear agreements over tenure and forest carbon ownership should be developed through the project. Sites that already have started to establish local agreements over forestland tenure will therefore be more suitable for demonstrations of REDD+.
- All REDD+ demonstration activities should build on existing forest or site conservation projects, rather than create new initiatives.
- All pilot projects for the voluntary carbon market and REDD+ demonstration activities should be approved by the respective Government agency responsible.
- The Forestry Administration prioritizes existing pilot projects for the voluntary carbon market for completion before any other demonstration activities. The current approved pilot projects are Oddar Meanchey and Seima.
- GDANCP prioritizes having 1-2 pilot projects in Protected Areas, and pilot projects should include thinking about how REDD+ can work with CPAs and the PA zoning system.
- Lessons from pilot projects and demonstration activities should be compiled, in order to improve subsequent implementation and reduce costs.
- All pilot projects and demonstration activities should aim to build national capacity, especially in the Government line agencies responsible and local stakeholders.
- Pilot projects for the voluntary carbon market and demonstration activities should follow the national guidelines to be established by the REDD+ Taskforce through the Technical Team on Project Guidelines.

2. PROJECT CONTEXT

2.1 Location of the proposed REDD+ initiative

Prey Long is a term used to refer to the lowland evergreen forests of central Cambodia (McDonald, 2004). More specifically, it is an area located in the center-north part of Cambodia, to the west of the Mekong River. It stretches over four provinces, with the main area of Prey Long being located in Kompong Thom province; to the east, it reaches into Kratie province, bordering the Mekong River, and to the north, Stung Treng and Preah Vihear provinces (Figure 1). The forest estate is not officially demarcated and therefore the exact definition and boundary of the Prey Long forest is unclear (Olsson and Emmett, 2007). In its broadest definition, the Prey Long landscape covers about 520,000ha (Ashwell et al., 2004; Olsson and Emmett, 2007). The forest is surrounded by large rivers, agricultural areas, villages and towns. The human population in the area is steadily increasing and access to the forest is relatively easy (Olsson and Emmett, 2007). It forms part of the forest estate administrated by the FA and has no current protection status.

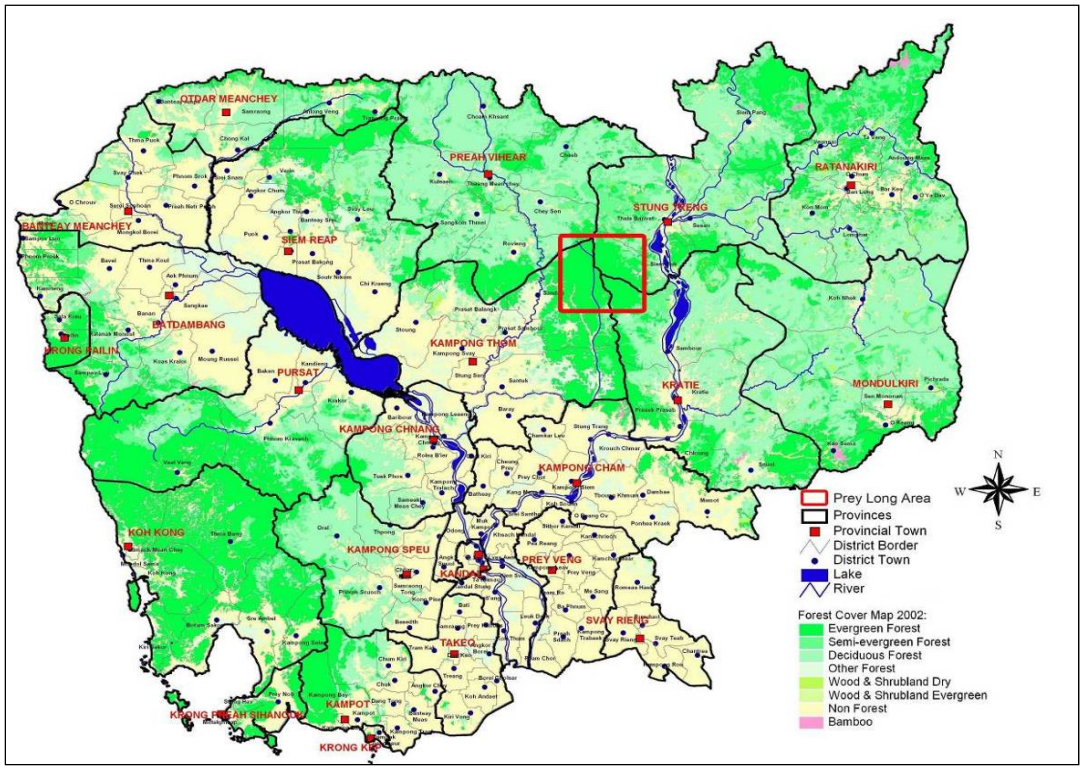


Figure 1. Prey Long region and Forest Cover of Cambodia (Olsson and Emmett, 2007)

2.2Biophysical characteristics of the project area

Climate and Rainfall

The climate is warm tropical with a short dry season and excess rainfall during the rainy season (Thelaide & Schmidt, 2010). Annual precipitation amounts to around 2500 mm due to the arrival of strong monsoon rains from June to October (CTSP 2003).

Vegetation

Categorized overall as lowland rain forest, Prey long covers a mosaic of many forest types with different degrees of deciduousness and species compositions (McDonald, 2004). As a general practice, lowland forests of Cambodia are usually characterized on the basis of leaf behavior: i.e., as evergreen, semi-evergreen and dry-deciduous forests. Their present-day distribution within Cambodia is primarily determined by the intensity of human activities; large and continuous distributions of all three forest types are now restricted to the province of Kampong Thom in central Cambodia, where Prey Long is located (McDonald, 2004).

Recent field botanical surveys in Prey Long conducted by McDonald (2004) of the University of Texas have identified at least seven distinct types of vegetation based on floristic criteria (i.e. biodiversity), which differ significantly from each other in terms of species composition, dominant trees, and plant community structure, including rare primary evergreen forest and evergreen marsh forest (McDonald, 2004). These seven vegetation types are further described in Table 1.

Table 1. Vegetation Types of Prey Long

Vegetation type	Characteristics
1. Deciduous Forest	This type of forest is similar to the dry seasonal forest found in dryer climates Indochina. Trees are relatively short (3-12 m), with mainly drought tolerant species with small leaves and thick barks. Dry deciduous forests form a transition to natural grassland, which are found on the very dry sandy sites.
2. Semi-evergreen short forest	This forest is a transition type to tall evergreen forest, and often with similar species composition, yet trees are significantly smaller.
3. 'Sralao' (*Lagerstroemia*) forest	*Lagerstroemia* stands are distinct by their white bark and high, erect, fluted stems. They often dominate patches of forests.
4. Short riparian and Melaleuca forest	This forest type occurs near rivers and streams, periodically inundated and remaining moist during the dry season.
5. Deciduous swamp forest	A quite unique forest type occurring around Pes Lake in the northern part of Prey Long. Several unique species and growth forms are found in this swamp forest, normally associated with mangrove forests.
6. Primary evergreen dipterocarp forest	This forest type is found on the moist but not waterlogged areas. The forest consists of a large diversity of species with canopy closure at 30-50 m.
7. Evergreen swamp forest	This forest type occurs on very wet sites with permanent or long term inundation. The forest type is rare and endemic to Cambodia.

Adapted from McDonald (2004); Olsson and Emmett (2007).

The species composition, plant community attributes, and natural distributions of these seven distinctive forests are determined primarily by the depth and composition of soils, but human disturbance is beginning to play an increasing role in defining the nature and distribution of plant communities in the region (McDonald, 2004). According to Olsson and Emmett (2007), the moist lowland rainforest (classes #2 and #6) is the most interesting from a biodiversity point of view. This forest type is by far the most species rich and, compared to the much more common dry deciduous forest, it is expected to contain a number of lesser known as well as endangered species. The swamp

forest, as described by McDonald (2004) (classes #5 and #7 above), is a unique forest type for the area and likely contains several rare, endemic and endangered species.

Geology

According to McDonald (2004), the greater Prey Long region in northern Kampong Thom is formed primarily by an ancient riverbed that is tens of millions years old. Due to the currents of two river systems, the Mekong and Sen rivers, the region is covered by a random patchwork of varyingly sandy soils. Some areas of Prey Long are covered with pure, silicaceous sands, while others are composed of sandy loams or sandy clay deposits (McDonald, 2004). ESIA reports of local logging companies, based on soil surveys conducted by Crocker (1962) indicate that the region as a whole is comprised approximately of 20% acid lithosols, 10% of recent alluvium, 60 % red-yellow podzols, with most of these substrates exhibiting relatively low water retention capacity and high degrees of leaching (McDonald, 2004). Studies on the productivity of Cambodian landscapes suggest that the alluvial soils North of the Tonle Sap sustain low fertility (CTSP 2003), however Legris & Blasco (1972) note that the region is capable of producing an abundance of economically important, fast-growing trees (i.e., various dipterocarps, sralaos, legumes and ebonies).

Wildlife

Prey Long is considered to be particularly important as a wildlife habitat, as it covers a large area of contiguous mixed forest habitats providing for a rich diversity of wildlife (Thelaide & Schmidt, 2010). Olsson and Emmett (2007) have conducted a floral and faunal biodiversity assessment of Prey Long in partnership with the Forestry Administration. They found several species of globally threatened large mammals present in the area, such as the Asian elephant (Elephas maximus), clouded leopard (Neofelis nebulosa), marbled cat (Pardofelis marmorata), Malayan sun bear (Helarctos malayanus), banteng (Bos javanicus), gaur (Bos gaurus), wild dog (Cuon alpinus), sunda pangolin (manis javanica), pileated gibbon (Hylobates pileatus), pigtailed macaque (Macaca memestrina), and smooth-coated otter (Lutrogale perspicillata). Tiger (Panthera tigris) has been seen in the area as late as 2006 according to local guides, although no confirmed reports exist and it may well be locally extinct (Olsson and Emmett, 2007). Most large mammals are found at relatively low densities, probably due to the high levels of hunting pressure in the area (Thelaide & Schmidt, 2010).

Prey Long is also rich in turtles and tortoises such as the elongated tortoise (Indotestudo elongata), Asian box turtle (Cuora amboinensis), Asian leaf turtle (Cyclemys oldhamii), giant Asian pond turtle (Heosemys grandis), yellowed-headed temple turtle (Heosemys annandalii), Malayan snail eating turtle (Malayemys subtrijuga), black marsh turtle (Siebenrockiella crassicollis) and Asiatic softshell turtle (Amyda cartilaginea). The very rare, critically endangered Siamese crocodile (Crocodylus siamensis) has also been recorded from this area (Thelaide & Schmidt, 2010). In addition Prey long is home for a rich and diverse fauna of smaller animals such as amphibians and insects. (Thelaide & Schmidt, 2010).

2.3 Importance of the area

Prey Long is important for a variety of reasons from an ecologic, social and economic perspective. It contains the largest area of wet lowland evergreen forest in Cambodia, and probably in the Indo-Burma

Hotspot[7]. According to McDonald (2004), these lowlands may be regarded as a unique biogeographic realm within the country, and not yet characterized adequately in biological terms. Early studies have highlighted the high ecological significance of Prey Long (McNeely 1975), however few surveys have been undertaken so far to fully appreciate its biological value (McDonald, 2004). Prey Long has also been included in a listing of tentative World Heritage natural sites for Cambodia (IUCN, 2002). One important fact is that Prey Long has been identified as home to 80% of the most valuable and endangered indigenous tree species of Cambodia (CTSP, 2003), and its importance for floral conservation has been recognized by national experts (Strange et al. 2007). In 2007, CI, together with the University of Copenhagen (KU) and the Forestry Administration (FA), began conducting biological surveys of the area in order to assess its biological importance (Olsson & Emmett, 2007).

In addition to the lowland evergreen forest, which is recognized as threatened globally, Prey Long is the last remaining area where forest types from deciduous to evergreen forests as well as the transition zones between them are found in a continuous and intact landscape. The evergreen swamp forest of Prey Long is of particular importance for conservation as it is unique to Cambodia, covering larger areas of the lowland plains in the past. It is now extremely rare as virtually all such areas have been converted for rice cultivation (Thelaide & Schmidt, 2010). In terms of wildlife it is also very important, as it harbors viable populations of many globally threatened species (see previous section).

Prey Long is also important from an economic perspective, being home to Cambodia's most lucrative tree species. Of the 20 Cambodian species that are defined as 'high priority' trees by the Cambodia Tree Seed Project (CTSP 2003), 15 occur in the Province of Kampong Thom, more than any other province in the country. Of particular importance are the *Dipterocarpaceae*, a distinctive Asian family of flowering plants that is highly desirable for its ability to produce large and straight boles (McDonald, 2004).

Cambodian forests also provide several ecosystem services that are very important for maintaining the sustainability and productivity of rice-cultivation and in-land fisheries, such as regulation of local water-circulation, mitigation of droughts and floods, and reduction of waterway sedimentation. As indicated by Thelaide and Schmidt (2010), Prey Long is a primary watershed, regulating water and sediment flow to the Mekong River and the Tonle Sap Lake. An estimated 700,000 thousand Cambodians depend on these watersheds for irrigation. In addition, southern Vietnam lies within the Mekong River watershed area, an area that makes up some of the richest agricultural and most densely populated areas of the region. As such, Prey Long is vital to Cambodia's and the regions' long-term environmental sustainability and its people's food and water security (Thelaide and Schmidt, 2010).

Finally, Prey Long is also important for rural livelihoods, with more than 250,000 people living in and around its forests. Much of Prey Long is found on infertile soil with little value for rice cultivation. However, Prey Long is an important spawning area for fish and people rely heavily on non-timber forest products as a source of income and livelihoods. Conservation of the Prey Long forest will thus benefit the local communities living in the vicinity of the forest as well as well as farmers and fishermen relying on the downstream water resources of the Mekong River.

[7] The Indo-Burma hotspot is one of the worlds' 25 biodiversity hotspots, which represent areas with exceptionally high biodiversity. The Indo-Burma hotspot encompasses more than 2mill km^2 covering Burma, Thailand, Laos, Cambodia, Vietnam, Southern China and part of the Indian West Bengal. www.biodiversityhotspots.org

2.4 Communities and land use in the project area

More than 250,000 people live in 340 villages located within 10 kilometers of the Prey Long forest, many of whom rely directly on it for their livelihoods. Most of the population belongs to the indigenous group called Kuy, and the forest also forms part of their cultural and spiritual life (Olsson and Emmett, 2007; Thelaide and Schmidt, 2010).

The primary source of income and livelihood for these forest communities is agriculture, mainly for subsistence use. McDonald (2004) indicates that most families of the region tend at least one plot of land for rice cultivation each year, usually from 2-4 hectares (McDonald, 2004). The sandy soil found around Prey Long is not a good substrate for rice paddy fields and so many villagers grow other crops such as soy, corn, beans, spices and cashew nuts, which they sell. Many families often buy rice to eat rather than growing it themselves. Most households also manage domesticated animals such as pigs.

The forests of Prey Long provide a number of benefits to rural households in the region. Local communities rely greatly on the forest as a source of firewood, charcoal, thatch, rattans, medicines, bush meat, fish and wild vegetables. Many families increase their standard of living by harvesting non-timber forest products (NTFPs) before and after their sowing and harvest schedules, such as resin, honey, medical plants, and small construction material. However, the socio-economic value of these resources to rural households in Prey Long has not been studied in detail (Thelaide and Schmidt, 2010).

Of particular importance as a source of supplementary income is the collection of oleoresin from dipterocarp trees. Similarly to many other parts of Cambodia, local people dedicate much of their spare time in the collection, preparation and transport of such resins. McDonald (2004) estimates that about 80% of the households in and around Prey Long rely on resin collection for income generation, while Thelaide and Schmidt (2010) indicate that resin collection provides a substantial, and often the only, cash income to many households in the vicinity of Prey Long, including both poorer and better-off households. Most families stake claim to specific dipterocarp trees and/or specific areas of dipterocarp forests, and they all respect such claims in a cooperative fashion. Villagers are paid up to US$4 for 30 liters of oleoresins, depending on the quality of their product. Each family can expect to harvest around 600 liters per annum to supplement their farming activities, amounting to about US$80 per annum (McDOnald, 2004). It is estimated that a total of 20,000 tons of resin are collected annually in Cambodia, benefiting around 100,000 people living near forests (Miller and Boscolo, 2004).

Illegal logging is also part of the local economy. In some cases it is conducted by villagers, while in other cases by migrants who are employed by powerful business men or military figures (Poffenberger, 2009). The Colexim ESIA report (quoted in McDonald, 2004) notes that round logs and sawn timber are not harvested or sold in significant quantities in the region, suggesting that only a few families earn around US$50 a year from wood sales. McDonald (2004) however notes that this likely underestimates the role of timber in the local economy.

Many poor villagers also work as seasonal laborers, picking potatoes, harvesting corn or planting crops. They are paid on average 10,000 riel, or about US$2.5 per day. Other sources of income include having a local shop, making rice wine and raising pigs, construction work, while some families are supported by internal remittances sent from Phnom Penh or from agricultural labor in other provinces.

2.5 Land Tenure and Use Rights in the project area

Prey Long is under the jurisdiction of the Forestry Administration (FA) of the MAFF and forms part of the Permanent Forest Estate governed by the 2002 Forest Law under which it is classified as Production Forest, which means that the primary purpose of the forest is for extraction of timber and non-timber forest products[8].

Three logging concessions are located in Prey Long belonging to Pheapimex Fuchan, Everbright CIG Wood Co. Ltd., and Colexim Forest Concession. The Everbright concession is located in Kratie and Steung Treng Provinces and covers an area of 136,376 ha. The Colexim concession is located in the western part of Prey Long in Kampong Thom Province and covers an area of 139,610 ha (Olsson and Emmett, 2007). However, all three concessions are currently suspended as part of the 2002 national logging moratorium and are currently left in a post-concession management vacuum.

Land tenure for villagers in the area is generally very weak. This situation leaves the population living around Prey Long highly vulnerable to outside interests and land grabbing, as in other parts of Cambodia. De Lopez (2001) notes that only 10% of families in Cambodia have official legal documents to demonstrate ownership of their land. As noted by the REDD+ Roadmap, although the legal framework on land tenure and ownership rights is relatively clear, implementation of this framework in rural or forest areas has been limited and local people are vulnerable to relocation for economic development or incursion resulting from migration to forest frontier regions. The lack of secure land rights has a direct knock-on effect on deforestation, since villagers who lose their land will need to find some way to grow food, with often the only solution being to clear new forest land.

Land tenure is therefore a critical issue for the success of a REDD+ initiative in Prey Long, which will need to be directly addressed by the project. This is also one of the key guidelines provided by the REDD+ Roadmap for the development of REDD+ demonstration activities, which requires that tenure over forestland be clarified through the development of REDD+ demonstration activities. Current mechanisms for local co-management of forestlands that the REDD+ project could support include Community Forestry, Community Protected Areas, Protected Area Zoning, and Community Fisheries arrangements (see section 1.6).

2.6 Drivers and agents of land use change in the project area

Several authors have highlighted the lack of protection for wet lowland evergreen forests in the existing system of protected areas in Cambodia, with most protected areas containing evergreen forests being located in mountainous regions (McDonald, 2004; Thelaide and Schmidt, 2010). Due to their ease of accessibility and abundance in high value timber, lowland evergreen forests have historically been granted for logging concessions in order to be economically exploited (Thelaide and Schmidt, 2010). Prey Long has followed a similar fate with few, if any, areas presently left completely undisturbed, although there still remain large areas of lowland evergreen forest with relatively minimal disturbance (Olsson and Emmett, 2007). Since the 2002 moratorium on logging the immediate threat of large scale

[8] Production Forest is defined as: "Forest area having the primary function for sustainable production of Timber and Non-Timber Forest Products. Production forest includes forest concession; forest permitted for harvesting, degraded forest, forest to be rehabilitated, reserved area for forest regeneration or forest plantation, reforested areas and forest areas under agreement between the Forestry Administration and the local community." (Forestry Law, 2002)

commercial logging has been significantly reduced, with the forest concessions in the area (Pheapimex, Everbright and Colexim) being inactive. Agricultural encroachment and the potentially excessive use of economic land concessions (ELCs) have since emerged as new threats to the forests of Prey Long (Thelaide and Schmidt, 2010).

Following the VCS standard[9] classification of deforestation typologies (VCS AFOLU, 2011), drivers of land use change in the area thus currently fall into two broad categories: unplanned deforestation and forest degradation in the form of small scale, locally undertaken land clearing and logging; and planned deforestation, in the form of large scale forest conversion for agro-industrial purposes, namely for Economic Land Concessions (ELCs). Both are a threat to the Prey Long forest, however, there are major differences in the aims and effects of these two types of activity, and their respective agents and underlying drivers that would have to be addressed through a REDD+ initiative.

Unplanned deforestation[10] in the area is mostly driven by small scale clearings in the forest made for the cultivation of crops, often cashew nut trees, maize, beans or soy. These are generally cash crops that are sold and the profit is used to buy rice for food. In some cases, clearings made by new families or villagers who lost their land will be used to grow rice. The underlying cause of this type of forest clearing is lack of food security, combined with population growth, including migration, and lack of secure land tenure. Population growth has been rapidly increasing in Prey Long as in the rest of Cambodia, with villages on the edge of the forest increasing both in numbers and in size (Olsson and Emmett, 2007). Much of the area is already crisscrossed with old logging roads, ox-cart tracks and footpaths, increasing access to the forest (Olsson and Emmett, 2007). According to Thelaide and Schmidt (2010) there is both an internal expansion of agricultural areas from the villages and an encroachment from the periphery and along the roads. Land grabbing and speculation by powerful local actors has also been identified as a proximate cause of deforestation, with land often being cleared and sold to businessmen from nearby towns (Thelaide and Schmidt, 2010). Small temporary villages are also built inside the forest estate for the purposes of housing loggers and slash-and-burn farmers (Olsson and Emmett, 2007).

Despite the official logging moratorium, there is widespread evidence of small-scale (illegal) logging in Prey Long, with a steady stream of wood-loaded ox-carts leaving from the forest (Thelaide and Schmidt, 2010). Old logging roads that were constructed by the Tanling Company during the Sihanouk Regime in the 1960s are kept in repair for the benefit of trucks, carts, and resin harvesters, with these same roads providing tree poachers easy access to the forests as well (McDonald, 2004). Illegal logging is carried out by villagers who log and sell timber to make a living, and by migrants who are often employed by powerful local actors. It is mostly undertaken in the form of small scale selective logging, targeting mainly luxury woods such as *Afzelia* and *Dalbergia.* Olsson and Emmett (2007) note that middlemen

[9] www.v-c-s.org

[10] According to the Verified Carbon Standard (VCS AFOLU, 2011), unplanned deforestation and/or degradation can occur as a result of socio-economic forces that promote alternative uses of forest land and the inability of institutions to control these activities. Poor law enforcement and lack of property rights can result in piecemeal conversion of forest land. Unplanned deforestation and/or degradation activities can include, inter alia, subsistence farming or illegal logging occurring on both public lands legally designated for timber production and on public or communal lands that are poorly managed or otherwise degraded.

from other areas often come to local villages around Prey Long to buy wood for the production of boats to sell to Vietnam. Reliance of local communities on forest resources for their subsistence, such as timber for housing, firewood, non-timber forest products, fish and bushmeat, can also have detrimental effects on forest biomass, although less severe.

Areas of Prey Long are also being allotted as Economic Land Concessions (ELCs), as in many other parts of Cambodia. This type of land use change is driven mainly by corporate interests, and follows a *planned deforestation*[11] pattern. In particular, rubber companies have recently been the agents of deforestation, especially in the south and west of the Prey Long area. There, the soil and climate are suitable and there is already a well established precedent for rubber plantations in the south of Kompong Thom and Kratie provinces. Large areas around Tumrinh have been converted by rubber companies into plantations. Figure 2 provides a map of current ELCs granted in the Prey Long area.

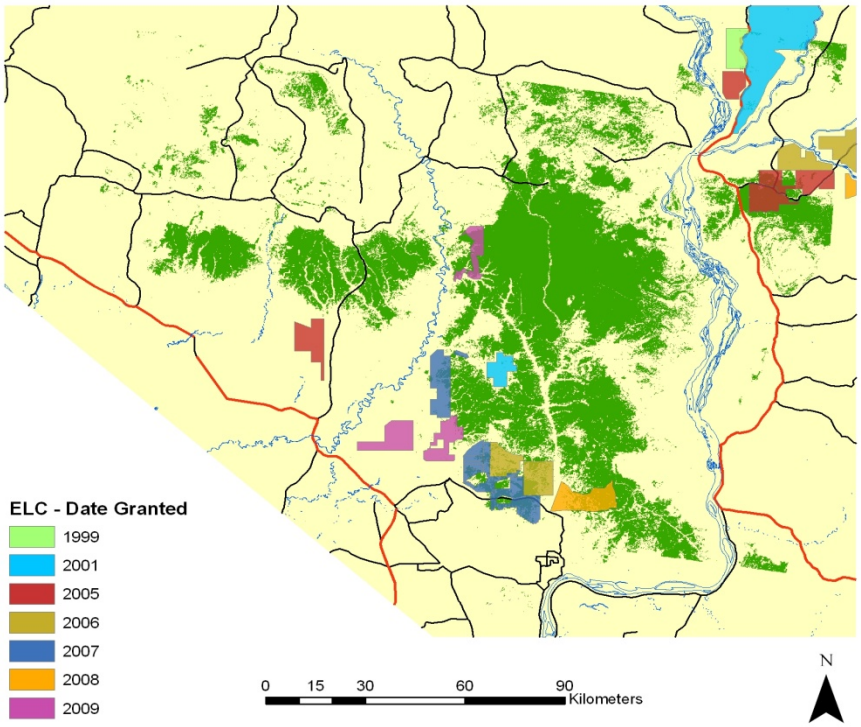


Figure 2. ELCs granted in the Prey Long area (1999-2009)

[11] According to VCS AFOLU (2011), planned deforestation includes activities that reduce net GHG emissions by stopping or reducing deforestation on forest lands that are legally authorized and documented to be converted to non-forest land. Planned deforestation can encompass a wide variety of activities, including:

- National resettlement programs from non-forested to forested regions.
- National land plans to reduce the forest estate and convert it to industrial-scale production of commodities such as soybeans, pulpwood and oil palm.
- Plans to convert well-managed community-owned forests to other non-forest uses.
- Planned forest conversion for urban, rural and infrastructure development.

3. Project Strategy

This section provides a non-technical summary of the proposed REDD-plus strategy for the Prey Long area. The implementation strategies proposed were identified based on an analysis of the REDD+ Roadmap and are meant to contribute to the national process by testing different tools as potential approaches to REDD+ implementation. They are not meant to represent definitive options for implementing REDD+ in Prey Long, and alternative strategies should be considered after extensive stakeholder consultation.

3.1 Baseline scenarios

A baseline scenario should represent the most plausible scenario of emissions form deforestation in the project area in the absence of the REDD+ initiative (also called without-project scenario). It provides the reference against which to measure the success of the REDD+ initiative. In order to develop a credible baseline scenario for the Prey Long REDD+ initiative thus, it is important to understand what are the potential scenarios of future deforestation in the area, based on recent historical observations. As discussed in section 2.6, land use change in Prey Long is currently driven by two distinct classes of underlying drivers and respective agents of deforestation. On the one hand, unplanned deforestation is mostly driven by the livelihood needs of the local population, while planned deforestation is driven by corporate interests seeking agricultural lands (i.e. ELCs).

The Emissions Reductions (ERs) generated through a REDD+ initiative in the area will therefore depend upon which of these drivers of deforestation will be addressed by the project, as dealing with each of these drivers entails very different project strategies. Dealing with unplanned deforestation usually involves strategies that are similar to traditional conservation and development projects, and thus represents a familiar scenario. Addressing planned deforestation on the other hand will entail a very different strategy that will involve working very closely at the political level with government agencies in order to avoid the granting of further ELCs in the Prey Long area.

In order to be comparable to the with-project scenario, a baseline (or reference) scenario has to reflect the emissions related to those drivers of deforestation that the project activities plan to address. Two different baseline scenarios are thus considered here that distinguish between the unplanned and planned deforestation drivers present in Prey Long. These baseline scenarios reflect the potential for ERs generated from a REDD+ initiative depending on which project strategies are finally chosen by the implementing organization.

Baseline scenario 1a: *unplanned deforestation continues at historical rates, and no further ELCs are granted within Prey Long*. In this scenario, the three suspended concessions continue under logging moratorium and no additional logging concessionaire is appointed. Prey Long continues to be classified as Production forest but with no official management taking place. No official protection status is granted and the forest remains without official demarcation. Small scale logging and clearing continues in the area for both subsistence and commercial reasons, while population growth and migration continue driving land encroachment following historical patterns. In this scenario, no further ELCs are granted by the Government within the Prey Long area. ELCs that have been already granted in the past (see Figure 2) continue their clearing operations but the project does not deal with them and thus they are not included in the REDD+ project area and their emissions are excluded from the baseline scenario.

Baseline scenario 1b: *unplanned deforestation continues at historical rates and ELCs continue to be granted within Prey Long at historical rates. The project does not address deforestation associated with the ELCs but does include an adjustment factor to omit an annual ELC allocation from the project site.* This scenario is very similar to scenario 1(a), in that the project only deals with the unplanned deforestation component as described above. However, in this scenario new ELCs are continued to be developed within the Prey Long area following historical trends and thus, an adjustment factor is used to omit an annual ELC allocation from the project site. Thus, the emissions associated with both past and future granted ELCs are not included in this scenario. The major difference between scenario 1a and 1b is that in scenario 1b the projected deforestation rate is applied to an annually decreasing amount of forest available for the unplanned component due to the newly granted ELCs.

Baseline scenario 2: *unplanned deforestation continues at historical rates and ELCs continue to be granted within Prey Long at historical rates; the project addresses both the unplanned and the planned deforestation components*. In this scenario unplanned deforestation continues as described in scenario 1(a), and the Government declares new ELCs within the Prey Long area at historical rates. In addition, emissions from forest conversion within newly granted ELCs are included in this scenario as the project developer decides to address both unplanned and planned deforestation agents. Emissions associated with past ELCs (see Figure 2)are still excluded from this reference scenario.

3.2 Project scenarios

A project scenario is a description of the activities aimed at reducing emissions from deforestation related to the drivers identified in the baseline scenarios. It constitutes the with-project scenario which, compared against the without-project scenario (baseline), provides an ex-ante estimation of the potential benefits, in terms of ERs, generated by the REDD+ initiative. This section will provide a description of the most appropriate project strategies identified for implementing a REDD+ initiative in Prey Long based on the Cambodia REDD+ Roadmap. The technical specifications of these strategies and the resulting carbon calculations are provided in section 4.

Any attempt to build a strategy for a REDD+ initiative in the Prey Long area has to take into consideration the types of management arrangements being considered under the Cambodia Draft REDD+ Strategy and Implementation Framework as outlined in the Cambodia REDD+ Roadmap, and which among those arrangements are best fit to address local realities. The Prey Long initiative therefore should aim to build upon Cambodia‘s REDD+ strategy and understand how the development of a REDD+ initiative in Prey Long could support the implementation of the National REDD+ Strategy, and the existing forest management arrangements that REDD+ is envisioned to support. Thus, a brief description of the National Strategy is provided below; the reader is encouraged to refer to the REDD+ Roadmap and/or the UN-REDD NPD for detailed information.

As set out in the General Principles of the REDD+ Roadmap, development of Cambodia’s REDD+ strategy will build on existing forest management strategies rather than initiating new policies, legal structures or governance arrangements. Implementation of REDD+ is therefore expected to follow Government agency jurisdictions, with different Government agencies developing REDD+ implementation strategies for the different forest areas that fall under their jurisdiction, based on the three existing main Government plans described previously: the National Forest Programme (NFP, 2010) for the forestry

sector, particularly the Permanent Forest Reserve managed by the FA of the MAFF, the planned National Protected Areas Strategic Management Plan for the Protected Area network managed by the GDANCP (MoE), and the Strategic Planning Framework for Fisheries managed by the FiA (MAFF) (see Table 2).

Table 2. Existing laws and policies to be supported by the National REDD+ strategy (adapted from UN-REDD NPD, 2010)

Forest class	Agency	Existing law & policy	REDD+ Strategy
Permanent Forest Estate	FA (MAFF)	-> Forestry Law (2002) -> National Forest Programme (2010)	-> Support implementation of the National Forest Programme under its six pillars: 1. Forest Demarcation, Classification and Registration; 2. Forest Resource Management and Conservation; 3. Forest Law Enforcement and Governance; 4. Community Forestry Programme; 5. Capacity Building and Research; 6. Sustainable Forest Financing.
Protected Areas	GDANCP (MoE)	-> Protected Areas Law (2008) (no subsidiary regulations yet issued) -> National Protected Areas Strategic Management Plan (not yet written)	-> Support the development of the NPASMP, including how REDD+ will support strengthened PA management in accordance with the PA law.
Flooded and mangrove forests (outside PAs)	FiA (MAFF)	-> Community Fisheries subdecree (2005) -> Fisheries Law (2006) -> Strategic Planning Framework for Fisheries (2010)	-> Support current management strategies, including community fisheries, fisheries conservation areas and fishing lots.

Additional implementation strategies that can be pursued by line agencies as part of the main strategy include:

- Conservation Concessions, as a viable alternative to other types of land concessions
- Local forest protection contracts
- Management of timber and wood energy
- Understanding how REDD+ can support implementation of the CBD in Cambodia
- Adopting the nested approach to REDD+ implementation

Based on the guidelines provided by the Cambodia REDD+ Strategy and Implementation Framework (REDD+ Roadmap), development of REDD+ in the Prey Long area should support the implementation of the National Forest Programme (NFP, 2010), since Prey Long is part of the Permanent Forest Estate managed by the FA. For more details on the NFP, please see Annex 4. Two different project strategies are suggested below for Prey Long. Each of these strategies refers to the respective baseline scenarios described in section 3.1 and is designed to address the deforestation drivers included in those scenarios.

Project strategy 1: targeting specific areas under highest threat from unplanned deforestation (encroachment for agricultural and commercial uses) through local forest protection contracts and enhanced law enforcement. This strategy would build on CI's experience in the Cardamoms Mountains to design local forest protection contracts in the form of conservation agreements with the local population living within the Prey Long area to reduce the rate of unplanned deforestation. The areas under higher threat of future unplanned deforestation would have to be identified through spatial modeling and targeted with efforts to reduce the pressure over forests.

Local Forest Protection Contracts are considered in the REDD+ Roadmap as a potential mechanism for implementing REDD+ that could inform decision making on how REDD+ benefit sharing mechanisms could work in the Cambodian context. The Roadmap further indicates though that very little experience exists currently in Cambodia with developing such contracts with local communities, apart from several pilot initiatives such as ecotourism projects (e.g. Tmatboey in Kulen Promtep Wildlife Sanctuary, Preah Vihear province) and other payment programs (e.g. Crocodiles, Cardamoms, Wildlife-Friendly products). Thus, the Roadmap mentions that further work is required to better understand how forest protection contracts might work in Cambodia and encourages further pilot projects to inform policy development. CI's approach with conservation agreements in the Cardamoms Mountains provides a workable model that could potentially be replicated in Prey Long to test local forest protection contracts as a REDD+ implementation strategy through conservation agreements with local communities (see Box 1).

Conservation agreements are voluntary, binding contracts negotiated with communities stipulating a package of benefits in order to overcome the opportunity cost of conservation actions. The agreements strengthen community management by stipulating specific conservation activities such as patrolling for illegal logging or improved land management in exchange for compensation (financial or in kind), and/or support to specific community projects as agreed. The objective of the agreements in Prey Long should aim to reduce forest clearing and logging by local communities as much as possible by improving farming techniques and potentially establishing alternative livelihood activities as appropriate, while creating additional employment opportunities by including community members in patrolling and monitoring activities. A feasibility analysis should be undertaken to assess the potential for conservation agreements in Prey Long and identify potential alternative livelihoods that could be established as part of the benefits package.

Box 1. The Cardamoms Mountain as a model for developing conservation agreements

At the heart of the Cardamom Mountain range in southwest Cambodia lies the Central Cardamoms Protected Forest (CCPF), a 401,313 hectare protected area that was created in 2002. The CCPF is one of the largest protected areas in Asia. It has abundant natural resources and values including high biodiversity, water, and a high value for carbon stock storage. The CCPF is the primary watershed for three provinces in Cambodia. The rivers flowing northwards into the Tonle Sap Lake play an important role supporting the lake's regionally important fishery. The rivers flowing southwards into the Gulf of Thailand support rice fields and fishing grounds upon which many of Cambodia's poorest people depend for food security. The local communities living in the CCPF consist of "Khmer Daeum", an indigenous group who have lived in the Cardamom Mountains for generations.

Unfortunately, due to improved access the Cardamom Mountains are now becoming increasingly vulnerable to illegal logging, wildlife hunting, forest clearing and land encroachment. Forest loss within this crucial forested watershed would have devastating effects in terms of both release of carbon dioxide and in terms of downstream impacts on water and food security, including floods during the wet season, droughts in the dry season, and reductions in fishery productivity.

Since 2001, Conservation International has supported the government agency responsible for managing the protected area. This support includes assistance with participatory land use planning and the use of conservation agreements for local communities that reconcile conservation and development and link livelihood improvements to wildlife protection. It also includes significant support for law enforcement and forest protection, including development of the ranger program, ranger training, provision of equipment, legal support, education to local communities, and development of an effective protected area management system. It also includes a comprehensive biological research and detailed monitoring program monitoring that supports adaptive management to address changing threats and drivers of threats. The 5-year management plan for the CCPF, which was produced by the Cambodian government and CI, was approved by the Minister of Agriculture, Forestry and Fisheries in December 2009; this is the first MAFF Protected Forest management plan to be approved and it specifically outlines management practices to reduce deforestation and forest degradation. The support provided by CI has built government capacity and the legal framework needed for effective long-term protected area management.

In designing the contracts careful attention must be paid in meeting the needs of the local population, otherwise food and/or income insecurity could lead to further forest clearing for subsistence agricultural use. The REDD+ project strategy should thus address the broader need for land use planning in the area (for example by supporting Communal and District Land Use Planning processes) to identify existing and future agricultural land needs, particularly in the area surrounding Prey Long where deforestation is actively taking place. Importantly, integrating REDD+ into land-use planning processes at subnational scales is also one of the supplementary strategies for REDD+ implementation indicated by the Roadmap. Land use planning should also be adopted alongside the process of land registration and tenure clarification for the communities in and around the project area. This is a process that would have to be conducted in collaboration with local government and through discussions with local communities in order to identify the most appropriate management arrangements (e.g. Community Forestry, Community Conservation Forestry, Community Protected Areas, etc.). Furthermore, clarifying land tenure is arguably a necessary pre-requisite to any sustainable REDD+ project and a requirement for demonstration activities under the REDD+ Roadmap. Community engagement thus will be an important part of the process of designing conservation agreements and land use planning, and substantial effort will have to be invested in participatory processes and capacity building activities, including locally appropriate technical assistance. Improving land management strategies such as reforestation and enhancement of carbon stocks could be supported as part of ongoing community forestry activities. Planting fruit trees as boundary markers between community forest and non-community forest land would be one way of clarifying boundaries.

Finally, strengthening governance and law enforcement must be conceived as a precondition for any successful REDD+ initiative in the area. In Prey Long, the Forestry Administration is the governing body in charge of forest protection. However, the FA is understaffed in this area and experiences budget constraints resulting in limited basic tools such as vehicles to remove illegally logged timber, and limited resources to deal with often armed illegal loggers and/or with land speculators. Consequently, increasing the manpower and financial capacity of the FA to control illegal activities should be a high priority in order to reduce unplanned deforestation.

This strategy could contribute to the National REDD+ process by testing forest protection contracts with local communities as a potential REDD+ implementation and benefit sharing mechanism, while integrating them into a broader land use planning and tenure clarification process.

Project strategy 2: Protecting a bigger area of forest by designating Prey Long as a Protection Forest or a Conservation Concession for REDD+ management, in order to prevent further ELCs from being granted in the Prey Long area, alongside local forest protection contracts to reduce the rate of unplanned deforestation. In this strategy project activities would seek to address both the policy based causes of planned deforestation related to the granting of ELCs as well as the illegal on-the-ground actions that contribute to unplanned deforestation and degradation. Unplanned deforestation would be addressed through local forest protection contracts and strengthening law enforcement as described in Project strategy 1 (see above). However, a bigger area of forest would be put under some form of protection status in order to establish management arrangements that prevent the granting of new ELCs in the area. The boundaries of the area would have to be decided, as well as the most appropriate management arrangements to be established. Mc Donald (2004) has suggested 80,000 hectares as a reasonable area to be proposed as a reserve to protect the most critical areas of Prey Long from a biodiversity conservation perspective. However, from a carbon stock and REDD+ perspective, a more ambitious area could be pursued aiming between 400,000-700,000 hectares, taking into account (economies of) scale and leakage effects. Two potential management arrangements are proposed below: Protection Forest, and Conservation Concession as an innovative alternative.

Protection Forests are a specific category of the Permanent Forest Estate, together with Production Forests and Conversion Forests, that directly falls under the jurisdiction of the FA. Their management objectives include the preservation of forests for special uses such as climate change mitigation; biodiversity and wildlife conservation; protecting watersheds and water supply; recreation; desertification prevention; botanical gardens; ecotourism; and religious forests, among others. (see NFP, 2010). Designating Prey Long as a Protection Forest would directly support the NFP, one of the priorities being to review and clarify the future of remaining forest concessions (such as Prey Long) by promoting alternative SFM systems including certified commercial forestry, community forestry, protected forests and conservation areas. In addition, it would directly contribute to the 3 million hectares of Protection Forests target set under Programme 2 of the NFP (Forest Conservation and Development of Forest Resource and Biodiversity). Under Programme 4 (Community Forestry) the NFP also identifies the importance of broadening strategies for decentralized forest management beyond community forestry to develop alternative CF models for protection forests, such as community conservation forestry.

Protection Forest could be the easiest management arrangement for implementing strategy 2 since it directly falls under the Permanent Forest Estate managed by the FA, and since there is already experience in the Mondukiri Province with the FA/WCS REDD+ pilot project. In addition, it would contribute to the objective of the Implementation Framework of the national REDD+ Strategy of integrating REDD+ into the management plans of Protection Forests.

Conservation Concessions are considered in the REDD+ Roadmap as a powerful new tool that could potentially be used to sustainably manage and protect large tracts of forest, and could be especially suitable for Cambodia‘s large areas of post-concession forests or protected areas that require additional funds for long-term management costs. If financed through REDD+, the Conservation Concession model could represent an innovative, economically viable alternative to Land Concessions since it would allow Cambodia to gain funds from preserving natural resources. However, the Roadmap also mentions that further work is required to understand how conservation concessions might work in the Cambodian context, potentially in both the Permanent Forest Reserve and Protected Areas. Prey Long thus has the potential to provide an interesting case study for testing the conservation concession model as a potential REDD+ implementation strategy and assess if the approach is feasible, in particular for protecting carbon- and biodiversity-rich forests from being granted as Economic Land Concessions.

Creating a conservation concession has already been suggested by several authors as an appropriate approach for protecting the Prey Long forest, as it is particularly suitable for extensive areas controlled by a single entity, such as the government, which has the authority to cancel concessions or exclude areas out of pending concessions (McDonald, 2004). As noted above, the REDD+ Roadmap also identifies conservation concessions as a suitable approach for managing Cambodia’s large tracts of post-concession forests, and at the same time as a viable alternative to Land Concessions. Thus, this model aligns with the current situation in Prey Long with three suspended concessions under the logging moratorium and continued pressures coming from the granting of new ELCs.

Since planned deforestation in the area is mainly due to the allocation of Economic Land Concessions, a high level of support will be necessary to prevent further ELCs from being granted within the area, and to prevent logging syndicates from conducting large scale illegal logging operations. Implementing this project strategy will entail working very closely with the FA to secure the right level of political support to declare the project area of Prey Long a Protected Forest or a Conservation Concession and obtain approval from the Council of Ministers. For this, it will be key to demonstrate not only that REDD+ revenues will be able to cover the long-term management costs of the protected forest/concession but, also, that it is a better economic alternative relative to other types of land uses. Therefore, a detailed opportunity cost analysis should be conducted to compare revenues from different uses of the forest in Prey Long with the potential revenues generated through a REDD+ initiative.

This strategy would contribute to the National REDD+ Strategy and Implementation Framework by directly supporting the implementation of the National Forest Programme, and/or bytesting whether and how conservation concessions, if financed through REDD+, could provide a viable economic alternative to Economic Land Concessions.

3.3 Additionality

Additionality is one of the most fundamental requirements that forest carbon projects (both A/R and REDD) have to comply with as it ensures that environmental integrity is maintained in offset transactions that occur in the carbon market. It means that projects have to demonstrate that they contribute to real GHG emissions reductions or removals compared to what would have happened in the absence of the project (i.e., projects generate emissions reductions or removals beyond the Business As Usual –or BAU- scenario).

As additionality is a CDM concept, it is not clear whether it will be a requirement for implementing REDD+ activities under the REDD+ mechanism adopted by the UNFCCC. In case the Prey Long REDD+ initiative is promoted as a subnational activity part of a National REDD+ strategy of the RoC under the UNFCCC framework, it would then only have to comply with any eventual additionality requirements that would be adopted under the convention. However, if it is decided that the Prey Long initiative be designed in accordance to a recognized voluntary carbon market standard, such as the VCS, additionality will have to be demonstrated according to the rules of the standard as well.

The VCS additionality rules require projects to demonstrate that they are not mandated by any systematically enforced law, statute, or other regulatory framework (i.e. regulatory surplus) and then demonstrate that they are not BAU through either a project, performance or technology test approach. However, in reality projects are required to follow the requirements set out by the methodology used, which establishes a procedure for the demonstration and assessment of additionality based on the VCS guidelines set out above.

Currently, all VCS validated REDD methodologies -including those under validation- require projects to use the most recent version of the "*Tool for the Demonstration and Assessment of Additionality in VCS Agriculture, Forestry and Other Land Use (AFOLU) Project Activities"*. The tool consists of four fundamental steps:

STEP 1. Identification of alternative land use scenarios to the AFOLU project activity. This step serves to identify realistic and credible land-use scenarios that would have occurred on the land within the proposed project boundary in the absence of the REDD+ initiative. For example, continuation of the pre-project land use, including continued deforestation and /or degradation, or switch to an alternative land-use typical for the region where the REDD+ project is planned to be located. In short, this means that the project has to demonstrate the credibility of the baseline scenario(s) that are used to calculate emissions from deforestation in the absence of the project (see section 3.1). Credibility is defined as all land-uses within the boundary of the project that currently exist or that existed at some time in the period beginning ten years prior to the project start date but no longer exist.

In the case of Prey Long, the credibility of the unplanned component of the baseline should be easily demonstrated, as it constitutes a continuation of the pre-project land use. For the planned component of the baseline though, which assumes the further development of ELCs within the Prey Long area, additional justification might be required n order to demonstrate credibility following VCS requirements. To comply with VCS requirements, the justification must include elements of spatial planning information (if applicable) or legal requirements and may include assessment of economical feasibility of

the proposed (baseline) land use scenario. In the absence of such information, demonstrating the credibility of the planned deforestation component of the baseline might be a challenge.

In addition, it must be demonstrated that the alternative land use scenarios identified (i.e. the baseline scenarios) are in compliance with all mandatory applicable legal and regulatory requirements. If not, then project proponents must show that, based on an examination of current practice in the region in which the mandatory law or regulation applies, those applicable mandatory legal or regulatory requirements are systematically not enforced and that non-compliance with those requirements is widespread, i.e., prevalent on at least 30% of the area of the smallest administrative unit that encompasses the project area. For the Prey Long REDD+ initiative this means that project proponents would have to show that the deforestation taking place in the baseline scenarios (both unplanned and planned components) is legally permitted, or that non-compliance is widespread as defined previously. Demonstrating this requirement of legal (non) compliance might be challenging, especially for the planned component which includes sanctioning of ELCs in forested areas. It is suggested that project proponents conduct further legal and policy analysis to assess the implications of this additionality requirement for the planned component (ELCs), as a full additionality test is beyond the scope of this feasibility study.

STEP 2. Investment analysis requires demonstrating that the proposed project activity, without the revenue from the sale of GHG credits, is economically or financially less attractive than at least one of the alternative (baseline) land use scenarios. Three methods are allowed: simple cost analysis, investment comparison analysis or benchmark analysis. For projects that generate no financial or economic benefits other than VCS related income, the simple cost analysis is deemed sufficient, which requires to document the costs associated with the VCS project and demonstrate that the activity produces no financial benefits other than VCS related income. For Prey Long the simple cost analysis will be the appropriate method as no revenues are expected other than potential VCS credits.

STEP 3. Barriers analysis requires to identify any barriers that would prevent the implementation of the proposed project activity from being carried out without the revenue from the sale of GHG credits. The following barriers may be considered, *inter alia*: investment barriers, other than the economic/financial barriers in step 2; institutional barriers; technological barriers; barriers related to local tradition; barriers due to prevailing practice; barriers due to local ecological conditions; barriers due to social conditions and land-use practices; lack of organization of local communities; barriers relating to land tenure, ownership, inheritance, and property rights. Transparent and documented evidence must be provided, demonstrating that the GHG revenues generated by the project are crucial for overcoming the barriers to its implementation. In addition, it must be shown that the identified barriers would not prevent the implementation of the alternative land use scenarios identified, i.e. the reference (or baseline) scenarios.

Many of the above mentioned barriers could be demonstrated to prevent the implementation of project activities that reduce unplanned deforestation (Project Strategy 1 in section 3.2) in the Prey Long area, in the absence of the REDD+ initiative (i.e. financial resources from the sale of GHG credits). However, the barriers analysis may be performed instead of or as an extension of the investment analysis (step 2),

so it is not a necessary requirement for demonstrating additionality in the case of Prey Long. However, it is recommended that such analysis be undertaken if a PDD should be developed.

STEP 4. Common practice analysis is conducted to assess to what extent similar activities to the one proposed by the REDD+ project have been implemented previously or are currently underway in the same geographical area, without relying on revenues from GHG credits for their implementation. The analysis does not include other registered carbon projects, and should be limited to the period beginning 10 years prior to the project start date. Similar activities are defined as that which are of similar scale, take place in a comparable environment, *inter alia*, with respect to the regulatory framework and are undertaken in the relevant geographical area, subject to further guidance by the underlying methodology. It is not expected that the activities proposed by the Prey Long REDD+ initiative to reduce deforestation will be common practice, since no local forest protection contracts or protection forests/conservation concessions exist in the broader area where the project is located.

Preliminary Result of the VCS Additionality test: a complete analysis would have to be conducted to assess with more certainty the likelihood of the Prey Long REDD+ initiative passing the VCS additionality test. The result of this preliminary analysis suggests that the additionality of the unplanned component of the proposed REDD+ initiative should be easy to demonstrate. However, demonstrating the additionality of the proposed planned component of the Prey Long REDD+ initiative (i.e. stopping further development of ELCs) might be more complicated. First of all, demonstrating the credibility of further ELCs being granted within the Prey Long area might be a challenging task in the absence of supportive documentation and/or evidence. In addition, legal and policy issues related to this scenario might pose additional complexity since it would have to be shown that any eventual ELCs would not have been stopped by an enforcement of applicable regulations in the absence of REDD+ revenues. Any decision thus to include this component in the baseline scenario of the project would have to factor in such complexities.

3.4 Contribution to the National REDD+ Strategy

The major contribution of developing a REDD+ project in the Prey Long would be to provide a concrete example of a REDD+ initiative that could improve the capacity to manage REDD+ at the subnational level in line with the national REDD+ strategy, while generating a series of information that could inform the national process. Please refer to Attachment 2 for a detailed assessment of the potential contribution of the Prey Long REDD+ initiative to the different components of the Implementation Framework of the national REDD+ strategy as outlined in the REDD+ Roadmap.

3.4 Potential Partners

The key stakeholders who should be engaged during the development of REDD+ in Prey Long include government, NGOs and donors, the private sector and development partners, academic institutions, indigenous and local communities. For Prey Long, the primary stakeholder is the Forestry Administration under MAFF.

Several NGOs have worked or continue to work within the Prey Long landscape including Conservation International, East West Management Institute, Regional Community Forestry Training Center (RECOFTC) – Center for People and Forests, and World Wildlife Fund (WWF). Donors currently interested

or investing in REDD include JICA, UNDP, EU, FAO, World Bank and USAID. Funding from private donors and foundations may be leveraged through NGOs. Within the private sector, Nexus could play a role in Prey Long. Their services include awareness raising, carbon auditing, capacity building, carbon project development, and carbon asset management. Private sector involved in mineral extraction within the larger Prey Long landscape should also be engaged whenever possible.

Academic institutions that have conducted studies in Prey Long include the Royal University of Phnom Penh, the Royal University of Agriculture, and the University of Copenhagen. These and other universities could play a role in implementation of REDD+ through courses in climate change and training in carbon stock assessments and forest inventories, as well as thesis student research field projects on REDD+ topics. The research and on-going studies from these universities that relate to REDD, such as studies of forest types, biodiversity monitoring and carbon stock assessments, will be important to incorporate into future work.

3.6 Potential Co-benefits of a REDD+ initiative in Prey Long

3.6.1 Potential co-benefits for local livelihoods

Due to the widespread poverty in the area, there is great potential to create co-benefits for the communities living in and around Prey Long. Such a strategy should be based mainly (at a minimum) in securing land tenure and access rights, providing alternative sources of income and livelihoods, and enhancing food security, aiming at the long-term improvement of living conditions for the local population. In addition, such strategy should clearly be linked and contribute to national and/or provincial development plans, such as the National Strategic Development Plan (2009-2013) and the Cambodian Millennium Development Goals (CMDGs), and be based on current arrangements for the management of forests, such as those specified in the National Forest Programme (NFP, 2010).

Communities in the area directly depend on the forest for their livelihoods, collecting resins, vines and wild meat, among other resources (see section 2.4). In villages surrounding Prey Long there are many people who sell forest products to support themselves. Round wood for building is also an important resource, and one that local communities seek to protect for future generations. The protection of the forest ecosystem and reduction in forest degradation would have a positive impact on those people's livelihoods. At the same time, it is important to carefully design the REDD+ initiative in order to ensure that it does not result in restricted access to those forest resources that are essential for survival. Local communities' use of the forests thus should be understood, mapped and taken into account in the delineation of the boundaries of the potential REDD+ initiative and any resulting management plans. Any potential loss of income that might result from the implementation of the project should be compensated through the development of alternative livelihood activities leading to new income opportunities.

On the other hand, forests in Cambodia are often a source of 'famine foods' –when the harvest fails or to supplement a rice-based diet, villagers will collect wild root vegetables, mushrooms and wild meat. Some communities in the area are newly established or have lost their fields as a result of land grabbing, in these villages the people do not have enough agricultural land to feed themselves, even in good harvest years. It is important to ensure that the REDD+ initiative does not have a negative effect on food security by making land inaccessible to peasant farmers. Any REDD+ project in the area thus should take

into account these families' need for farmland and invest in land use planning and the improvement of agricultural production.

As discussed in section 2.5, land tenure for villagers around Prey Long is very weak, leaving the population highly vulnerable to outside interests and land grabbing. Villagers who lose their land will often clear new forest land in order to grow food. Securing land tenure is therefore a critical issue for the sustainability of any intervention in Prey Long, and would have to be directly addressed by the REDD+ initiative. It is suggested that in order to ensure that a REDD+ initiative in Prey Long provides positive development benefits and avoids negative impacts to local communities, project developers apply the criteria of the Climate, Community and Biodiversity Standards (CCBS)[12].

3.6.2 Potential biodiversity co-benefits

Prey Long encompasses a very large tract of lowland tropical evergreen forest that in its natural state supports an extremely high diversity of wildlife. However, due to many years sustained and uncontrolled hunting pressure the populations of many species have declined dramatically, and far below the potential density of wildlife that the area could support (Thelaide and Schmidt, 2010). Even at its current state, the site still contains a wealth of globally threatened animal species such as the Asian elephant, banteng, and pileated gibbon. Because many of those species occur in protected areas in Cambodia though, Prey Long is not currently a priority site for investment in conservation of those species. A floral and faunal biodiversity assessment of Prey Long conducted in 2007 shows that the forested area is still large enough to harbor viable populations of many threatened species, even those with large home ranges such as clouded leopards, dhole and bears (Olsson and Emmett, 2007). In addition, interview and survey data from the same authors indicated the presence of several species in Prey Long that, if their presence in significant numbers is confirmed, would considerably elevate the conservation importance of the site. The three most important such species are the Hairy-nosed otter, the Siamese crocodile, and the tiger.

If Prey Long is effectively protected and wildlife populations are allowed to recover to levels comparable to other protected sites in Cambodia, the national and global conservation importance of Prey Long would increase dramatically. In addition, protection of Prey Long would allow the recovery of an extremely rare example of lowland evergreen tropical forest, meaning that the protected site would represent the best example of a globally threatened ecosystem and it would contain an abundance of globally threatened species. Prey Long could provide an example thus of how REDD+ can support fulfilling Cambodia's commitments under the Convention of Biological Biodiversity (CBD), an explicit target under its UN-REDD strategy document (UN-REDD NPD, 2010; Leng et al., 2010).

A desk-based literature review of available sources of information on the biodiversity of Prey Long was conducted for this feasibility study by the Rapid Assessment Program for Biodiversity (RAP) of CI. The review assessed the current threats to biodiversity and projected them to the future, comparing them to a REDD+ scenario. The results further indicate that a REDD+ initiative in Prey Long would provide clear net benefits to biodiversity compared to the continuation of current practices, and thus would easily be validated against the Climate, Community and Biodiversity Standards (CCBS). Please see Attachment 2.

[12] www.climate-standards.org

4. CARBON ANALYSIS

4.1 Applicable REDD+ Baseline & Monitoring Methodologies

The goal of this section is to provide an estimate of the REDD+ potential in Prey Long in terms of Emissions Reductions generated. As no established methodologies yet exist under the UNFCCC (for setting Reference Emissions Levels, or baselines), this feasibility study has been aligned with methodologies currently approved or under approval by internationally recognised standards of the voluntary carbon market, specifically the Verified Carbon Standard (VCS)[13].

According to the VCS Agriculture, Forestry, and other Land Uses (AFOLU) Requirements, this project falls within multiple activity categories (VCS AFOLU, 2011). It falls within the category of Avoiding Unplanned Deforestation and/or Degradation (AUDD); it also falls within the Avoiding Planned Deforestation (APD) category due to the planned activities occurring in the currently defined project area. Within the AUDD category VCS defines two deforestation patterns, frontier and mosaic. Frontier deforestation captures patterns that result from infrastructural expansion, such as the construction of new roads, into areas that were previously considered inaccessible. Mosaic deforestation captures patterns that occur in landscapes composed of a combination of forest parcels (including, for example, degraded, secondary, and mature forests) interspersed with various cleared lands resulting from local population pressure. As this project does not completely fall within either of these patterns, a frontier or mosaic unplanned deforestation methodology would be used for a potential Project Design Document (PDD); a frontier REDD baseline methodology with a spatial modeling component has been used in this feasibility study.

The Prey Long area has historically experienced both unplanned and planned deforestation. Unplanned deforestation in the area has taken a number of forms including small scale land clearing for, for example, agricultural expansion, the extraction of timber for fuel wood, and the small-scale extraction of valuable timber sources. Planned deforestation has included land development activities such as the allocation of Economic Land Concessions (ELCs) (see section 2.6). Based on the above information, the following REDD+ methodologies that have been proposed to the VCS could be used to develop the baseline for a PDD. These include the *Methodology for Estimating Reductions of GHG Emissions from Frontier Deforestation* developed by Idesam and FAS (2010), and Avoided Deforestation Partners (ADP) *Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation* (2010). The fundamental steps used to generate a baseline scenario in each of these methodologies are similar and are closely aligned with the steps used in this feasibility study.

Three baseline scenarios have been defined and produced for this feasibility study to capture the variety of options that may exist for implementing a REDD+ initiative in Prey Long (see section 3.1). The first scenario, the unplanned baseline, addresses unplanned deforestation. This scenario captures potential future deforestation that would be attributable to unplanned activities only, such as clear-cutting for agriculture, timber, or fuelwood (with a patch size of at least 0.5 – 1 hectare). Clearings with a smaller patch size may exist in the area but are not included in any of the baseline scenarios considered in this feasibility study. The second scenario defined for this study, the unplanned plus allocation adjustment factor, also captures only the unplanned deforestation component but in addition includes an allocation

[13] www.v-c-s.org

for planned deforestation by including an adjustment factor that captures the annual area that would be allocated to ELC activities. In this scenario, only future unplanned deforestation is included in the estimates, as described above. The third baseline scenario defined, the unplanned plus planned baseline, fully captures both the unplanned and planned deforestation components. As in the first two scenarios, the future deforestation attributable to unplanned activities is included. However, future deforestation that is attributable to planned activities in the form of further granting of ELCs is included as well, and credits are estimated for reducing emissions from both types of deforestation. This scenario may generate the highest potential in terms of emissions avoided but might also be the most complicated to implement.

4.2 Delineation of the proposed project boundary and reference region

We define the project site as the remaining humid evergreen forest in the Prey Long area according to the c.2009 forest cover map generated for this feasibility study (see Figure 3 area A). The site covers approximately 443,207 hectares with an elevational range of 12-639 meters. The leakage belt covers the humid evergreen forest patches surrounding the project area and is approximately 287,872 hectares. We assume that these forests are accessible to the main agents of deforestation; these forests are within approximately 100km of the Prey Long forest extent. A thorough assessment of the most relevant leakage belt, based on an in-depth analysis of the drivers and agents of deforestation and ensuring it meets the minimum size requirements as defined in the VCS methodologies, would be needed for the PDD. The reference region, as currently defined for the unplanned deforestation component, covers an elevational range of 3-666m. It is composed of the project area plus the leakage area, approximately 731,078 hectares, and meets the minimum area guidelines recommended by selected proposed VCS methodologies[14]. For the PDD the reference area should be thoroughly assessed and meet the requirements – in terms of agents/drivers of deforestation, landscape conditions, and socio-economic conditions – included in the Idesam and FAS *Frontier Deforestation* methodology (2010). Further, the applicability criteria for the planned deforestation component should be thoroughly assessed and meet the criteria included in the methodologies proposed to VCS. For example, Avoided Deforestation Partners (2010) recommend a suite of criteria including land tenure and documentation for legal deforestation, as well as minimum proxy area conditions in terms of similarity in land conversion practices, post-deforestation classes, management rights, and landscape conditions (+/-20% forest types; soil types; and elevation).

An area of non-forest to the southwest bordering the Tonle Sap has been omitted for this feasibility study to minimize the impact of, for example, distant market centers and other spatial data variables on the spatial modeling. In addition, areas beyond approximately 25km east of the Mekong River have

[14]Idesam and FAS (2010) recommend that the reference region "be larger than the project area and include the project area", and satisfy a suite of landscape and socio-economic conditions as well as presence, or "expected to exist", of similar agents/drivers of deforestation. Avoided Deforestation Partners (2010b) recommend a formula based minimum reference region size (min reference region = RAF(9000*project area^-0.7)*project area) along with agent, landscape, policy regulation, and transportation/infrastructure analyses to delineate the region. The reference region as currently defined does not meet the reference region recommendations defined by Terra Global Capital (2009). Terra Global Capital recommend a reference region of at least 2 times larger than the project area for projects > 100,000ha and of similar conditions in terms of agents/drivers of deforestation, landscape conditions, and socio-economic conditions.

been omitted from the area of analysis assuming that the agents and drivers of deforestation do not exist in Prey Long. The majority of the Prey Long project area, as currently defined, is located in the province of Kampong Thom, approximately 237,619 hectares. The project area also extends into the provinces of Kratie, Stung Treng, Preah Vihear, and Kampong Cham (see Table 3).

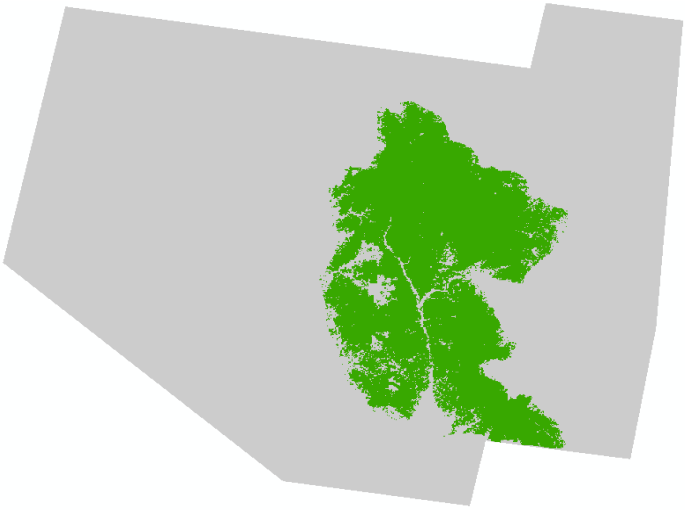


Figure 3. Project area analyzed for Prey Long REDD+ feasibility study

Table 3. Allocation of Prey Long project area by Province

	Kampong Thom	Kratie	Stung Treng	Preah Vihear	Kampong Cham	Total
Area (ha)	237,619	112,479	72,014	15,626	5,469	443,207

4.3 Forest stratification and carbon stocks in the proposed project area

We performed a literature review of available biomass information to identify average carbon stock (tC/ha) estimates for humid evergreen forests. Several studies have been performed in Cambodia and have produced varying carbon stock estimates, see Table 4 below. Sasaki and Yoshimoto (2010) and Kiyono et al. (2010) calculated carbon stock estimates for four carbon pools including aboveground, belowground, deadwood, and litter. The estimate generated by Sasaki and Yoshimoto (2010) was produced using forest inventory data from the Sandan district of Kampong Thom Province, where the majority of the Prey Long humid evergreen forest is located; the plot data used by Kiyono et al. (2010) are from throughout Cambodia. Therefore, the Sasaki and Yoshimoto (2010) estimate was used in the feasibility study. Further, the historical deforestation analysis classified mature humid evergreen forest which is compatible with the definitions used in the forest biomass estimates of Sasaki and Yoshimoto.

Additional data from Top et al., (2004) and Sasaki (2006) were considered but not selected due to the incompatible forest category system and carbon pools used in these analyses. In addition, one average carbon stock was calculated for the project area as the forest represents a relatively homogeneous forest type, albeit with some variation in species composition; this is also compatible with the historical deforestation analysis which classified forest –mature humid evergreen forest– and non-forest (see

Figure 5). The estimated carbon stock value of 172 tC/ha, produced by Sasaki and Yoshimoto (2010), includes aboveground and belowground, deadwood, and litter. For plots outside the project site, carbon stocks range from 133 to 256 tC/ha. The biomass carbon estimate used in this feasibility study is slightly lower than the national estimates described in UNEP-WCMC's report analyzing co-benefit options for Cambodia (Kapos et al., 2010). However, as the Sasaski and Yoshimoto (2010) estimate was generated based on plot data from the Sandan District, as described above, and therefore represents an accurate area-specific estimate, this estimate was selected.

Table 4. Carbon stock estimates (tC/ha) for Prey Long and other humid evergreen forests in Cambodia based on published literature

Site	**Source**	**Carbon stock (tC/ha)**	**Component**
Region-wide	Sasaki, 2006	133	Average aboveground (AG) for dryland[i] forests
Sandan District, Kampong Thom province	Sasaki & Yoshimoto, 2010	172	AG, belowground (BG), deadwood, litter
Region-wide	Kiyono et al., 2010	224	AG, BG, deadwood, litter
Kampong Thom province	Top et al., 2004	256	AG only

[i] includes evergreen, semi-evergreen, mixed, deciduous, and plantation forests

4.4 Description of data used (GIS or other)

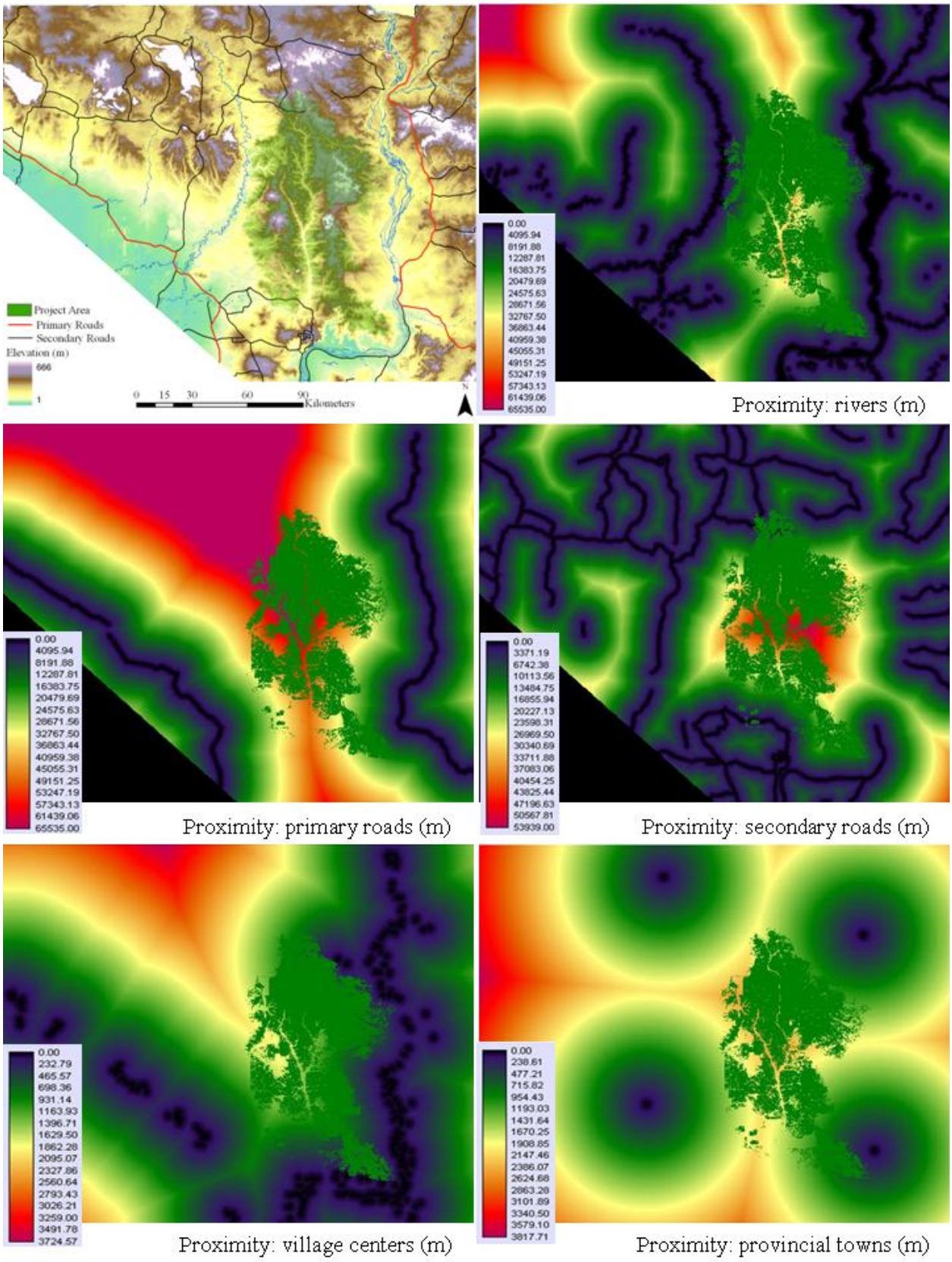
We used pre-existing GIS and ancillary data sources for this study, see Table 5, and compared these to multiple data sources including, for example, data underlying the NREM Data Tool Box (2007). We assessed and derived spatial driver variables, see Figure 4, according to the Frontier Deforestation methodology recommendations and consulted additional literature sources including Kim et al., 2008; Kim et al., 2006; Sasaki and Yoshimoto, 2010; Top et al., 2004; and Schmidt and Theilade, 2010 to refine the driver variables. The spatially explicit Economic Land Concession (ELC) data were provided by the Forestry Administration (FA). These data represent legally granted ELCs in the provinces of Kampong Thom, Stung Treng , and Kratie. Twenty-seven ELCs are located within the currently defined reference area, ranging in size from 1 to < 45,000 ha; a list of the ELCs is contained in Appendix 4. These data were supplemented by information regarding the ELC granting and allocation process retrieved from the Sub-Decree on Economic Land Concessions (MAFF, 2010) (see also Annex 2). Additional data may be considered for use in the PDD and could include, for example, the national map of forest types, additional population information and, potentially, other parameters. These options are further addressed in Section 4.10.

Table 5. GIS data sources used

	Spatial Driver Variable	**Source**
1	Accessibility - elevation	50m Digital Elevation Model (DEM) data for Cambodia[15]
2	Accessibility - slope	Derived from 50m DEM data for Cambodia
3	Proximity to rivers	Ministry of Land Management, Urban Planning & Construction, Cambodia (2005)
4	Proximity to primary roads	Ministry of Land Management, Urban Planning & Construction, Cambodia (2003)
5	Proximity to secondary roads	Ministry of Land Management, Urban Planning & Construction, Cambodia (2003)
6	Proximity to village centers	Ministry of Land Management, Urban Planning & Construction, Cambodia (2005)
7	Proximity to provincial towns	Ministry of Land Management, Urban Planning & Construction, Cambodia (2005)
8	Management land categories: Economic Land Concession (ELC) areas	Forestry Administration of Cambodia (2010)

[15] http://www.gdem.aster.ersdac.or.jp/

Figure 4. Derived Spatial Driver Variables



4.5 Analysis of historical time series of deforestation

Methods:

A multi-temporal forest cover and change product for the currently defined reference region was produced using CI's standard change detection methodology (Harper et al., 2007; Habitat Monitoring, 2010). Landsat TM and ETM+ imagery were selected for this analysis due to the extensive image archive for the area, medium-fine resolution of the imagery, and no-cost acquisition. Three time periods, circa 1990, c.2000, and c.2006/9 were processed for the reference area from two adjacent Landsat path/rows, P126R051 and P125R051 (Table 6). However, the latter two periods were used in this feasibility study because the selection of a base year by Cambodia remains in discussion (Cambodia REDD+ Roadmap, 2010).

The major components of the standard change detection methodology are briefly discussed below and fully described in Christie et al. (2007) and Harper et al. (2007). The methodology involves a supervised classification approach where changes are directly identified and classified within multi-temporal images which have been co-registered to within one pixel. Analysts delineate training sites for each land cover or change class based on visual interpretation and by referring to high resolution imagery, such as those available from Google Earth. Approximately six classes are mapped including forest, nonforest, deforestation, water, cloud, and shadow, and numerous sub-classes are created for each final class to capture the full range of spectral transitions within the periods. Multiple iterations are run using See5 decision tree software (Rulequest, 2010) and the Classification and Regression Tree (CART) sampling toolset available through the National LandCover Data (NLCD) interface of Erdas Imagine. The final classification is produced by merging the sub classes, which have been developed through the iterations to capture the full suite of spectral transitions and change classes.

Table 6. Landsat image acquisition date list

Path/Row	Acquisition Date 1	Acquisition Date 2	Acquisition Date 3
125051	19901221	20020213	20050104
126051	19901228	20010711	20090130

Deciduous forest is present in the currently defined reference area, however this forest type presented complex mapping challenges. For example, the complexity of the deforestation dynamics in this class caused confusion with degraded evergreen forest and secondary evergreen forest. In addition, image interpretation to capture the seasonality of deciduous forests combined with the burning period dynamics in this area was further complicated by the acquisition dates of the available Landsat imagery. For these reasons deciduous forest has not been included in the feasibility study. Typical map accuracies for this data source and analysis methodology are >90% for humid tropical forest and >75% for dry tropical forest (e.g. Harper, et al, 2007; Christie et al. 2007). Post-classification processing included a single pass of a sieve filter resulting in a 0.5-hectare minimum-mapping unit (MMU). The projection of the acquired images was UTM Zone 48N WGS84, with a raster resolution of 30m, and this projection was maintained for the delineation of the reference area and all spatial modeling.

For the PDD the deciduous forest will need to be classified and this will require close interaction with partners to ensure correct interpretation of the imagery. A c.2005 deforestation product is also needed to allow for calibration and validation of the spatial modeling. A validation plan for the forest cover and change map is also required and could include data from various sources such as field data, aerial survey data and/or very high resolution imagery from Google Earth.

Results:

Prey Long has historically experienced unplanned and planned deforestation. These activities resulted in a combined annual deforestation percent of 1.28 for the period c.2000-c.2009, with each component contributing 1.23% and 2.01% respectively to the combined rate (see Figure 5). A number of actors have participated in this deforestation, as discussed in section 2.6. Unplanned deforestation has included small scale land clearing and logging by actors such as the rural population. In fact, Sasaski and Yoshimoto (2010) note that the majority of Cambodia's population, ninety-two percent, is based in rural areas and depends on forest resources. In addition, powerful local actors have contributed to this unplanned deforestation in a process of land grabbing and speculation and, through the early 2000s, commercial logging companies also practiced large–scale extraction in the area. The inclusion of multiple actors in the unplanned deforestation activities complicates the separation of the historical unplanned deforestation patterns, and analyzing the contribution of each of these actors to these patterns will require further research for the development of a PDD. Finally, land development activities such as the allocation of Economic Land Concessions (ELCs) have occurred in recent years and contributed to the planned deforestation component.

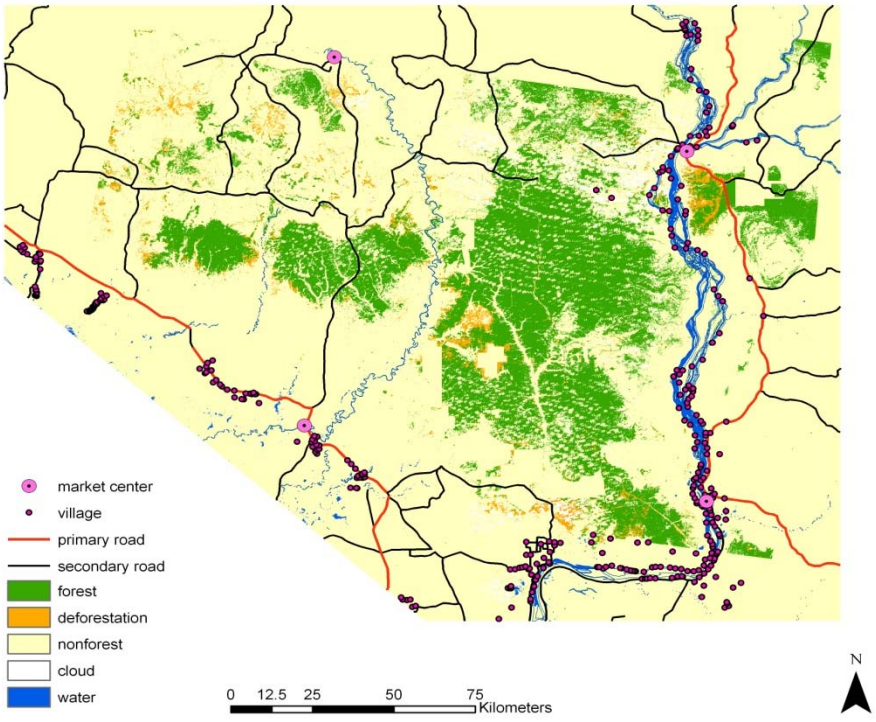


Figure 5. Unplanned and planned deforestation, c.2000-c.2009

4.6 Preliminary analysis of future deforestation under different baseline scenarios

4.6.1. Map of deforestation potential

We used a land use change modeling tool in a GIS to perform the spatially explicit modeling. This follows the overall approach common to all methodologies for unplanned deforestation proposed to the VCS. We first produced a map of potential for deforestation, a unitless deforestation risk map, for all forest in the reference area and then generated a map of future deforestation. The specific steps include the analysis of drivers of deforestation, the combination of associated factor maps with the historical deforestation map to develop a logistical regression or Multi-Layer Perceptron (MLP), and the generation of a potential for deforestation map, scaled 0-1 (see Figure 6). Input factor maps are listed in Table 5 and derived spatial driver variables are illustrated in Figure 4. We also incorporated an evidence likelihood layer into the modeling analysis (IDRISI, 2009). This driver variable was generated using a commune boundary file and the c.2000-c.2009 deforestation data to further refine the allocation of risk in the deforestation risk map. We then produced a map of future deforestation based on the historical deforestation rate and the pixels with the highest potential for deforestation. Multiple model runs are executed with different combinations of inputs and the most realistic model is selected based on the historical patterns and discussions with in-country partners.

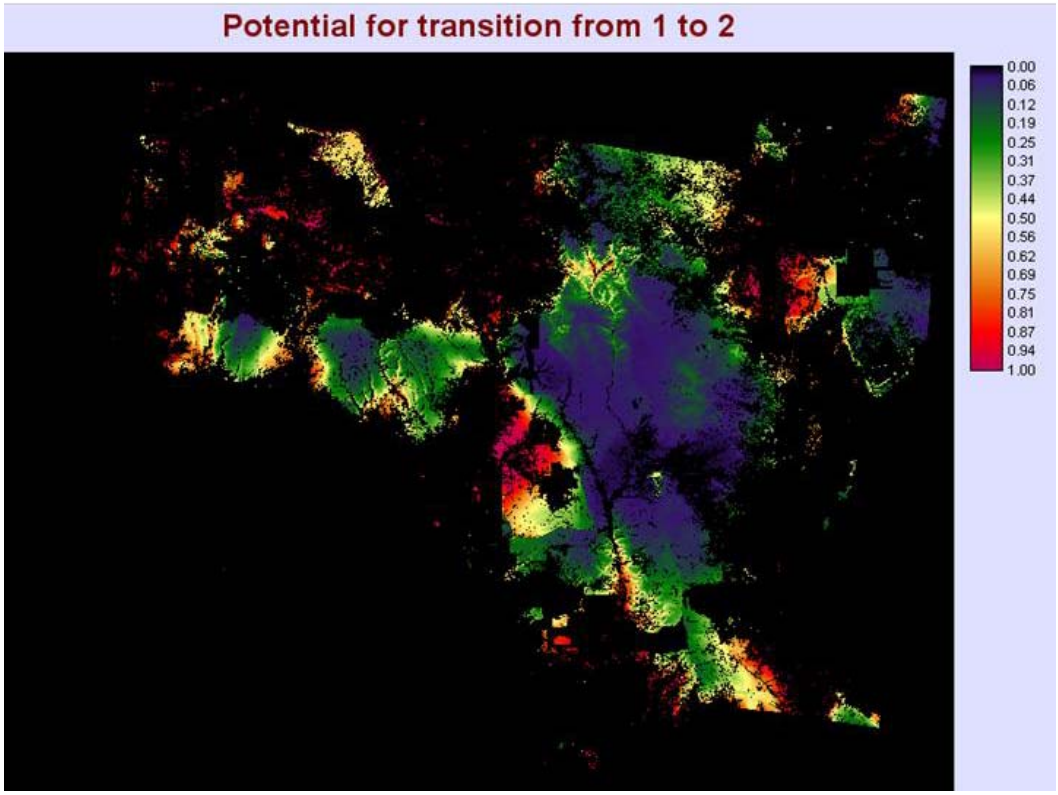


Figure 6. Map of potential for deforestation

4.6.2. Estimation of total deforestation rate

We used the historical deforestation rate for the reference area and assumed a continuation of this rate. To separate unplanned and planned historical rates we performed the following steps. We identified the unplanned component of the historical rate by omitting the deforestation that occurred within the currently defined ELCs. This produced an annual historical deforestation rate of 1.23% outside of ELCs, i.e. the historical rate of unplanned deforestation. The historical rate within ELCs was 2.01% y-1. Based on the ELC information provided by the FA, we estimated the annual future ELC allocation using the date information available for 26 of the 27 existing ELCs; allocation information for one ELC was not available. The ELCs were allocated between 1999 and 2009 and we assumed that deforestation commenced once wan ELC had been allocated. The ELCs covered approximately 47,061 ha of the reference area forest in 2009. We then estimated a historical rate of allocation of forest based on the average time since the majority of the allocations occurred (2006-2009). We calculated the average amount of allocation based on this four year period, yielding a rate of ELC area allocation of 1.35% y-1, or 11,765 ha y-1. The calculation of the planned deforestation estimate represents a conservative approach because unplanned deforestation that may have occurred prior to the allocation of an area as an ELC was included in the calculation of the ELC deforestation rate. Therefore, while the rate generated – 2.01% y-1 – was higher than the historical rate of unplanned deforestation, it was applied to a much smaller forest area.

We generated two projections, five years (2009-2014) and ten years (2015-2019), for the reference area using the approach described above and the c. 2009 forest cover map as the forest benchmark map, see Figure 7. We produced spatially explicit maps for each period and combined these maps to generate one product with the following categories: forest persistence in the reference, leakage, and project areas; deforestation for the first period and second period in reference, leakage, and project areas. We then extracted area estimates for the above categories. We used this information to firstly calculate the five year rate of deforestation in the project site by dividing the area deforested by the sum of the area deforested by 2014, the area deforested by 2019, and the forest benchmark map area in the project site. This five year rate was used to calculate an annual rate of 0.83% y-1. To estimate the annual rate for the second period, 2015-2019, and produce a 10 year projection we calculated the five year rate by dividing the area deforested between 2015-2019 by the sum of the area deforested during this period and the forest benchmark map area in the project site and then calculating an annual rate of 0.80% y-1 for the second period.

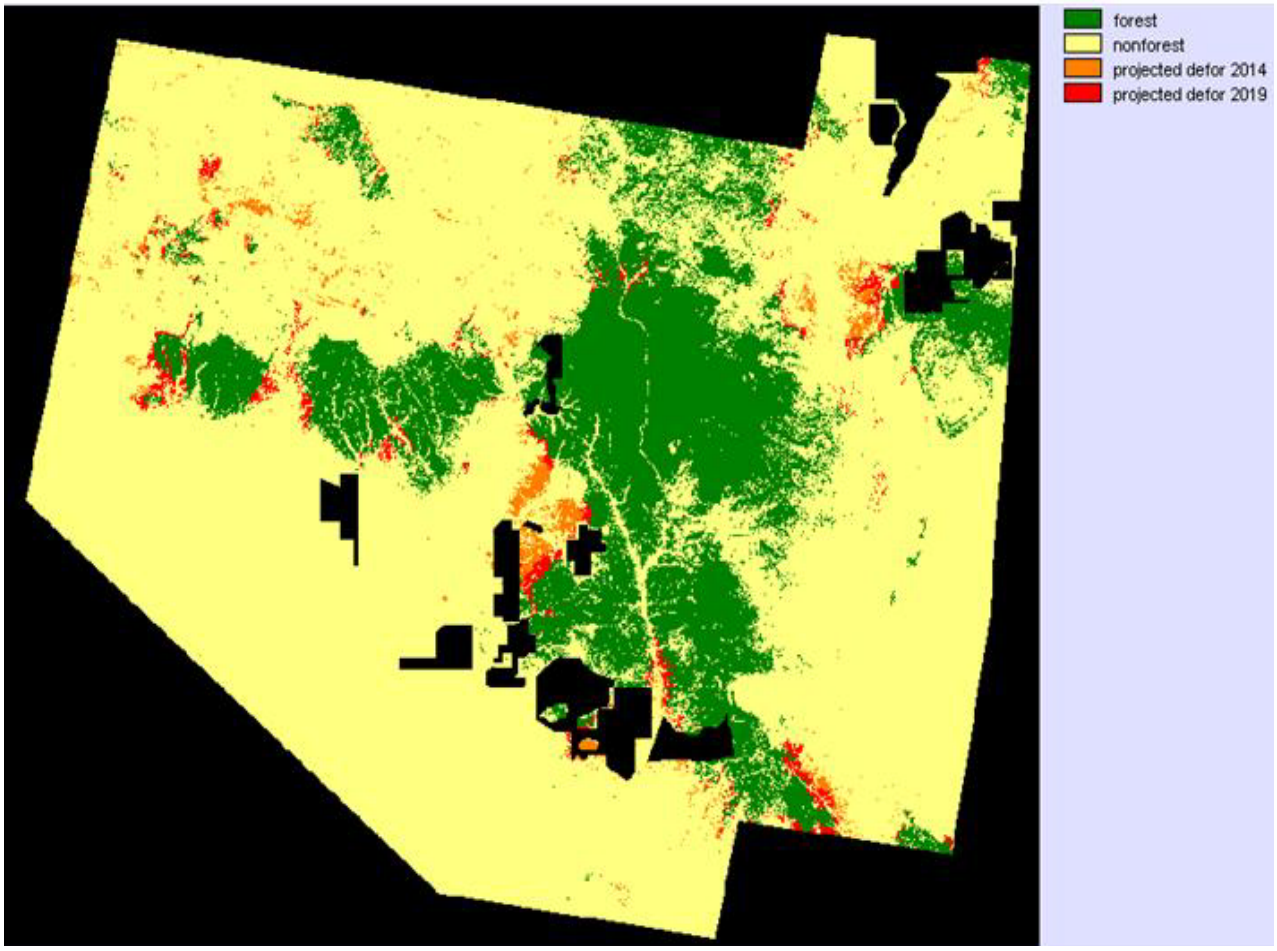


Figure 7. Five- and Ten-year Deforestation Projections (2014 & 2019)

4.6.3. Assumptions of each scenario

For all scenarios, we omitted currently decreed ELCs from the modeling extent (see Figure 2 and Annex 5). Thus, we consider currently decreed ELCs, whether inside or outside of the project site, to be beyond the control of the proposed project. None of the scenarios described in this section thus assume that the project will seek to reduce emissions generated from the existing ELCs.

Baseline scenario 1a: Unplanned deforestation with no future ELCs

The first baseline scenario, the unplanned baseline, represents the spatially explicit modeling described above. This scenario assumes that, with or without the project, there will be no new ELCs created in the project area. As noted, the future deforestation in this scenario uses a partial historical deforestation rate from unplanned deforestation only; 0.0083 for 2009-2014 and 0.008 for 2015-2019. The application of this rate yields a deforestation amount of 3,663 ha within the project site for year 1. For each remaining year within the five year projection, the same rate of 0.0083 was applied but to a recalculated project site based on the omission of the area deforested from the previous year, thus yielding a decreasing project forest extent and reduced deforestation amount, see Table 7a. The unplanned baseline scenario yields a forest area of 425,194 ha in the project area after five years and 408,532 ha,

with the 0.008 rate applied for years 2015-2019, after ten years. The cumulative deforestation amount in the project area is 18,013 ha after five years and 34,675 ha after ten years.

Table 7a. Annual forest extent and annual and cumulative deforestation amounts (ha) over the 5 year and 10 year projections under baseline scenario 1a, the unplanned deforestation baseline

Year	Forest (ha)	Deforestation (ha)	Cumulative deforestation (ha)
1	443,207	3,663	3,663
2	439,544	3,632	7,295
3	435,912	3,602	10,897
4	432,310	3,572	14,470
5	428,737	3,543	18,013
6	425,194	3,386	21,399
7	421,808	3,359	24,757
8	418,449	3,332	28,090
9	415,117	3,306	31,395
10	411,811	3,279	34,675
Project end final forest area (ha)	408,532		
Cumulative deforestation area (ha)			34,675

Baseline scenario 1b: unplanned deforestation outside future ELCs

The second baseline scenario, 1b, assumes that with or without the project, new ELCs will be granted, but the project only seeks to reduce unplanned deforestation outside of the new ELCs. This scenario incorporates adjustments to the project forest benchmark area to accommodate the new ELC allocation. In the absence of available spatial information on the location of the (assumed) future ELCs, the adjustments are incorporated by subtracting forest area from the project based on a historic allocation rate, and this is assumed to be for the creation of new ELCs; the project does not seek to reduce emissions in these newly granted ELCs. The area subtracted each year, to accommodate the assumed ELC allocation, is equal to the historical average ELC allocation rate, 1.35%. To this reduced forest area, the scenario then applies the same projected unplanned deforestation rate as the first baseline scenario, 0.0083 for years 2009-2014 and 0.008 for 2015-2019, yielding a deforestation amount in year 1 of 3,613, ha (Table 7b). Under this scenario, the project forest area is 391,889 ha after five years and 356,603 ha after ten years. However, most of that reduction in forest area is via assigning forest to ELCs and thus out of the project area, rather than from unplanned deforestation in the project area. Cumulative unplanned deforestation in the, shrinking, project area is 17,300 ha after five years and 32,251 ha after ten years.

For a PDD, certainty about future ELC allocation must be known in order to delineate a stable project area. For the purposes of this feasibility analysis, we apply the historical rate of ELC creation, in a non-spatial manner, to provide an indication of how large a project area may be for projects of five to ten years and estimates of associated baseline emissions.

Table 7b. Annual forest extent and annual and cumulative deforestation amounts (ha) over the 5 year and 10 year projections under baseline scenario 1b, the unplanned plus ELC allocation adjustment factor

Year	Forest (ha)	Deforestation (ha)	Cumulative deforestation (ha)
1	437,222	3,613	3,613
2	427,754	3,535	7,148
3	418,491	3,458	10,606
4	409,429	3,383	13,990
5	400,563	3,310	17,300
6	391,889	3,121	20,421
7	383,519	3,054	23,475
8	375,327	2,989	26,463
9	367,311	2,925	29,388
10	359,466	2,863	32,251
Project end final forest area (ha)	356,603		
Cumulative deforestation area (ha)			32,251

Baseline scenario 2: unplanned plus planned deforestation (i.e. future ELCs considered)

While the first scenario, 1a, assumes no new ELCs will be granted and the second, 1b, accounts for new ELC creation but does not seek to reduce deforestation within them, the third scenario – the unplanned plus planned baseline – incorporates emissions from both the unplanned deforestation component and from newly allocated ELCs. The unplanned deforestation component in this scenario is the same as in scenario 1b with the unplanned deforestation rates of 0.0083 for years 2009-2014 and 0.008 for 2015-2019 applied. This yields 3,613 ha of deforestation in year 1. This scenario yields forest areas of 391,889 ha and 356,603 ha after five and ten years for the portion of the project area not assigned to new ELCs, and cumulative unplanned deforestation amounts to 17,300 ha and 32,251 ha over five and ten years.

Baseline deforestation in the portion of the project area that is assigned to new ELCs, which itself increases over the projection period, is 2.01% y-1 (Table 7c). This rate is estimated based on the historical deforestation analysis as discussed in section 4.6.2 and yields a deforestation amount of 120 ha within the area allocated to ELCs in year 1. As the allocation of project area to ELCs increases over the project period, the resulting forest area within ELCs is 27,500 ha after five years (2009-2014) and 49,507 ha at the beginning of year 10 (2015-2019). The cumulative deforested area within the new ELCs is 1,707 ha over five years and 5,841 ha over ten years. In this scenario, the sum cumulative deforested amount for both portions of the project area, unplanned plus planned, is 19,007 ha over five years and 38,092 ha over ten years.

Table 7c. Annual forest extent and annual and cumulative deforestation amounts (ha) over the 5 year and 10 year projections under baseline scenario 2, the unplanned plus planned deforestation.

		Unplanned (Non-ELC)			Planned (ELC)				Total deforestation	
Year	**Total Forest (ha)**	**Non-ELC forest (ha)**	**Deforestation (ha)**	**Cumulative deforestation (ha)**	**New ELC designation (ha)**	**ELC Forest (ha)**	**Deforestation (ha)**	**Cumulative deforestation (ha)**	**Total annual deforestation (ha)**	**Total cumulative deforestation (ha)**
1	443,207	437,222	3,613	3,613	5,984	5,984	120	120	3,733	3,733
2	433,609	427,754	3,535	7,148	5,855	11,719	236	356	3,771	7,504
3	424,219	418,491	3,458	10,606	5,728	17,211	346	702	3,804	11,309
4	415,033	409,429	3,383	13,990	5,604	22,469	452	1,154	3,835	15,144
5	406,046	400,563	3,310	17,300	5,483	27,500	553	1,707	3,863	19,007
6	397,253	391,889	3,121	20,421	5,364	32,311	650	2,357	3,771	22,778
7	388,768	383,519	3,054	23,475	5,249	36,911	742	3,100	3,796	26,574
8	380,464	375,327	2,989	26,463	5,137	41,305	831	3,930	3,820	30,394
9	372,338	367,311	2,925	29,388	5,028	45,502	915	4,846	3,840	34,234
10	364,386	359,466	2,863	32,251	4,920	49,507	996	5,841	3,858	38,092
Project end final forest area (ha)		356,603				48,511				
Cumulative deforestation area (ha)				32,251				5,841		38,092

Table 8 provides a summary of the cumulative deforestation under the three potential baseline scenarios considered in this analysis. As illustrated, deforestation in baseline scenario 1b (unplanned deforestation outside future ELCs), is slightly lower that baseline scenario 1a (unplanned deforestation with no future ELCs), because the allocation of new ELCs (in scenario 1b) decreases the amount of forest available for unplanned deforestation at a faster rate compared to scenario 1a, where no new ELCs are allocated. Baseline scenario 2 (unplanned plus planned deforestation) which accounts for deforestation arising from newly allocated ELCs, is also the one with the highest deforestation. However, the difference is not that big.

Table 8. Summary of cumulative deforestation under the three baseline scenarios considered

	Cumulative deforestation (ha)		
Year	**Baseline scenario 1a**	**Baseline scenario 1b**	**Baseline scenario 2**
1	3,663	3,613	3,733
2	7,295	7,148	7,504
3	10,897	10,606	11,309
4	14,470	13,990	15,144
5	18,013	17,300	19,007
6	21,399	20,421	22,778
7	24,757	23,475	26,574
8	28,090	26,463	30,394
9	31,395	29,388	34,234
10	34,675	32,251	38,092

4.7 Estimation of CO_2 emissions in the different baseline scenarios

We used the deforestation estimates listed above to generate CO_2 emissions under the three baseline (without-project) scenarios: the unplanned, unplanned plus allocation adjustment factor, and unplanned plus planned. We used an average carbon stock value of 172tC/ha for humid evergreen forests, as estimated by Sasaski and Yoshimoto (2010) and described in Section 4.3. We estimated 100% combustion of the four carbon pools – aboveground, belowground, deadwood, and litter. To estimate the average carbon stock value for post-deforestation non-forest classes we adapted option 2, the 'historical LU/LC-change approach', of the Idesam and FAS Frontier Deforestation methodology (2010). Table 9 lists the post-deforestation non-forest classes, associated allocation estimates, and average carbon stock.

We estimated that 60% of the post-deforested area is allocated to crops with an average carbon stock value of 5tC/ha, based on the default crop values of the IPCC Guidelines (IPCC 2006), and 20% to fallow with an average carbon stock value of 20tC/ha for fallow. We adapted information on the rate of carbon sequestration in plantations based on rubber plantation estimates produced by Cotter et al. (2009) for two provinces in China. This study estimated 273tC/ha sequestered, over a 30 year period, for rubber plantations in Hainan province and 191tC/ha for rubber plantations in Yunnan province. We used an average 30 year period estimate of 232tC/ha with annual accumulations of ~8tC/ha. We assumed that

plantation cultivation begins in year 2.5 with a pro-rated accumulation of 4tC/ha and continues with annual accumulations of 8tC/ha for years 3 – 10, yielding a year 10 annual accumulation of 56tC/ha, thus we used an average carbon stock value for plantations of 28tC/ha. We consider this replacement vegetation value high and, therefore, an over-estimation of replacement vegetation carbon stock values. Thus, this represents a conservative approach to the REDD+ scenario. Further, for the development of a PDD, robust post-deforestation class biomass information will be required based on biomass plots located in deforested areas.

Table 9. Post-deforestation non-forest class allocation area and average carbon stock value

Post-deforestation class	**Average allocation (%)**	**Average C stock value (tC/ha)**
crops	60	5
fallow	20	20
plantation	20	28
Mosaic weighted avg.	100	53

We estimated 10,658,124 tCO_2e over a five year projection for the *unplanned baseline (1a)* scenario based on a cumulative deforestation area of 18,013 ha and the post-deforestation non-forest class allocations of 60% crop, 20% fallow, and 20% plantation. The 10 year projection generated 20,378,923 tCO_2e based on a cumulative deforestation area of 34,675 ha and the above-listed post-deforestation non-forest class allocations. Lower CO_2 emissions estimates result under the second baseline scenario, the *unplanned plus allocation adjustment factor scenario (1b)*. This scenario generates 10,239,293 tCO_2e and 18,961,849 tCO_2e under the five year and ten year projections respectively based on the cumulative deforestation area estimates of 17,300 ha and 32,151 ha. While the without-project CO_2 emissions generated under this scenario are lower for both the 5 year and 10 year projections than the without-project unplanned baseline scenario, the inclusion of an ELC adjustment factor in this scenario reduces the area available for unplanned deforestation, hence the lower cumulative deforestation area estimates. This scenario, however, does not account for the CO_2 emissions generated within the new ELC-allocation areas. As expected, the *unplanned plus planned baseline scenario (2)* generates the highest CO_2e emissions. The without-project CO_2 emissions estimated under this scenario are 11,242,641 tCO_2 based on a five year projection, resulting from 19,007 ha of deforestation. Using a ten year projection, 23,377,002 tCO_2e are generated based on a cumulative deforested area of 38,092 ha. Table 10 provides a summary of the estimated CO_2 emissions under the three baseline scenarios considered.

Table 10. Summary of estimated CO_2 emissions under the three baseline scenarios considered

	Estimated (cumulative) CO_2 emissions (tCO_2e)		
Years	**Baseline scenario 1a**	**Baseline scenario 1b**	**Baseline scenario 2**
1-5	10,658,124	10,239,293	11,242,641
6-10	20,378,923	18,961,849	23,377,002

4.8 Preliminary analysis of ex-ante REDD+ benefits (with-project scenario)

We used conservative assumptions for assigning the project success, emissions, and leakage estimates in this feasibility study. However, an in-depth discussion with in-country representatives regarding project emissions, leakage, and project success must be part of the PDD development in order to incorporate this expert input into the process. For all three with-project emissions projections under the unplanned, unplanned plus allocation adjustment factor, and unplanned plus planned scenarios we estimated a 40% project success rate for years 1 to 3, increasing to 60% for years 4 to 6, and again to 90% for the remaining years, years 7 to 10. We estimate the project will have a 40% leakage rate for the first three years, 30% for years 4-6, and 10% leakage and project emissions combined for years 7-10. We estimate project emissions at 20% for years 1 to 3 and 10% for the remaining years, see Table 11. We assumed less success in the future ELC allocations in scenario 2 the unplanned plus planned scenario. In these areas we assumed 10% emissions from the project site, 50% leakage of emissions from the project site to the leakage area, and 40% project success are assumed for the entire ten-year period.

Table 11. Assumptions of project success, leakage, and emissions estimates

Year	Project success rate (%)	Leakage rate (%)	Project emissions rate (%)
1	40	40	20
2	40	40	20
3	40	40	20
4	60	30	10
5	60	30	10
6	60	30	10
7	90	5	5
8	90	5	5
9	90	5	5
10	90	5	5

REDD+ benefits under baseline scenario 1a:

Based on these assumptions for project success, leakage, and project emissions, for the with-project scenario 1a we estimated a reduction in annual deforestation by 2,126 ha from 3,543 ha to 1,417 ha in year 5 compared to the year 5 without-project scenario, and by 2,951 ha, from 3,279 ha to 328 ha, in year 10. The resultant emissions estimates are 5,564,635tCO_2e compared to 10,658,124tCO_2e after five years and 7,129,326tCO2e compared to 20,378,923 tCO_2e after ten years under the with-project vs. without-project unplanned scenario (1a). These emissions estimates account for the different project success, leakage, and project emission rates, which are in effect in year 5 and year 10, as discussed above. The cumulative deforestation under this with-project scenario is reduced to 9,384 ha compared to 18,013 ha by year 5, a reduction of 8,628 ha in deforestation, and by 22,608 ha from 34,675 ha to 12,066 ha by year 10. The *ex ante* REDD+ benefit estimates under this scenario are 5,093,489tCO_2e and 13,249,597tCO_2e over five- and ten-years respectively (Table 12a).

REDD+ benefits under baseline scenario 1b:

The with-project unplanned plus allocation adjustment factor scenario (1b), results in a decrease in annual deforestation by 1,986 ha (3,310 ha to 1,324 ha) in year 5 and by 2,576 ha (2,863 ha to 286 ha) in year 10. The emissions generated under this with-project scenario are 5,362,565tCO_2e compared to the without-project scenario of 10,239,293tCO_2e in year 5, and 6,781,012tCO_2e compared to 18,961,849tCO_2e in year 10. The cumulative deforestation under this with-project scenario is reduced by 8,259 ha after five years from 17,300 ha to 9,041 ha and by 20,778 ha, from 32,251 ha to 11,473 ha after ten years. The *ex ante* REDD+ benefit estimates yielded under this with-project scenario are 4,876,728tCO_2e and 12,180,837tCO_2e in years five and ten respectively (see Table 12b).

REDD+ benefits under baseline scenario 2:

The with-project unplanned plus planned scenario (2), results in an annual deforestation reduction of 2,207 ha from 3,863 ha to 1,656 ha in year 5 and of 2,975 ha from 3,858 ha to 884 ha in year 10. The emissions projections for the unplanned plus planned scenario, 2, are reduced to 5,964,574tCO_2e compared to 11,242,641 tCO_2e by year 5 and to 8,830,104tCO_2e compared to 23,377,002tCO_2e after ten years. The cumulative deforestation under this with-project scenario is reduced by 8,942 ha from 19,007 ha to 10,066 ha after 5 years and by 23,115 ha from 38,092 ha to 14,977 ha after ten years. The *ex ante* REDD+ benefit estimates are 5,278,068tCO_2e after 5 years and 13,546,898tCO_2e after 10 years (see Table 12c). While further refinement of the ELC information used for this feasibility study may yield different benefit results, using the spatially explicit ELC information provided and the assumptions listed above, the inclusion of future ELCs in the project site area does not, currently, offer significant *ex ante* REDD+ benefits over the other two scenarios. This scenario could prove the most complicated to implement due to the range of stakeholders that would need to be involved in implementing this scenario.

Table 13 provides a summary of the estimated ex-ante REDD+ benefits for the different baseline scenarios considered in this feasibility analysis, under the assumptions for project success, leakage, and project emissions as outlined in Table 11.

Table 12a. Without & with-project CO_2 emissions for the unplanned baseline scenario (1a). Without-project estimates are from Table 7a. With-project estimates assume 20% emissions from the project site, 40% leakage of emissions from the project site to the leakage area, and 40% project success for the first three years; 10%, 30%, and 60% for years 4 – 6 for project emissions, leakage, and project success; and 90% project success for the remaining 4 years with 10% project and leakage emissions combined.

	WITHOUT PROJECT					WITH PROJECT					Ex-Ante REDD+ benefit estimate
				Net Emissions			Net Emissions				
Year	Deforestation (ha)	Cumulative deforestation (ha)	Annual Carbon (tC)	Cumulative Carbon (tC)	CO_2e (tCO_2e)	Deforestation (ha)	Cumulative deforestation (ha)	Annual Carbon (tC)	Cumulative Carbon (tC)	CO_2e (tCO_2e)	CO_2e (tCO_2e)
1	3,663	3,663	604,321	604,321	2,211,814	2,198	2,198	362,592	362,592	1,327,088	884,726
2	3,632	7,295	599,327	1,203,648	4,405,350	2,179	4,377	359,596	722,189	2,643,210	1,762,140
3	3,602	10,897	574,201	1,777,849	6,506,927	2,161	6,538	344,521	1,066,709	3,904,156	2,602,771
4	3,572	14,470	569,456	2,347,305	8,591,137	1,429	7,967	227,783	1,294,492	4,737,840	3,853,297
5	3,543	18,013	564,751	2,912,056	10,658,124	1,417	9,384	225,900	1,520,392	5,564,635	5,093,489
6	3,386	21,399	539,719	3,451,775	12,633,495	1,354	10,739	215,888	1,736,280	6,354,784	6,278,712
7	3,359	24,757	535,421	3,987,196	14,593,136	336	11,075	53,542	1,789,822	6,550,748	8,042,388
8	3,332	28,090	531,157	4,518,353	16,537,172	333	11,408	53,116	1,842,937	6,745,151	9,792,020
9	3,306	31,395	526,928	5,045,280	18,465,726	331	11,739	52,693	1,895,630	6,938,007	11,527,720
10	3,279	34,675	522,731	5,568,012	20,378,923	328	12,066	52,273	1,947,903	7,129,326	13,249,597

Table 12b. Without & with-project CO_2 emissions for the unplanned plus allocation adjustment factor baseline, scenario (1b). Without-project estimates are from Table 7b. With-project estimates assume 20% emissions from the project site, 40% leakage of emissions from the project site to the leakage area, and 40% project success for the first three years; 10%, 30%, and 60% for years 4 – 6 for project emissions, leakage, and project success; and 90% project success for the remaining 4 years with 10% project and leakage emissions.

	WITHOUT PROJECT					WITH PROJECT					Ex-Ante REDD+ benefit estimate
				Net Emissions			Net Emissions				
Year	Deforestation (ha)	Cumulative deforestation (ha)	Annual Carbon (tC)	Cumulative Carbon (tC)	CO_2e (tCO_2e)	Deforestation (ha)	Cumulative deforestation (ha)	Annual Carbon (tC)	Cumulative Carbon (tC)	CO_2e (tCO_2e)	CO_2e (tCO_2e)
1	3,613	3,613	596,161	596,161	2,181,948	2,168	2,168	357,696	357,696	1,309,169	872,779
2	3,535	7,148	583,251	1,179,412	4,316,647	2,121	4,289	349,951	707,647	2,589,988	1,726,659
3	3,458	10,606	551,254	1,730,666	6,334,238	2,075	6,364	330,753	1,038,400	3,800,543	2,533,695
4	3,383	13,990	539,317	2,269,983	8,308,137	1,353	7,717	215,727	1,254,126	4,590,102	3,718,035
5	3,310	17,300	527,638	2,797,621	10,239,293	1,324	9,041	211,055	1,465,182	5,362,565	4,876,728
6	3,121	20,421	497,443	3,295,064	12,059,933	1,248	10,289	198,977	1,664,159	6,090,821	5,969,112
7	3,054	23,475	486,818	3,781,882	13,841,686	305	10,595	48,682	1,712,840	6,268,996	7,572,691
8	2,989	26,463	476,420	4,258,302	15,585,385	299	10,894	47,642	1,760,482	6,443,366	9,142,019
9	3,925	29,388	466,245	4,724,547	17,291,840	292	11,186	46,624	1,807,107	6,614,011	10,677,829
10	2,863	32,251	456,286	5,180,833	18,961,849	286	11,473	45,629	1,852,736	6,781,012	12,180,837

Table 12c. Without & with-project CO_2 emissions for the unplanned plus planned baseline scenario (2). Without-project estimates are from Table 7c. With-project assumptions differ for the portion outside versus inside future ELCs. For outside future ELCs, with-project estimates assume 20% emissions from the project site, 40% leakage of emissions from the project site to the leakage area, and 40% project success for the first three years; 10%, 30%, and 60% for years 4 – 6 for project emissions, leakage, and project success; and 90% project success for the remaining 4 years with 10% project and leakage emissions. For inside future ELCs, 10% emissions from the project site, 50% leakage of emissions from the project site to the leakage area, and 40% project success are assumed for the entire ten-year period.

	WITHOUT PROJECT					WITH PROJECT					Ex-Ante REDD+ benefit estimate
				Net Emissions			Net Emissions				
Year	Deforestation (ha)	Cumulative deforestation (ha)	Annual Carbon (tC)	Cumulative Carbon (tC)	CO_2e (tCO_2e)	Deforestation (ha)	Cumulative deforestation (ha)	Annual Carbon (tC)	Cumulative Carbon (tC)	CO_2e (tCO_2e)	CO_2e (tCO_2e)
1	3,733	3,733	616,022	616,022	2,254,639	2,240	2,240	369,613	369,613	1,352,783	901,856
2	3,771	7,504	622,143	1,238,164	4,531,682	2,262	4,502	373,286	742,899	2,719,009	1,812,673
3	3,804	11,309	606,435	1,844,600	6,751,235	2,283	6,785	363,861	1,106,760	4,050,741	2,700,494
4	3,835	15,144	611,355	2,455,955	8,988,794	1,625	8,410	258,950	1,365,709	4,998,497	3,990,298
5	3,863	19,007	615,805	3,071,760	11,242,641	1,656	10,066	263,956	1,629,665	5,964,574	5,278,068
6	3,771	22,778	601,034	3,672,794	13,442,425	1,638	11,704	261,132	1,890,797	6,920,316	6,522,109
7	3,796	26,574	605,156	4,277,949	15,657,294	751	12,445	119,684	2,010,481	7,358,361	8,298,934
8	3,820	30,394	608,848	4,886,797	17,885,679	797	13,252	127,099	2,137,580	7,823,542	10,062,137
9	3,840	34,234	612,128	5,498,925	20,126,066	842	14,094	134,154	2,271,734	8,314,547	11,811,520
10	3,858	38,092	615,010	6,113,935	22,377,002	884	14,977	140,863	2,412,597	8,830,104	13,546,898

Table 13. Summary of Ex Ante REDD benefit estimate under the three baseline scenarios considered

	SCENARIO 1a: UNPLANNED DEFORESTATION	SCENARIO 1b: UPLANNED PLUS ALLOCATION ADJUSTMENT FACTOR	SCENARIO 2: UNPLANNED PLUS PLANNED
Year	**Ex Ante (cumulative) REDD benefit estimate (tCO2e)**		
1	884,726	872,779	901,856
2	1,762,140	1,726,659	1,812,673
3	2,602,771	2,533,695	2,700,494
4	3,853,297	3,718,035	3,990,298
5	5,093,489	4,876,728	5,278,068
6	6,278,712	5,969,112	6,522,109
7	8,042,388	7,572,691	8,298,934
8	9,792,020	9,142,019	10,062,137
9	11,527,720	10,677,829	11,811,520
10	13,249,597	12,180,837	13,546,898

4.9 Permanence buffer

Carbon sequestered or protected through REDD+ projects is subject to potential loss over time, whether intentionally, i.e. by the inability of the project to control the drivers of deforestation (e.g., timber harvesting or agricultural expansion) or unintentionally, i.e. as a result of natural devastating events (e.g., natural fires, landslides, pests etc.). In short, permanence refers to the fact that a tree (and the carbon it contains) protected today, might be lost tomorrow. For afforestation/reforestation projects under the CDM, the risk of permanence has been addressed by allowing only the issuance of temporary credits, that need to be replaced after each commitment period (temporary credits) or at the end of the crediting period of the project (long-term credits). It is not clear how permanence will be dealt with within the REDD-plus mechanism adopted by the UNFCCC, although Annex I to the Decision adopted in Cancun during COP16, which addresses safeguards on issues relating to REDD-plus, mentions that activities under REDD+ should include “actions to address the risk of reversals”.

In the voluntary carbon market, the VCS has established an innovative self-insurance mechanism to address the risk of such reversals from REDD-plus projects. The VCS defines the key risks that must be evaluated for each project type, including risks related to geopolitical factors, rising opportunity costs, project design, management and longevity issues, as well as the potential for fire. Based on these risks, a certain percentage of the project’s carbon credits are deposited into a pooled buffer account shared by all VCS AFOLU projects. These buffer credits are non-tradable and are maintained in the pooled account to cover the risk of unforeseen losses in carbon stocks no matter where they occur within the VCS AFOLU project portfolio. Thus the mechanism, based on this buffer reserve, is designed to ensure that all carbon credits issued by a project are backed by a diverse pool of non-tradable buffer credits, and thus can be traded as permanent credits in the carbon market.

For PDD development, the most recent version of the VCS *Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination* would have to be used to properly assess the risk of non-permanence of a REDD-plus initiative in Prey Long. The minimum risk rating that can be applied to any project is 10%, while the maximum allowed is 60% (any project with a risk rating higher than 60% is considered unacceptable). However, conducting a complete risk assessment is beyond the scope of this feasibility

study as it is too early to perform such analysis at this stage. A 20 % discount thus has been applied to the ex-ante REDD+ benefit estimates of Table 13, in order to more accurately reflect the real value of a REDD+ initiative in Prey Long. Table 14 thus represents the volume of credits that could be traded in the voluntary market as a result of a REDD+ initiative in Prey Long, assuming a 20% permanence risk buffer.

Table 14. Ex ante REDD+ benefits including a 20% risk buffer to account for non-permanence risk

	SCENARIO 1a: UNPLANNED DEFORESTATION	SCENARIO 1b: UPLANNED PLUS ALLOCATION ADJUSTMENT FACTOR	SCENARIO 2: UNPLANNED PLUS PLANNED
Year	**Ex Ante REDD benefit estimate, CO2e (tCO2e) minus 20% permanence risk buffer**		
1	707,780	698,224	721,484
2	1,409,712	1,381,327	1,450,138
3	2,082,217	2,026,956	2,160,395
4	3,082,638	2,974,428	3,192,238
5	4,074,791	3,901,382	4,222,454
6	5,022,969	4,775,290	5,217,687
7	6,433,911	6,058,152	6,639,147
8	7,833,616	7,313,615	8,049,709
9	9,222,176	8,542,263	9,449,216
10	10,599,678	9,744,669	10,837,518

4.10 Recommendations for monitoring

Prey Long represents an active frontier site similar to other lowland forest areas in Cambodia that have experienced extensive deforestation due to ease of accessibility and conversion to agricultural activities. For example, a qualitative assessment of imagery acquired in January 2010 compared to the 2009 imagery used to generate the 2009 benchmark forest map shows that deforestation has continued in multiple areas between 2009 and 2010. This deforestation has primarily occurred in currently decreed ELCs but also in other locations within the project site. Based on this apparently high rate of conversion in the area, a two-tiered system of monitoring is recommended. Such a monitoring system is consistent with the requirements outlined in the Cambodia REDD+ Roadmap. The first tier would include rapid monitoring of hotspot areas based on readily available near real-time decision support tools. Two such tools, developed by Conservation International, are the Fire Alert System (FAS) and the Illegal Logging and Encroachment Monitoring System (FAS, 2007). FAS uses MODIS active fire data to generate daily email alerts of active fire locations. This system can be customized by the user, such as the project manager, to track and respond to fire and associated deforestation activity capture in specific areas of interest. This level of monitoring is in place for the CCPF. The Illegal Logging and Encroachment Monitoring System uses visual interpretation of high resolution imagery - such as Landsat, ASTER, and ALOS AVNIR - to quickly generate alerts highlighting areas of forest encroachment and illegal logging whenever cloud-free data are available within target areas. The use of these monitoring tools allows, for example, the project manager to efficiently identify and intervene in areas where deforestation is occurring and to tailor and refine enforcement plans.

In addition to the near real-time decision support tools, bi-annual or annual wall-to-wall deforestation mapping using optical data at 30m resolution, or less, is recommended. This second tier of monitoring would enable quantitative assessments of deforestation to be produced and the baseline re-generated as needed. As cloud cover is not a major problem in this area, the use of optical data is recommended. These data are generally readily available, often at no-cost, and represent an operational method of deforestation mapping. Other monitoring options based on, for example, RADAR data may prove useful in areas that experience persistent cloud cover but the utility of these data for deforestation mapping remains an area of active research.

For a PDD, project monitoring must involve similar data sources and analysis methods to those used for the emissions baseline. It should also be noted that all of these estimates are for deforestation only, not forest degradation. In order to include the latter in a project, a baseline for degradation would need constructing and a monitoring plan developed, which may be heavily or entirely field based.

4.11 Additional technical recommendations for PDD development

The development of this feasibility study highlighted a number of aspects that should be considered and addressed prior to the development of a PDD. The study used a two-date historical period with c.2000 as the base year. While the selection of a base year by Cambodia remains in discussion, further analyses must accommodate the base year requirements (Cambodia REDD+ Roadmap, 2010). According to the Cambodia REDD+ Roadmap, current considerations suggest 1997/8 as the base year but this may be revised based on an analysis of implications (2010).

For the development of a PDD, a three-date historical time series, at a minimum, will be required for number of reasons, including to facilitate calibration and validation of the future deforestation; this feasibility study used a two-date historical deforestation time series, based on image availability. The specific date criteria, outlined in the VCS AFOLU and IPCC AFOLU Guidelines, required for the time series will need to be accommodated. In addition, the deciduous forest class will need to be included and mapped; this will require expert input to assist in image interpretation as well as the provision of very fine resolution imagery and field data, if available, to review areas where expert input is not available. Finally, the 2009/2010 forest benchmark map will most likely require multiple optical images, or potentially RADAR images, to exclude all areas obscured by clouds in any single image.

As discussed, one carbon stock value was used for this study. For the development of a PDD this value should be re-assessed and, potentially, separated into sub-classes based on the collection of biomass plot data, if these data show that the carbon stock value differs significantly. This may be the case for swamp evergreen forest if below-ground carbon values are significantly higher. In addition, refined estimates of post-deforestation non-forest class allocations are required. This information should also describe the average rotational cycle per class and average carbon stock value; there are a number of options available for acquiring this information.

The project site extent used in this study represents the remaining humid evergreen forest of Prey Long. An explicitly delineated project site extent will need to be developed and GPS locations recorded for the development of a PDD. Any project will need to be certain of further ELCs planned for this area and state whether or not it seeks to reduce emissions from future ELCs. Similarly, further workshops and reviews of assumptions in other projects should be conducted to inform and justify assumptions of project leakage and success rates.

Other aspects that will need assessing include the provisions of accurate up-to-date spatially explicit data. For example, we used a village center data layer for which source information was available, however these data may not fully capture the extent of communities within the project site, particularly within the interior areas, as suggested by a secondary village data source that was consulted but could not be verified. Incorporating the most up-to-date and accurate community location information into the spatial modeling could impact the resulting deforestation risk map and resultant baseline scenarios. The development of a robust data layer could be accomplished by interpreting high resolution imagery, such as those available on Google Earth, and further supplementing this interpretation through the collection of GPS points of villages not apparent in the imagery. This provision of up-to-date information on road locations and types is also required. For example, some secondary roads in the recent imagery are not present in the Shapefiles used in this study.

Finally, the dynamics of the various land development activities, such as ELCs, need to be understood. These variables need to be fully incorporated into the spatial modeling, interpretation of results, and implications. For example, the provision of spatially explicit information delineating the location of future ELCs would be required to assess whether the ELCs will be allocated in high threat areas, according to the deforestation risk map, thus requiring a higher deforestation rate.

5. PROJECTED REDD+ REVENUES

Generating revenue from a REDD+ initiative in Prey Long assumes that a market exists which is interested in its carbon credits; or that a fund exists able to finance such initiative, independent of interests in trading carbon credits. While the expectation exists that funding for REDD+ will be available eventually through a REDD-plus mechanism under the UNFCCC (either through a market mechanism or a fund), currently, the voluntary carbon market is the only place where carbon credits from a REDD+ initiative in Prey Long could be marketed, until forest carbon gets fully integrated into compliance frameworks.

It is hard to predict the exact price that a carbon credit could be sold in the voluntary carbon market, since pricing expectations often depend on different kinds of underlying deals and projects. According to the *Forest Carbon Offsetting Report 2010*[16], the most common price ranges that buyers of forest carbon offsets were willing to pay in 2010 range from US$5-10 per ton of CO_2, with the most common answers being in the US$7-8 range. Companies which have their headquarters based in North America and Australasia indicated a pricing expectation in the US$7-8 per ton range, whereas buyers from Europe appeared more willing to pay a higher price of US$11-12 for forest carbon offsets. The most common price for the 'Rest of the World' was US$9-10.

Other relevant highlights from the survey include:

- Positive attitudes towards forest carbon offsetting have increased since 2009, with nearly 80% of respondents having a 'positive' or 'very positive' attitude compared to only 58% in 2009;
- In particular, the most significant change in attitude was from Europe where 84% of participants claim to have a 'positive' or 'very positive' attitude compared to 36% in 2009;

[16] http://www.ecosecurities.com/Standalone/Forest_carbon_offsetting_report_2010/default.aspx

- Social and local community benefits (90%) and biodiversity and environmental benefits (89%) were listed as the highest motivations for interest in offsets from forest carbon projects instead of from other sectors.
- Participants highlighted the most important factor when purchasing forest carbon offsets are carbon standards (89%), closely followed by project location (84%), project type (80%) and the projects' ability to generate additional community and biodiversity benefits (83% & 77% respectively);
- The VCS and CCB Standards were the two most popular carbon standards (73% and 64% respectively) and CCB Standards were the most 'highly desirable'.
- 67% of all respondents and 83% of carbon companies are willing to pay a premium of $1 or more per ton for offsets from projects that also achieve the CCB Standards.
- Interestingly, there seems to be more willingness to pay a premium among European buyers than among those in North America and Australasia.

Since the potential revenues from any REDD+ initiative are extremely sensitive to the price of carbon, Table 15 provides a range of potential revenues generated from the Prey Long REDD+ initiative, based on the discounted (for permanence) ex-ante REDD+ benefits estimates (presented in Table 14) and depending on a set of different carbon price ranges potentially captured in the marketplace. As the table indicates, the REDD+ initiative in Prey Long has the potential to generate a considerable amount of carbon revenues, i.e. from a minimum of approximately US$11M to a maximum of US$42M in the first five years, for prices ranging from US$3-10 per ton of CO_{2e}, to a minimum of approximately US$29M and a maximum of US$108M in a ten years timeframe, for the same price ranges. However, it is important to note that these numbers should be treated with caution, as the numbers in this feasibility study are preliminary estimates, and there is no certainty on how future voluntary or compliance markets will work in a 5 or 10 years timeframe. In addition, it should be noted that these numbers do not preclude the possibility of obtaining donor funding that is not related to the amount of potential carbon credits generated by the REDD+ initiative. The take-home message from these numbers should be that there is high value in this project, the exact amount of which would require more detailed calculations.

Table 15. Potential REDD+ revenues from a REDD+ initiative in Prey Long, in 5 and 10 years timeframes, including a 20% non-permanence risk buffer

Price of carbon (US$/ tCO2e)	SCENARIO 1a: UNPLANNED DEFORESTATION	SCENARIO 1b: UPLANNED PLUS ALLOCATION ADJUSTMENT FACTOR	SCENARIO 2: UNPLANNED PLUS PLANNED
Potential REDD+ revenues in 5 years timeframe (US$)			
$3	12,224,373	11,704,146	12,667,362
$5	20,373,955	19,506,910	21,112,270
$7	28,523,537	27,309,674	29,557,178
$10	40,747,910	39,013,820	42,224,540
Potential REDD+ revenues in 10 years timeframe (US$)			
$3	31,799,034	29,234,007	32,512,554
$5	52,998,390	48,723,345	54,187,590
$7	74,197,746	68,212,683	75,862,626
$10	105,996,780	97,446,690	108,375,180

6. CARBON RIGHTS AND BENEFIT SHARING FRAMEWORK IN CAMBODIA

6.1 Carbon rights framework

While the legal framework for the management of forest resources is relatively clear in Cambodia, the regulatory framework regarding ownership and rights over forest carbon is not yet clearly defined. However, a general framework can be determined based on the existing land classification and ownership system, and the respective management and regulatory jurisdictions of relevant Government ministries and institutions. As noted by the REDD+ Roadmap, additional processes will need to be established during the national REDD+ Readiness process to clarify the decision-making authority of various State institutions over carbon and create appropriate regulatory procedures and guidelines.

The purpose of this section thus is to provide an overview of the current framework with regards to (forest) carbon rights in Cambodia, as presented in official documentation submitted to the UN-REDD (NPD) and the World Bank's FCPF (R-PP). The UN-REDD NPD (2010) states that "*it is legally correct to presume that the owner of a tree also owns the forest carbon stored in a tree. In most cases, forest resources belong to the owner of the land property that the forest resources are growing on*". The way land is classified thus will presumably have a determining role on who owns or has rights over the forest carbon contained in it (see Annex 1 for a scheme of the land classification system in Cambodia).

Given that most forests in Cambodia are classified as state public property, most forest carbon is owned and/or regulated by the state. More in detail, according to the UN-REDD NPD (2010), *naturally occurring* forest resources (and the carbon stored in them) growing on State Public Land (such as Prey Long) are by definition property of the State. Forest resources (and the carbon stored in them) *planted* on State Public or State Private land through an agreement with the appropriate State jurisdictional management authority are the property of those that planted the forest resources and invested other resources involved in the planting of the forest resources[17]. Forest resources (and the carbon stored in them) growing on private property are the property of the entity that legally owns the land that the forest resources are growing on, unless the land property owner has permitted another individual or entity to plant forest resources on the private land property in accordance with agreement of the owner of the land property, such as through some sort of long term lease agreement.

The state entrusted authority for forest carbon thus depends on the forest designation. For forests resources classified as state property, FA/MAFF, FiA/MAFF and GDANCP/MoE are entrusted management authorities of the state, having management and regulatory authority over the forests under their jurisdiction: the Permanent Forest Estate, Protected Areas, and flooded forest resources and mangrove areas (located outside of PAs) respectively. However, while the FA, FiA, and GDANCP are the authorities entrusted with the management of forest resources in the country, they do not have the right to sell, lease, transfer or otherwise dispose of these state properties without direct permission from or previously delegated authority to do so from the RGC. The Ministry of Economy and Finance (MEF) acts as the executive agency of the RGC in managing state properties (including forest carbon) in terms of selling, leasing, transferring, and other arrangements, and granting of various state concessions or contracts on management of state property.

[17] "Any individuals that plant trees on private land or on state forest land where they have granted user rights, have the right to maintain, develop, use, sell, and distribute their products." (Forestry Law, Article 46); "The state will not require the payment of royalties or premiums for the harvesting of Forest Products & By-products from private forests." (Forestry Law, Article 52)

With regards to sales of forest carbon, while they are not explicitly covered by current legislation the 2008 Subdecree #188 has designated the FA as the responsible authority for developing and arranging forest carbon trades and forest services to increase revenue for effective forest operations and development (Article 4). The FA therefore currently has authorization to develop forest carbon sales, however based on the law this applies only to the Permanent Forest Estate that lies under the jurisdiction of the FA. In addition, the FA was earlier designated as the agent of the RGC for arranging the sale of forest carbon credits from the Oddar Meanchey REDD+ pilot project, under the Council of Ministers Circular (SaraChor) #699, 26 May 2008.

6.2 Benefit sharing framework

There is no clear set of rules established yet for how benefit-sharing mechanisms under a national REDD+ mechanism would work in Cambodia. The purpose of this section thus is to provide an overview of the current thinking on how such mechanisms could work based on the REDD+ Roadmap and other official documents (UN-REDD NPD, 2010; FCPF R-PP, 2011), which a REDD+ initiative in Prey Long would have to take into account.

The guiding aim of a REDD+ benefit sharing structure should be to ensure that funds flow in logical sequence from reduction in deforestation rate to those institutions and communities who have a legitimate claim in and/or contributed to the achieved emissions reductions. Depending on the scale of implementation of the REDD+ initiative, different implementation modalities for benefit-sharing may be required, including:

- National-level payments (e.g. compensation for cancelling ELCs or timber concessions);
- Payments to Jurisdictional Agencies (FA, GDANCP etc) , e.g. for capacity-building or results;
- Payments to individual landscape units, e.g. Protected Forests, to cover management costs and for results at achieving REDD+;
- Payments to provinces, districts and/or communes as appropriate, e.g. for land-use planning or forming development plans;
- Payments to communes, villages and even households for results at achieving REDD+.

Existing local forest co-management agreements, such as Community Forests, Community Protected Areas, and Community Fisheries are considered as an ideal platform for potential REDD+ benefit-sharing arrangements with local people, although further work is required to understand how these approaches might work (UN-REDD NPD, 2010). In addition, some pilot examples of benefit-sharing and fund-disbursement mechanisms related to the management of forests and wildlife already exist in Cambodia which, even if not specific to REDD+, could inform decision-making. Some of these examples are:

- The Commune/Sangkat fund Natural Resource Management (NRM) allocations;
- Community-based Ecotourism (e.g. Tmatboey in Kulen Promtep Wildlife Sanctuary);
- Conservation agreements with local villagers in the Cardamom mountains (CI's project);
- Payments to villagers for wildlife protection;

The REDD+ Roadmap stresses the importance of documenting and studying the experiences of such pilots in order to understand the implications for future REDD+ benefit-sharing arrangements. In addition, the further piloting of projects is encouraged during the Readiness Phase in order to inform policy development through the testing of different approaches, particularly local forest protection contracts. A *Benefit-sharing Technical Team* under the REDD+ Taskforce has been proposed to be

formed, including the FA, GDANCP, and the MEF (others to be defined), in order to investigate existing benefit-sharing examples, document the lessons learned and develop guidelines for how to manage REDD+ revenues in Cambodia.

With regards to pilot REDD+ projects, Decision #699 of the Council of Ministers which approved the Oddar Meanchey pilot project explicitly recognizes the importance of local benefit-sharing to communities in REDD+ implementation. The Decision established guiding principles to ensure that carbon revenues are used to: 1) improve forest management; 2) provide maximum benefits to local communities which participate in the project activities; and 3) support development of new REDD projects in Cambodia. In addition, the Decision requires that revenues from the pilot project are managed through the TWGF&E bank account, ensuring transparency and oversight, and designates the FA as the Government agency responsible for arranging carbon sales. Box 2 provides an overview of how the distribution of project revenues was divided among project stakeholders in the Oddar Meanchey pilot project.

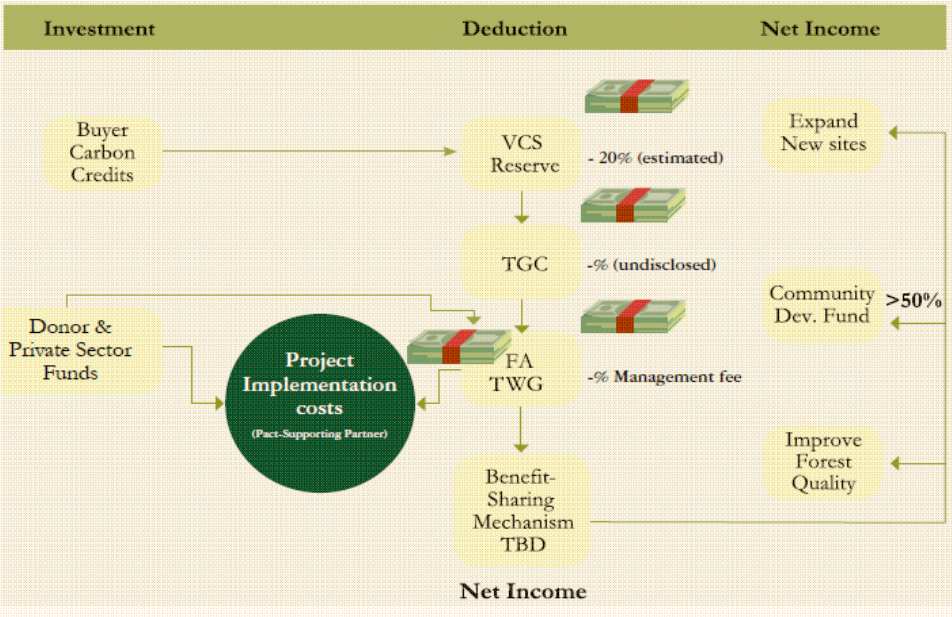
For the Prey Long REDD+ initiative, the benefit-sharing mechanism could be linked to the proposed project intervention strategies. This should include Forestry Administration management costs, to ensure the forest is effectively protected either as a Protected Forest or conservation concession. Local forest protection contracts for example (project strategy 1), could be used as a mechanism for providing performance-based compensation to local people for reductions in deforestation and forest degradation. Funds could pay for on the ground actions such as patrolling, improving agricultural productivity and providing livelihood alternatives. This would have the added value of providing a pilot test-case to inform the national process of designing REDD+ benefit-sharing mechanisms, by monitoring their effectiveness and documenting lessons learned. Part of the carbon revenues could be used to leverage additional donor funding to establish a Trust Fund for the long-term sustainable management of a Protected Forest or Conservation Concession and to negotiate the cessation of land and timber concessions in the area, and to align land use planning to avoid road building (project strategy 2). Given the absence of established mechanisms however, the most appropriate benefit sharing arrangement for Prey Long would have to be decided by the FA and other relevant government authorities.

Box 2. Benefit sharing in the Oddar Meanchey REDD+ pilot project (adapted by Bradley, 2009)

Generating financial resources from REDD+ activities entails defining the exact allocation of benefits to the different project stakeholders as well as the mechanism for distributing them. Following the guidance of Decision #699, carbon revenues from the Oddar Meanchey pilot REDD project are intended to be divided as follows (Figure 8)[18]:

1. 20% of the credits will be reserved as a buffer against the risk of permanence after verification. This is a mandatory requirement of the VCS in order to eliminate the possibility of major under-delivery of credits. The reserve rate is based on a risk analysis following VCS guidelines, and was estimated by Terra Global (the company providing technical support to the project).
2. A percentage of credits (undisclosed) after reserves will go to Terra Global as compensation over the first 20 years of the project, based on their agreement for carbon development and marketing services with the FA.
3. 5% suggested as an on-going management fee. The secretariat of the joint Technical Working Group on Forestry and Environment will have the task of managing the flow of funds to Pact, the implementing partner, at a level established by the annual budget and work-plan.
4. Payment for project costs. Supporting partner Pact will, for at least the first five years of the project, coordinate and implement on-going project activities in the field, while seeking donor funds to supplement the running costs of the project (approximately $600,000).
5. Net income (after project costs). Decision #699 provides guidance on the use of net income, with the three general priorities being to: a) Maximize benefits to communities for livelihood improvement, with the Terra Global-FA Agreement stating that at least 50% of net income will flow to local communities in the project areas; b) Develop new REDD initiatives; and c) Improve forest quality. When revenues begin to flow, Pact, Terra Global and the FA must agree on both the division of net income and the mechanism of distribution.

Figure 8. Proposed Revenue Flows in the Oddar Meanchey pilot REDD+ Project



[18] Although published in Bradley (2009), interview with the author clarified that the scheme presented is a preliminary division of project income, and not yet ratified by project participants.

7. CAVEATS

There are a number of potential methodological and technical risks associated with generating the carbon analysis component of a feasibility study; these are primarily related to the historical deforestation time series, the biomass information, and the quality of the driver information. For example, the accuracy of historical deforestation time series data can be impacted by a number of factors including the presence of clouds in the imagery used to generate the time series, the incorrect classification of forest and non-forest, and the geometric accuracy of the imagery. The presence of clouds in optical satellite imagery, for example, prevents classification of the land beneath the clouds thus potentially reducing the amount of deforestation classified in areas that transition from cloud to non-forest between two image dates. Further, the presence of clouds in the latter image date of a deforestation time series may result in an underestimation of forest extent in the forest benchmark map. The biomass information used in a feasibility study may also introduce error into the carbon emissions calculations. While a literature review of relevant local-regional biomass values was performed for this feasibility study, the biomass value along with the stratification of the forest by one major forest type may represent a source of error, and for analyses beyond this feasibility study it will be necessary to collect field plot data in order to generate robust biomass estimates for Prey Long.

The quality of the spatial data used to derive the spatial driver information represents another potential source of error, thus increasing the methodological and technical risks of a feasibility study. If the data do not capture the full extent of each variable, or do not represent the most up-to-date characteristics of each variable, this will reduce the accuracy of the spatial modeling. For example, as discussed in section 4.10, the spatial data used for this feasibility study represent currently available information, including ELC information. The ELC data represent currently available information provided by the FA, and for analyses beyond this feasibility study a thorough assessment of the completeness of these data will be necessary. For example, the model results suggest that the inclusion of ELCs in scenario 2, the unplanned plus planned scenario, does not significantly impact the Ex Ante REDD benefit estimates when compared to scenario 1, the unplanned scenario and, therefore, one potential conclusion is that including activities aimed at reducing and/or omitting future ELCs may not be viable. However, there are a number of factors that should be considered. Firstly, the presence of clouds in the c.2000 imagery could have resulted in a lower deforestation rate within the ELCs, in fact 10% of the ELC area in c.2000 was cloud covered. Secondly, the historical unplanned deforestation within Prey Long may represent a combination of unplanned deforestation plus planned ELCs that were either not contained in the available ELC spatial data or represent non-officially sanctioned ELCs, or other planned activities, that would not have been included in the available data. Thus, if the current ELC data does not cover the full extent of ELCs in Prey Long, this may have reduced the actual historical deforestation rate within ELCs and reduced the potential Ex Ante REDD benefits that could be provided by addressing ELCs. The ELC dynamic is further complicated by the large non-forest extent present in the currently defined ELC data.

These observations highlight a number of methodological and technical risks associated with this feasibility study and the revisions that would be required for analyses beyond this study. These revisions include the classification of additional satellite imagery to minimize the extent of the cloud cover, the collection of field plot data to produce robust biomass estimates, and a thorough review of the spatial data information to ensure that the spatial drivers represent the most up-to-date characterization of the area. This review of the spatial data must include a thorough consultation with

government institutions regarding ELCs in order to fully capture the complete trajectory of ELCs within Prey Long.

8. PRELIMINARY CONCLUSIONS

The preliminary results of this feasibility study show that developing a REDD+ initiative in Prey Long has the potential to generate substantial climate mitigation benefits, in the order of approximately 10 million tCO_{2e} within a 10-year timeframe, following VCS methodologies and after discounting for a 20% permanence risk buffer. In addition, the project would be able to easily meet the requirements of the Climate, Community and Biodiversity standards if properly designed, given the social conditions and the biodiversity importance of the area.

The development of this feasibility study also highlighted a number of technical aspects that should be considered and addressed prior to the development of a REDD+ initiative in Prey Long (for a detailed description see sections 4.11). Most notably, the study suggests that, under the current assumptions, the inclusion of future ELCs (i.e. planned deforestation) in the baseline scenario does not offer significant ex-ante REDD+ benefits over the unplanned scenarios (1a and 1b). In addition, legal issues related to this scenario (2) might complicate the demonstration of additionality if it cannot be proved that ELCs would not have been stopped in the absence of the REDD+ project. Furthermore, this scenario could prove the most complicated to implement due to the range of stakeholders that would need to be involved in implementing an effective REDD+ strategy. All this indicates that including activities aimed at reducing and/or omitting future ELCs from the project area may not be a viable strategy, and that a REDD+ initiative in Prey Long should focus on targeting areas at high threat of unplanned deforestation instead. However, these results should be treated with caution for a number of reasons (see section 7).It is possible that the historical unplanned deforestation rate that was estimated within Prey Long may represent a combination of unplanned deforestation plus planned ELCs that were either not contained in the available ELC spatial data or represent non-officially sanctioned ELCs, or other planned activities not included in the available data. Thus, this may have reduced the actual historical deforestation rate within ELCs and reduced the potential Ex Ante REDD benefits that could be provided by addressing ELCs. It is suggested that a deeper analysis of the drivers and agents of deforestation be conducted in consultation with relevant stakeholders and government agencies in order to have a more complete picture of the dynamics of deforestation in the area, particularly with regards to the threat of future ELCs, that would allow to construct a planned baseline that would more accurately reflect the future of Prey Long and thus recognize the real efforts of protecting its forests.

9. NEXT STEPS

The immediate next step for developing a REDD+ initiative in Prey Long would be to reach an agreement with and obtain approval from the Government -particularly the FA which has jurisdiction over the forests of Prey Long- to move forward with the project and include it as one of the national REDD+ pilots. This would be pursued within a general approach that involves extensive consultation and participation with key actors within the national REDD+ policy arena as well as regional/local stakeholders, in order to build support for the project and adjust it according to their views.

Upon agreement and approval from key stakeholders, the management structures and processes required to enact the proposed project strategy would have to be put in place. Initial activities could include:

- Develop a consultation process and establish a dialogue among relevant stakeholders at different levels (i.e. national, provincial, local, etc.) to inform and receive feedback on key project design aspects (e.g. define project boundaries, appropriate intervention strategies, benefit sharing arrangements, etc.);
- Conduct a thorough analysis of the drivers and agents of deforestation in Prey Long in consultation with relevant stakeholders and government agencies in order to better capture the real threat of future ELCs in the project area and construct a realistic planned baseline based on documented evidence
- Do a scoping of the different partnerships and capacities that need to be developed in order to start implementing project activities (i.e. field activities, technical aspects, etc.);
- Investigation of potential sources of funding for the different components of the project (i.e. technical, capacity building, conservation agreements, etc.);
- Collection of relevant background information (e.g. maps, land use plans, community resource use, commercial timber distribution);
- Conduct opportunity cost analysis comparing revenues from distinct uses of the Prey Long forest in order to assess whether REDD+ is an economically viable alternative to ELCs;
- Analysis of potential approaches for integrating REDD+ into the management plans of Protection Forests;
- Analysis of appropriate legal instruments and processes to implement conservation concessions;
- Feasibility analysis to assess the potential for conservation agreements/local forest protection contracts in Prey Long and identify potential alternative livelihood activities that could be established as part of the project intervention strategy;
- Land use planning process with local community members and local authorities to determine areas where agricultural expansion will be tolerated, areas to be protected as forest, degraded/abandoned areas to replant with timber, or fruit trees, etc.;
- Support and capacity building for local stakeholder groups, e.g. communities, provincial authorities etc., to socialize the initiative and promote participation.

REFERENCES

Avoided Deforestation Partners, 2010, +REDD Methodological Module: *Estimation of baseline carbon stock changes and greenhouse gas emissions from planned deforestation*. Version – May 2010: BL-PL -1 – BL-PL-14.

Avoided Deforestation Partners, 2010b, +REDD Methodological Module: *Estimation of baseline carbon stock changes and greenhouse gas emissions from unplanned deforestation*. Version – February 2010: BL-UP -1 – BL-PL-33.

Bradley A., 2009. Communities & carbon, establishing a community forestry redd project in Cambodia. PACT Cambodia, Kingdom of Cambodia.

Cambodia REDD+ Roadmap, revised draft 4 October 2010, version 3.1.

Christie, T., M. K. Steininger, D. Juhn, and A. Peal, 2007, Fragmentation and clearance of Liberia's forests during 1986-2000. Oryx 41(4): 539-543

Cotter, M., K. Martin and J. Sauerborn, 2009, How Do "Renewable Products" Impact Biodiversity and Ecosystem Services – The Example of Natural Rubber in China. Journal of Agriculture and Rural Development in the Tropics and Subtropics 110(1): 9-22

FAO 2005 Forest Resources Assessment. FAO, Rome.

FAS, Fire Alert System, 2007. 20 Oct. 2010 https://firealerts.conservation.org/fas/

Forestry Administration, 2007. Forest Cover Changes in Cambodia, 2002-2006. Paper prepared for the Cambodia Development Cooperation Forum. Forestry Administration, Phnom Penh.

Griscom, B., Shoch, D., Stanley, B., Cortez, R. and Virgilio, N. 2009. Sensitivity of amounts and distribution of tropical forest carbon credits depending on baseline rules. Environmental Science and Policy 12: 897-911.

GTZ 2009. Foreign Direct Investment in Land in Cambodia. GTZ, Germany.

Habitat Monitoring. Forest Cover and Change. Jan. 2010. 25 Oct. 2010 <https://learning.conservation.org/spatial_monitoring/Forest/Pages/default.aspx>

Hansen K. K. and Top N., 2006. Natural forest benefits and economic analysis of natural forest conversion in Cambodia. Cambodia Development Research Institute (CDRI) Working Paper 33, Phnom Penh.

Harper, G., Steininger, M.K., Tucker, C.J., Juhn, D. & Hawkins, F., 2007, Fifty years of deforestation and forest fragmentation in Madagascar. Environmental Conservation 34(4): 325-333

Heov, K.S et al. 2006.The Value of Forest Resources to Rural Livelihoods in Cambodia. Cambodia Development Research Institute (CDRI) Policy Brief 2, Phnom Penh.

Idesam and FAS, 2010, Methodology for Estimating Reductions of GHG Emissions from Frontier Deforestation. Manaus, 15 May 2010, v01.2

IDRISI, 2009, IDRISI Taiga Tutorial. Clark Labs, Worcester. August 2009

IPCC, 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

Kapos, V., Ravilious, C., Leng, C., Bertzky, M., Osti, M., Clements, T., Dickson, B., 2010, Carbon, biodiversity and ecosystem services: Exploring co-benefits. Cambodia. UNEP-WCMC, Cambridge, UK.

Ken Serey Rotha, 2010. Considerations in designing a REDD Benefit Distribution System in Cambodia. IUCN Cambodia.

Kiyono, Yoshiyuki, Naoyuki Furuya, Thy Sump, Chisa Umemiya, Eriko Itoh, Makoto Araki, and Mitsuo Matsumoto, 2010, Carbon Stock Estimation by Forest Measurement Contributing to Sustainable Forest Management in Cambodia. JARQ 44(1), 81-92

Leng, C., Ravilious, C., Kapos, V., Bertzky, M., Osti, M., Clements, T., Dickson, B. (2010) Carbon, biodiversity and ecosystem services: Exploring co-benefits. Cambodia. UNEP-WCMC, Cambridge, UK

MAFF, Ministry of Agriculture, Forestry and Fisheries. Overview of Economic Land Concession in Cambodia Web Page. May 2010. 4 Aug. 2010. < http://www.elc.maff.gov.kh/overview.html>

NREM DATA TOOL BOX Web Page, -Royal Danish Embassy- Danida - Phnom Penh, Cambodia. March 2007. 6 Oct. 2010. < http://www.cambodiaatlas.com/index/disclaimer>

Oberndorf, R. and Nhean, M. 2010. REDD+ in the Cambodian context. An overview of the policy, legal and governance Frameworks impacting implementation. Report for the Cambodia REDD+ readiness process. UNDP Cambodia, Phnom Penh.

Poffenberger M., 2009 Cambodia's forests and climate change: Mitigating drivers of deforestation. Natural Resources Forum 33: 285–296

Sasaki, Nophea and Atsushi Yoshimoto, 2010, Benefits of tropical forest management under the new climate change agreement—a case study in Cambodia. Environ. Sci. Policy, doi:10.1016/j.envsci.2010.04.007

Sasaki, Nophea, 2006, Carbon emissions due to land-use change and logging in Cambodia: a modeling approach. J. For. Res., 11:397-403

Schmidt, Lars and Ida Theilade, 2010, Conservation of Prey Long Forest Complex, Cambodia Working paper nr.50-2010. Forest & Landscape

Sloth, C., K. S. Heov, and B. Khlok (2005), Natural Resources and Environment: Issues, Constraints and Challenges. In: Murshid, K.A.S. and Ballard, B. (editors): Annual Development Review 2004-2005. Cambodia Development Research Institute (CDRI), Phnom Penh.

Stibig, H-J., Stolle, F., Dennis, R. and Feldkötter, C. (2007) Forest Cover Change in Southeast Asia - The Regional Pattern. JRC Scientific and Technical Research series. Office for Official Publications of the European Communities, Luxembourg. ISSN 1018-5593.

Top, N., Mizoue, N., Ito, S., Kai, S., Nakao, T., Ty, S. 2006. Re-assessment of woodfuel supply and demand relationships in Kampong Thom Province, Cambodia. Biomass and Bioenergy 30: 134-143.

Top, N., Mizoue, N., Ito, S., Kai, S., Nakao, T. 2004 Variation in woodfuel consumption patterns in response to forest availability in Kampong Thom Province, Cambodia. Biomass and Bioenergy 27: 57-68.

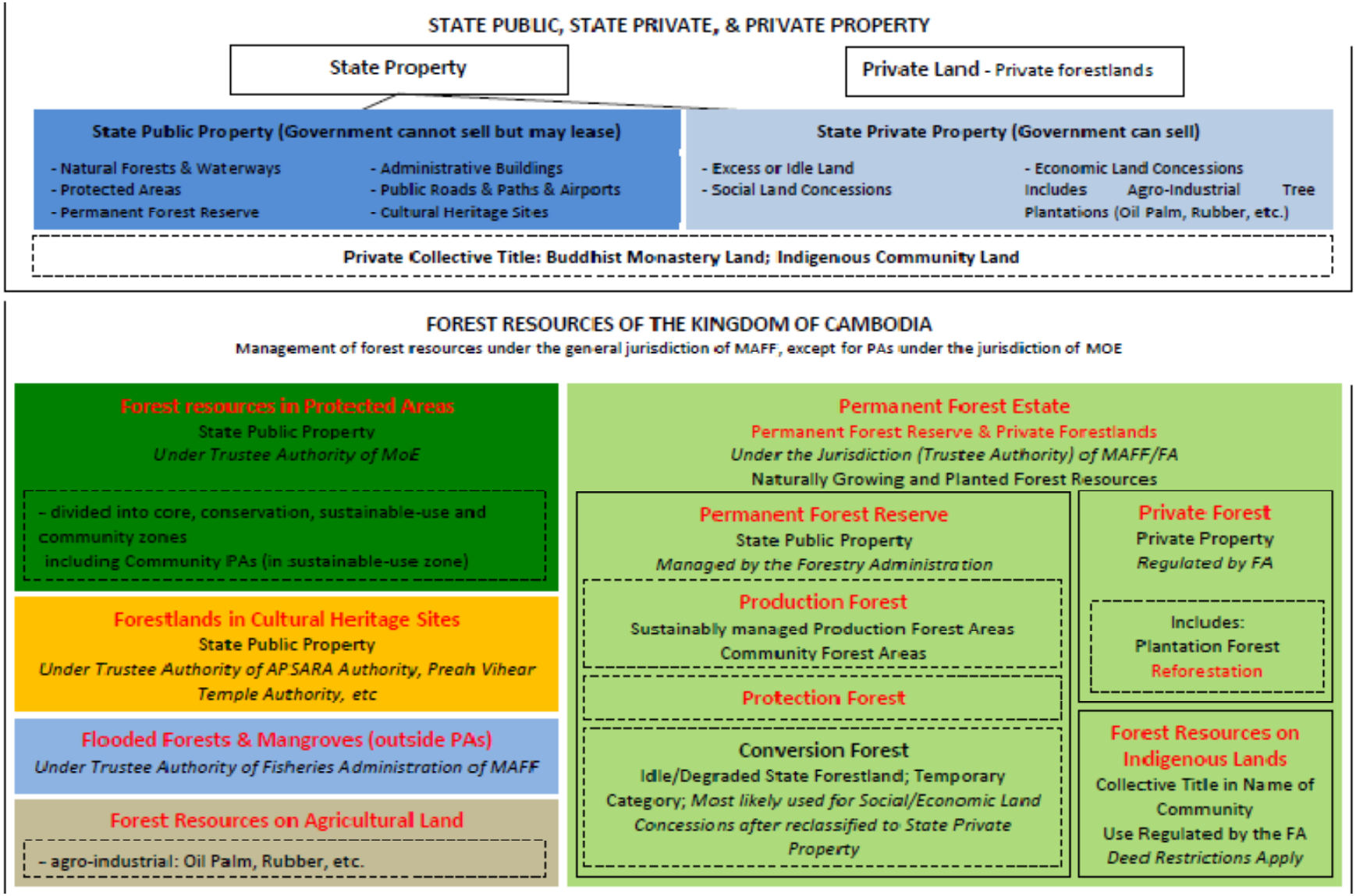
Top, Neth, Nobuya Mizoue, and Shigetaka Kai, 2004, Estimating forest biomass increment based on permanent sample plots in relation to woodfuel consumption: a case study in Kampong Thom Province, Cambodia. J. For. Res., 9:117-123

UNHCR (2004), *Land Concessions for Economic Purposes in Cambodia: A Human Rights Perspective.* Special Representative of the Secretary General for Human Right in Cambodia, Phnom Penh, Cambodia.

Verified Carbon Standard AFOLU Requirements: VCS Version 3. 2011. Verified Carbon Standard: Requirements for Agriculture, Forestry, and Other Land Use Projects.

ANNEXES

Annex 1. Land classification and forestland management in Cambodia (UN-REDD NPD, 2010)



Annex 2. Specifications regarding Land Concessions in Cambodia

Initial legal analysis conducted as part of the REDD+ Roadmap suggests that ELCs and SLCs are not appropriate modalities for implementing REDD+ because they are implemented on state private land and do not involve forest resources. However, as reported by the UN Cambodia Office of the High Commissioner for Human Rights (UNHCR, 2004) and cited in the UN-REDD NPD (2010), concessions have been granted in forested areas and in former forest concessions contrary to the forestry law and forestry regulations. In fact, the designation of areas for use as ELCs and SLCs are considered as primary drivers of current land use change in Cambodia in the UN-REDD+ National Programme Document (see Section on Drivers of Deforestation and Forest Degradation, pg. 14). As such, this Annex provides further details on the procedures for granting and cancelling such concessions, which should be considered in the REDD+ strategy for Prey Long. Should such an initiative be designed for the voluntary carbon market, any ELC-related REDD+ project activity would fall under the "planned deforestation" category of the VCS, and would have to follow the respective guidelines and methodologies. As such, appropriate evidence should be provided to validators to demonstrate that ELCs present a real threat to the Prey Long area, which might prove to be a challenge.

The Land Law (2001) authorizes the granting of land concessions for either social or economic purposes. There are three main types of land concessions in Cambodia: i) Social Land Concessions (SLCs), under which beneficiaries can build residential constructions and/or cultivate State lands for their subsistence; SLCs are limited to 10 hectares per family and after five years the land becomes their private property if it has been developed properly; ii) Economic Land Concessions (ELCs), under which beneficiaries can clear land for agro-industrial businesses; ELCs are limited to a maximum area of 10,000 hectares and a maximum duration of 99 years; iii) Use, development or exploitation concessions, including fishing, mining, port, airport, and industrial development concessions. Land concessions must be based on a specific legal document, issued by the competent authority (in the case of forest, either MAFF or MoE) prior to the occupation of the land, and must be registered with the MLMUPC.

The Sub-Decree for SLCs regulates allocation of state private land to poor communities and households (type ii). The Council for the Development of Cambodia is responsible for authorizing investment projects to be implemented under concession contracts (type iii). In general, these apply to infrastructure projects.

According to the Land Law, ELCs can only be granted over State private land. ELCs granted prior to the passage of the Land Law are to be reduced to comply with the area limit, although an exemption may be granted if the reduction will compromise exploitation in progress. Article 59 further prohibits the granting of concessions in several locations, jointly exceeding the 10,000 ha size limit, in favor of the same person(s) or different legal entities controlled by the same person(s). The 2005 Sub-Decree #146 on ELCs provides criteria for granting ELCs (Chapter 2, Article 4). The land for an ELC must be registered and classified as state private land in accordance with the 2005 Sub-Decree #118 on State Land Management and the Sub-Decree on Procedures for Establishing Cadastral Maps and Land Register or the Sub-Decree #48 on Sporadic Registration. An ELC may be granted only on lands that meets all of the following four criteria:

1. Land use plan has been adopted by the Provincial-Municipal State Land Management Committee and the land use is consistent with the plan;

2. Environmental and Social Impact Assessments (ESIA) have been completed with respect to the proposed land use and a development plan has been created;

3. Land has solutions for resettlement issues, in accordance with the existing legal framework and procedures. The Contracting Authority shall ensure that there will not be involuntary resettlement of lawful land holders and that access to private land shall be respected;

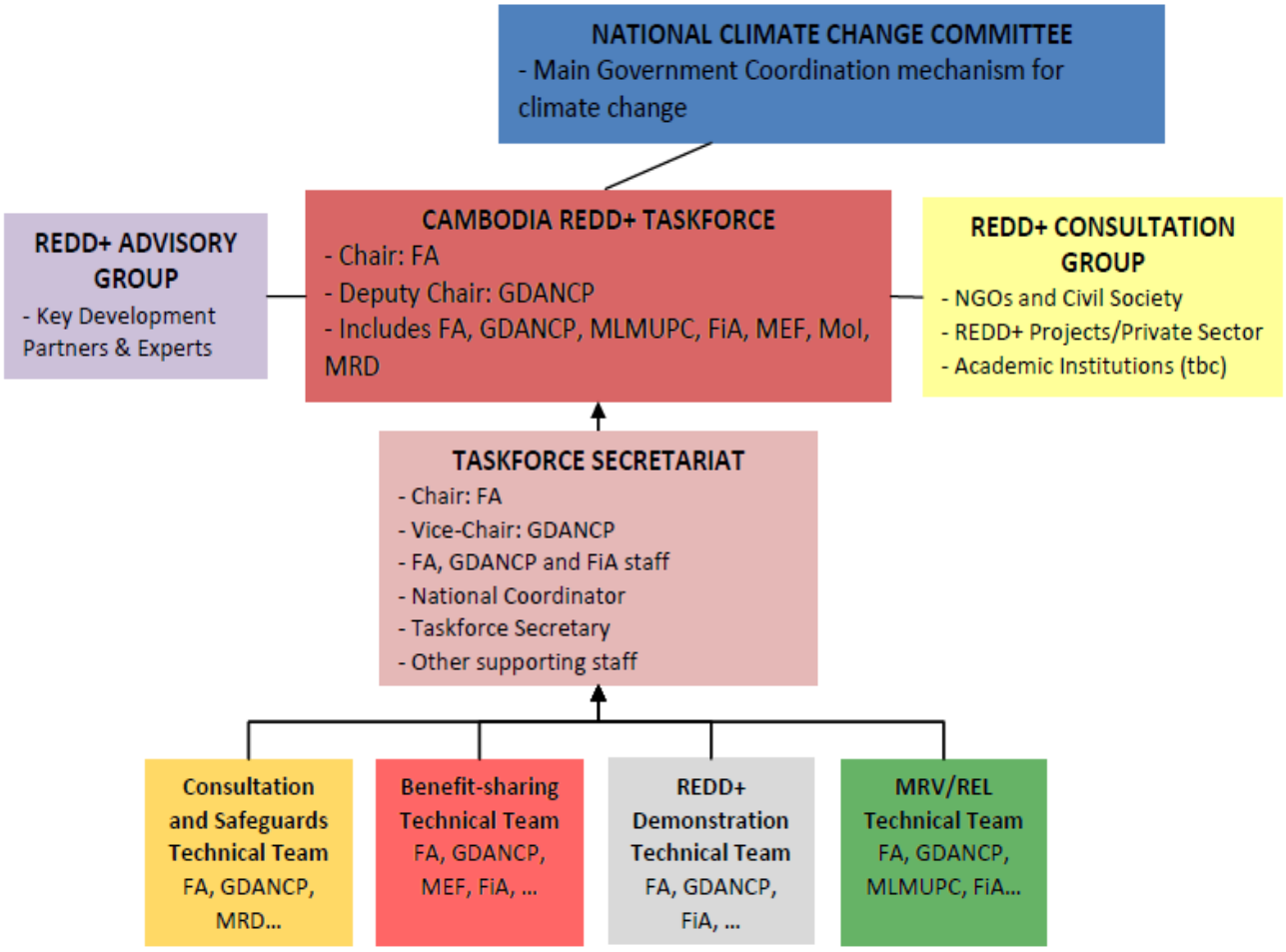
4. Land for which there have been public consultations, with regard to ELC projects or proposals, with territorial authorities and residents of the locality.

The Contracting Authority for ELCs is MAFF. Evaluation of ELC proposals is based on the following criteria: increase in agricultural and industrial-agricultural production by using modern technology; creation of increasing employment; promotion of living standards of local and indigenous people; continuous environmental protection and natural resource management; avoidance or minimization of adverse social impacts; linkages and mutual support between social land concessions and ELCs; processing of raw agricultural materials, to be specified in the concession contract.

ELCs must be exploited within 12 months of being granted, or will be considered cancelled. ELCs granted prior to the Land Law must be exploited within 12 months of the law‘s entry into force, or shall be cancelled. Any failure to fulfill the conditions of an ELC shall be grounds for its withdrawal, and land concessionaires are not entitled to seek compensation for any damages resulting from the withdrawal of a concession.

Article 18 of the Land Law states that ELCs that fail to comply with the above provisions are null and void, and cannot be made legal in any form. Article 55 provides that ELCs may be revoked by the Government for non-compliance with legal requirements, and the land concessionaire may appeal this decision. Further, a court may cancel the ELC if a land concessionaire does not comply with clauses specified in the contract.

Annex 3. Proposed National-level REDD+ Management Arrangements (UN-REDD NPD, 2010).



Annex 4. Main elements of the National Forest Program (UN-REDD NPD, 2010)

The National Forest Program (NFP) was developed over a two year period (2008-2009) by the Forestry Administration (FA), together with other stakeholders in the forest sector. It is intended to be a strategic framework designed to guide the implementation of the policy reforms mandated by the Rectangular Strategy and the NSDP. The forest policy reforms prioritized under the NFP build on the new legal framework for forests that has been established based on the 2002 Forestry Law and other regulations[19].

The NFP was formally approved by the MAFF in early 2010 and is being promoted by the government and development partners alike as a key guiding document for the sector, especially the Permanent Forest Reserve. The National REDD+ strategy of Cambodia thus is indented to build on the NFP and understand how REDD+ might support implementation of the NFP and other forest management strategies, such as Protected Areas and flooded forest management. As such, and given that the Prey Long area is under the Permanent Forest Reserve, it is important to understand the goals and structure of the NFP in order to design a REDD+ initiative that is in line with it.

The NFP identifies nine strategic priorities, including contribution to the economy, climate change and REDD, forest governance, conservation of forest resources, improved forest management, and sustainable financing. The NFP prioritises six programmatic areas that will receive emphasis over the next two decades in order to achieve these objectives, namely:

1. *Forest Demarcation, Classification and Registration (Programme 1).* Forest land is demarcated, classified and registered by MAFF and then entered on to the land register by the Ministry of Land Management, Urban Planning and Construction (MLMUPC). The NFP sets a target of maintaining 60% forest cover by 2015, based on the CMDGs, with 120,000km of forest boundaries demarcated by 2029.
2. *Forest Conservation and Development of Forest Resource and Biodiversity (Programme 2).* The NFP sets targets of 3 million hectares of Protection Forests, 0.5 million hectares of plantations and 2.4 million hectares managed according to sustainable forest management guidelines, 50% of processed wood for export being certified, and establishment of a chain of custody system.
3. *Forest Law Enforcement and Governance Programme (Programme 3)*, including law enforcement and forest crime monitoring and reporting.
4. *Community Forestry (Programme 4).* The NFP sees local management as a key component of efforts to reduce deforestation and forest degradation and sets a national target of 1,000 community forestry groups registered, covering 2.0 million hectares. The Rectangular Strategy prioritizes community forestry as the principal vehicle for obtaining payments for carbon, through voluntary carbon markets and REDD. The NFP also identifies the importance of broadening strategies for decentralized forest management beyond community forestry to include community conservation forestry (in protection forests), and partnership forestry or community production forestry (at larger scales).

[19] Additional regulations include: Community Forestry under the 2003 Subdecree #79 and 2005 prakas (Ministerial regulation), various Subdecrees creating Protected Forests, Subdecree #53 on classification and registration of the Permanent Forest Estate, and reform of forest concessions.

5. *Capacity and Research Development (Programme 5),* including development of the managerial and technical capacity of FA staff and other stakeholders. Also includes activities on research and awareness-raising activities on sustainable forest management.
6. *Sustainable Forest Financing (Programme 6).* The NFP identifies REDD as a critical source of sustainable financing for implementation, and prioritises development of national capacity to manage the proposed international REDD+ mechanism, including setting baselines and improving capacity for forest carbon monitoring.

Annex 5. ELCs in the Prey Long reference region

Name of ELC, province situated, and year granted for ELCs located within the currently defined reference region of Prey Long (see also Figure 2).

Name	Province	Year Granted
GG World	Stung Treng	2005
Rubber Plantation Tomring	Kampong Thom	2001
Sivget	Stung Treng	2006
Grand Land	Stung Treng	2006
An Mady Group	Kampong Thom	2005
Mean Rethy Co.; Ltd	Kampong Thom	2006
Sopheak Nika	Stung Treng	2005
Green Sea Agriculture Co.; Ltd	Stung Treng	2001
Damlong mi	Stung Treng	1999
Sal Sophear	Stung Treng	2005
Farmer	Kampong Thom	2007
Siv Gech	Kampong Thom	2007
Golden Farming	Kampong Thom	2007
An Sophy	Kampong Thom	2007
Heng Mean	Kampong Thom	2007
HMH.Co.; Ltd	Kampong Thom	2006
Tan Bien	Kampong Thom	2007
Great Asset Agricultural Dev.	Kratie	2006
Gold Foison	Kampong Thom	2007
Try Pheap	Kampong Thom	2007
Phumady	Stung Treng	2006
Timass resource	Kampong Thom/Kratie	2008
Telecommunication Site	Stung Treng	2008
Research Mining Development	Stung Treng	2008
BNA (CAM) CORP	Kampong Thom	2009
C.RC.K. Aphivath Caoutchouc Co.	Kampong Thom	2009
CCV	Kampong Thom	2009

ATTACHEMENTS

Attachment 1. Implementation Framework of the National REDD+ strategy and potential contribution of the Prey Long REDD+ initiative

Attachment 2. Potential biodiversity co-benefits of a REDD+ initiative in Prey Long: a desktop analysis