Reducing Carbon Emissions from Deforestation in the Ulu Masen Ecosystem, Aceh, Indonesia

~ A Triple-Benefit Project Design Note for CCBA Audit ~

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Resubmitted December 29, 2007

Executive Summary

This project will develop and test carbon finance mechanisms to reduce greenhouse gas emissions, contribute to sustainable economic and social development and conserve biodiversity over the next 30 years. The project will use land use planning and reclassification, increased monitoring and law enforcement, reforestation, restoration, and sustainable community logging on 750,000 ha of forest in the Ulu Masen Ecosystem and peripheral forest blocks located in the Indonesian Province of Nanggroe Aceh Darussalam (hereafter referred to as Aceh Province). The project estimates proposed activities will reduce deforestation in the area by 85% and 3,369,848 tons of CO_2 emissions can be avoided each year. Adequate carbon finance is essential for this project to succeed. This Project Design Note is intended to provide a qualified CCBA auditor with sufficient information to make informed decision on whether the project passes CCBA validation, and if so at what level (basic, silver or gold).

The project will be undertaken by the Government of Aceh and its institutions, with expected endorsement and support of the national Government of Indonesia (GOI) and relevant agencies. The proposal has been submitted for review to the National Working Group on Climate and Forests as a pilot project for reducing emissions from deforestation and degradation (REDD). The project is supported by a tri-partnership of government, non-governmental and civil-society organizations (NGOs/CSOs) and the private sector. Leadership by the Provincial Government will ensure compliance with, and integration with, governmental and regulatory structures. Fauna and Flora International (FFI), its NGO partners and locally based CSOs will facilitate participatory processes for community development, spatial and land use planning, biodiversity conservation, collaborative law enforcement and community-based forest management. Carbon Conservation Ltd, PTY is the lead private company assisting with project design, development, start-up and carbon finance at the request of Governor Irwandi's office. The project is closely associated with, and builds off the work of the World Bank Multi-Donor Fund's Aceh Environment and Forest project (AFEP) which called for among other tasks, development of sustainable ecosystem service finance (including carbon credits) to be developed for Aceh[1]. All project proponents are committed to ensuring that benefits are equitably shared among stakeholders, including forest dependent communities and those with customary (*adat*) rights to forest land.

The project has been conceived to ensure that stakeholder confidence and commitment will be built through a participatory and transparent process. All levels of government and civil society have been invited to contribute to the design and implementation of project activities and initial community consultations have begun. In particular, traditional *Mukim*[2] leaders have a critical role in the management of land and natural resources in Aceh's rural communities, typically being responsible for between three and eight villages. Though their authority was undermined during the years of conflict, *Mukim* leaders are now formally recognised under Aceh's Special Autonomy Law.

Project development, design and initial implementation will be initially funded from official development aid (ODA) funds. After the initial phase of the project, carbon finance from sale

[1] *Project Appraisal Document for a Proposed Multi-Donor Fund Grant in the Amount of USD 17.53 Million to Leuser International Foundation and Fauna Flora International: For a Project Integrating Environment and Forest Protection into the Recovery and Future Development of Aceh. Report No. 24610-ID, December 15, 2005.*

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[2] *A mukim (sometimes known as kemukiman) consist of a number of communities or villages with a common ethnic and cultural background under the leadership of the mukim (or more correctly the Imeum mukim), a religious leader who also had secular functions. Under the Imeum mukim were specialist community leaders such as the Kejrun blang (responsible for agricultural matter), the Pawang Uteun (controlling forest use) and the Panglima Laot (fisheries in coastal areas).*

of Verified Emission Reductions (VERs) must be secured to provide immediate and substantial incentive payments to all relevant stakeholders who help the project area arrest deforestation and increase forest protection.

The ability of this project to succeed is contingent on:

- Emergence of a real market for REDD credits that allow sustainable forest land uses to out-compete unsustainable logging and forest conversion
- Independent review and approval of this project's baseline land use and carbon emission scenario
- Successful design and implementation of project activities
- Development of robust forest monitoring and carbon accounting systems.
- Actual reductions in deforestation in the project area
- Measures to adequately address possible leakage and permanence concerns.

We propose using carbon finance to see if a new type sustainable development in Aceh can succeed. Carbon finance, for all of its potential downfalls, moves conservation out of the donor mode and into the cluttered traffic of everyday economics. This is not going to be easy or without risks. We accept these risks and feel they are justified by the new REDD opportunities.

Our Philosophy about Methodologies

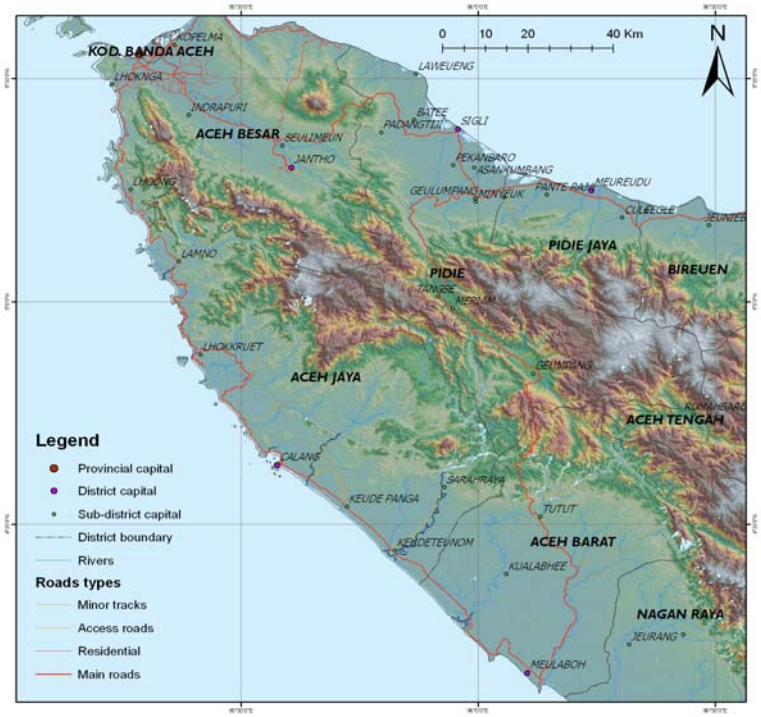
The methods and analysis of this project design note are based on a few premises. First, we have made every effort to provide readers with as much information as is possible about relevant issues. We acknowledge methodological uncertainties in general, as well as specific gaps in our data and understanding. We can not at present provide every final piece of information on carbon stocks, or reference emission scenarios, or leakage or any other desired or required data set. Still, we believe the world does not want to argue methodologies while the largest unprotected block of Sumatran rainforest disappears. Aceh - an area ravaged by conflict and natural disaster war - is at a crossroads. Like other parts of Sumatra, Aceh can deforest large areas as it develops. Alternatively, Aceh can embrace emerging carbon finance opportunities, even if the REDD policy environment is still unsettled.

We have tried to be conservative in estimating any proposed benefits realized from our proposed activities. We have tried also to be transparent, so readers can understand our reasoning and determine if in fact we have made conservative claims. And finally, we have tried to provide readers with our initial plans to improve our understanding of key issues as time and resources permit. We can't answer every question currently, but we do have a deliberate strategy for moving forward. It is our hope that while we advance our methodology, we can also begin work conserving forests, engaging communities and safeguarding the ecology of northern Sumatra.

1. Current Conditions & Background

Aceh Province has a population of just over four million people[3] and lies at the northern tip of the island of Sumatra. Aceh Province retains the largest contiguous area of forest left in Sumatra, stretching from near the northern city of Banda Aceh to the border with North Sumatra province. Much of these forests cover the Bukit Barisan Mountains, which runs down the spine of northern Sumatra (see Map 1). The mountains of the Bukit Barisan range are considered as giving rise to two distinct but connected ecosystems, the Ulu Masen ecosystem, which forms the northern-most forest and the Leuser ecosystem reaching from the southern part of Aceh into the province of North Sumatra. The Gunung Leuser National Park lies within Leuser ecosystem, a large landscape protected by presidential decree. While the National Park status provides a strong legal status for protection, the Leuser Ecosystem is a multi-functional landscape and provides limited legal protection due to conflicting laws that give authority to provincial and district government for land use planning.

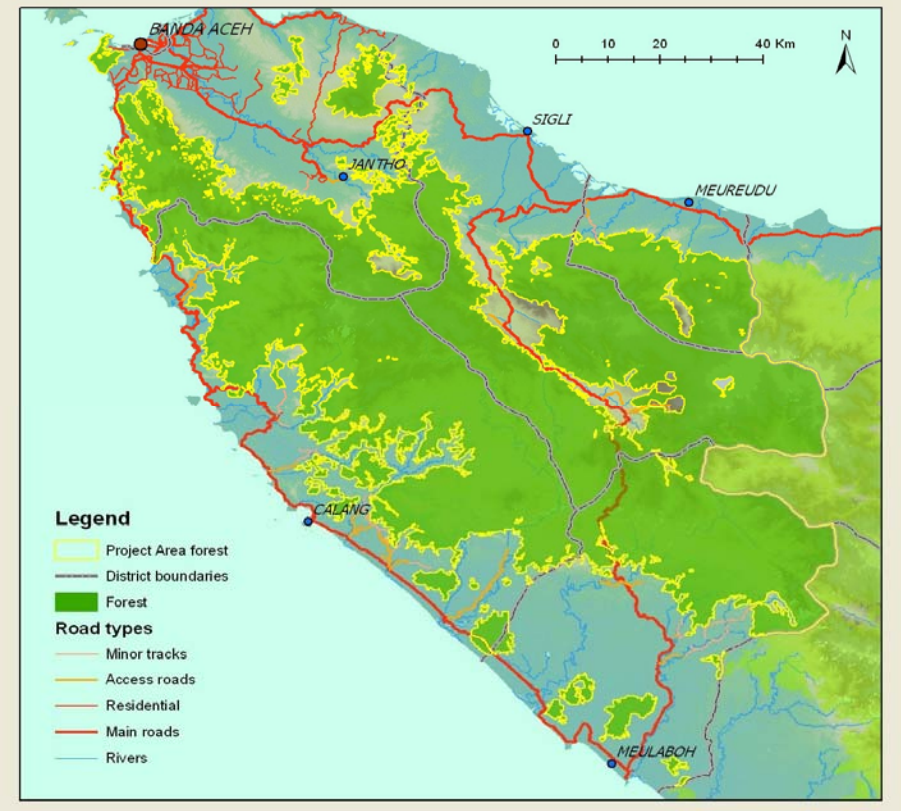
Map 1. Aceh, Indonesia



[3] *Aceh Population Census 2005. Badan Pusat Statistik – Central Statistic Agency*

This project will focus on 750,000 hectares of forest, comprised of a contiguous forest block known as the Ulu Masen ecosystem as well as the surrounding blocks of forest located in the five northernmost districts or *kabupaten* of Aceh Province, namely Aceh Besar, Aceh Jaya, Aceh Barat, Pidie, and Pidia Jaya[4]. Detailed maps of the four districts are contained in **Annex I** at the end of this report. The project area is situated between 4''20'3 N and 5''30'0 N between 95''20'0 E and 96''30'0 E. For simplicity sake, throughout this document the project area will be referred to as *Ulu Masen ecosystem,* which is hereby defined to include the adjacent forest blocks which are not necessarily contiguous but occur in the above districts and are delineated in Map 2.

Map 2. Ulu Masen Ecosystem - Project Area



It should be noted, that the light yellow line along the eastern edge (on the map, going from approximately Meureudu down toward Meulaboh) is both a district border and the eastern edge of the project area.

1.1 Physical Parameters (soil, geology, climate)

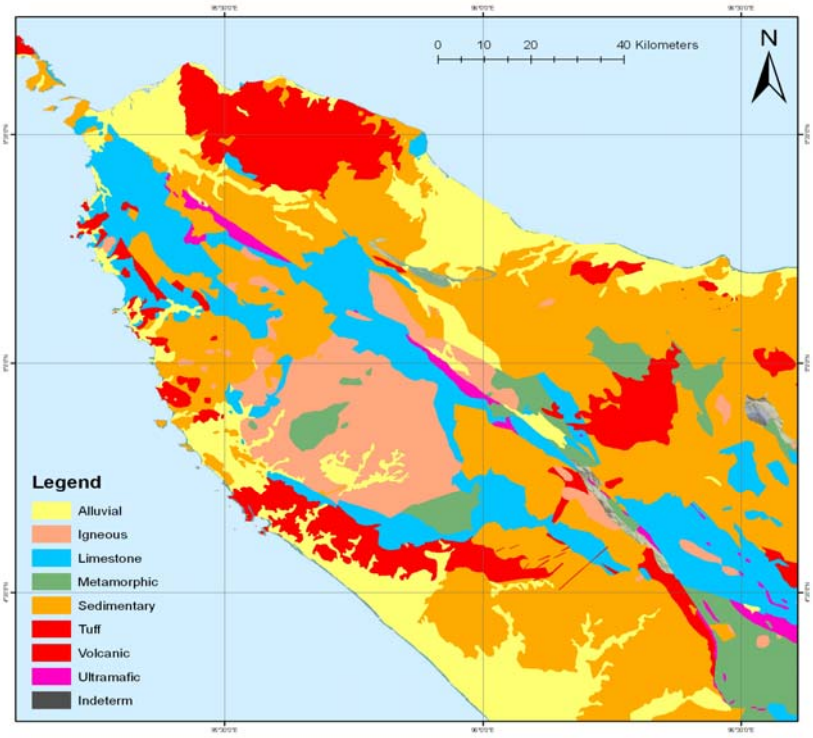
1.1.1 Geology

The Bukit Barisan Mountains comprise several different geological formations, the differing characteristics of each determining differences in the overlying soils, the hydrology, the vegetation cover and biological productivity. Extensive limestone areas, including karst formations, are typically porous, retaining little surface water and having relatively low

[4] *Pidie District was recently sub-divided into 2 districts, Pidie and Pidie Jaya. Given the recent change, these districts are sometimes referred to as one district in this document.*

productivity. Intrusions of igneous granodiorites, for example in the Krueng Sabe watershed of Aceh Jaya district, have low porosity, thin soils and also have relatively low productivity.

Map 3. Geology of Aceh



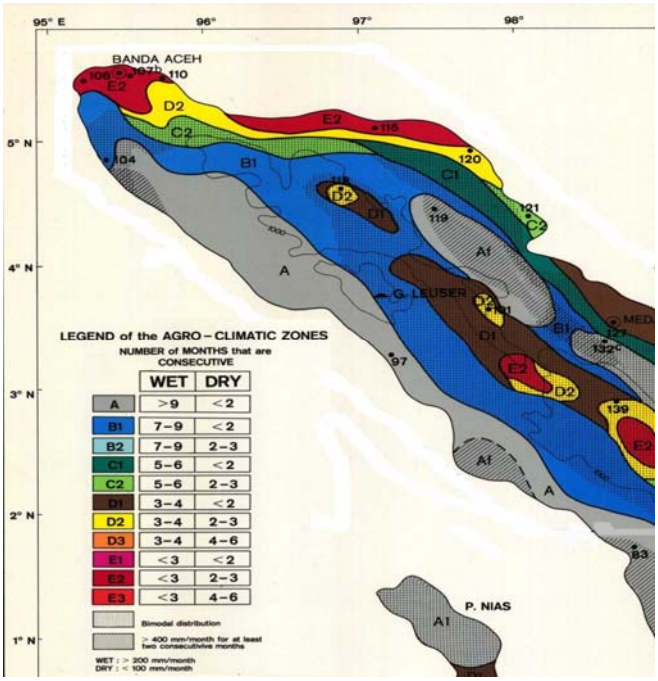
1.1.2 Climate

The climate of Aceh is described as tropical with high humidity (80-90%) and little variation in mean daily temperature (25-27 °C) throughout the seasons. Mean annual temperature varies with elevation, decreasing from about 26°C at sea level by approximately 0.52°C per 100m rise in elevation[5]. While the steamy hot lowlands have a mean annual soil temperature of above 22°C, the mountain tops have a mean between 0-8°C (3000m and above)[6]. Wind speeds are generally low ranging between 1.5- 2.5 m/sec, though higher wind speeds have been observed in coastal areas[7].

[5] *Binnie & Partners. 1986. Inventory of Water Resources Schemes – Volume 2 - Existing Situation. Aceh Design Unit – Provincial Water Resources Development Plan Binnie and Partners Ltd. With Hunting Technical Surveys Ltd. and Hunting Surveys Ltd. - Ministry of Public Works, General Directorate of Water Resources Development, Directorate of Planning and Programming Jakarta.*
[6] *van Beek, C. C. G. 1996. Geology, Geomorphology and Climate of Gunung Leuser National Park. Pages 33 - 48 in C. P. van Schaik and J. Supriatna, editors. Lueser - A Sumatran Sanctuary. Yayasan Bina Sains Hayati Indonesia, Jakarta, Indonesia.*
[7] *IWACO. 1993. Study of water sources for allocation of water supply for D. I. Aceh Province - Kabupaten Aceh Barat IWACO.*

The region can be classified into 11 rainfall types, based on the long term average number of wet and dry months[8]. The mapping of these zones for northern Sumatra and Aceh are shown in **Map 4**.

Map 4. Rainfall in Aceh



Mean annual rainfall in Aceh varies widely, caused partly by the complex inter-relationship between topography and precipitation. The region of highest rainfall is along the west coast and inland as far as the Barisan mountain range, with amounts between 3000 mm and 5000 mm per annum. In contrast, mean annual rainfall ranged from 1000 mm to 1500 mm in small areas along the north and east coast, with totals as low as 1500 mm in the inter-montane basin between Takengon and Owaq in Aceh Tengah. In this classification, the Aceh west coast and foothills and eastern Barisan Mountains are mapped as the very wettest *A* and *Af types* (> 9 wet and < 2 dry months). More elevated Barisan mountains are mapped as slightly less wet *B1 type* (7 – 9 wet and < 2 dry months). The north eastern and eastern foothills of Aceh are the next driest *types C1* and *C2* (5 – 6 wet and < 2- 3 dry months). The rain-shadow areas of the Semangka fault (at Takengon and eastwards) and northern eastern coastal plains below the foothills are a dry *type D1* and *D2* (3 – 4 wet and < 2 – 3 dry months). The lower Kreung Aceh valley, and north and north eastern coastlines of Aceh are mapped as the driest *type E2* (< 3 wet and 2 -3 dry months) climate.

1.1.3 Soil

Detailed soil maps are available for the project area, but due to their size and complexity, and in the interest of space, they are not included in this document[9].

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[8] *Oldeman, L. R., I. Las, and S. N. Darwis. 1979. An agroclimatic map of Sumatra. Contributions Central Research Institute for Agriculture, Bogor **52 (1979)**:35.*

[9] *RePPProt. 1988. Sumatra - Review of Phase I Results. Volume Two - Annexes 1-5, Regional Physical*
Planning Programme for Transmigration (RePPProt), Natural Resource Institute, ODNRI, ODA, London, England - Direktorat Bina Program, Direktorat Jenderal Penyiapan Pemukiman,

1.1.4 Vegetation Types and Conditions

The Ulu Masen mountains are known to support a diversity of forest types, due to their complex geology, climate types, range of soil types and altitudinal range. Forest type classifications carried out in the past recorded lowland broadleaf forest, pine forest, sub-montane broadleaf forest, montane broadleaf forest, and other forests.

Most of the rich lowland forests that covered the plains along the coast have been converted to agriculture and other uses. In most areas above 500 meters there are still substantial areas of high quality forest.

1.2 Carbon

Carbon stocks of tropical forest ecosystems are distributed in above ground and below ground biomass, litter and woody debris, and soil carbon. Biomass is the total dry mass of living matter in a tree and provides a means of estimating "forest carbon stocks". Forest carbon stocks include the total amount of carbon stored in living above ground (branches and trunk) and below ground (roots) biomass. In our calculations, as reported in most other methods and carbon assessments, we do not report the values for understory vegetation, coarse woody debris, herbaceous vegetation or litter since these values are typically substantially less than 10% of total carbon biomass (above- and below-ground). In our monitoring section (section 9.3) we discuss how this assumption will be verified and whether - as we progress through time and to higher levels of certainty and analysis - other carbon pools will be assessed. Depending on the assessments, project proponents will consider the amount of carbon, the variance, and the costs of measuring in determining the eventual carbon monitoring system. If any pool approaches 10% of total carbon, we will include it in our measuring and monitoring. By neglecting these classes at this stage, we are being conservative in estimating potential emission reductions.

1.2.1 IPCC Carbon Stock Values for Project Area

The most commonly accepted way to estimate forest carbon stocks over large areas is to apply carbon values to broad forest classes, the "biome-average approach". This is the approach required by Tier 1 of the IPCC's National Greenhouse Gas Inventories. Biome averages are freely available in the published literature and provide a source of globally-consistent information. Despite limitations, biome averages continue to be the most routinely used method for a first approximation of forest carbon stock and for estimating emissions from large-scale deforestation[10]. However, in reality, forest carbon stocks vary within biomes according to drainage, soil type, land-use history and other variables.

Departemen Transmigrasi (Ministry of Transmigration), Jakarta, Jakarta, Indonesia

[10] Ramankutty, N., H. K. Gibbs, F. Achard, R. DeFries, J. A. Foley, R. A. Houghton. 2007. Challenges to estimating carbon emissions from tropical deforestation. Global Change Biology 13(1):51-66.

Table 1. Relevant IPCC 2006 National Guidelines for Greenhouse Gas Inventories.

350	IPCC Default value for above ground **biomass** tropical moist forest, insular Asia, table 4.7
0.47	IPCC Default value for **carbon fraction of above ground biomass** (tropical and subtropical), table 4.3
164.5	Tons of above ground carbon per hectare
1.37	Tropical rainforest **conversion from above ground to total biomass** (table 4.4)
225.4	IPCC Estimate of Per Hectare Carbon in Insular Asia (appropriate for Ulu Masen)

The above values are what project proponents believe to be the most appropriate IPCC values for the project area. The Ulu Masen Ecosystem is located in the geographic area which prescribes all of northern Sumatra as "tropical rainforest" (labelled as *Tar* in Figure 4.1 of IPCC AFOLU Chapter 4). The value of 350 tons of above ground biomass for the project area is the value for insular Asia (Figure 4.7 of AFOLU Chapter 4). Use of IPCC default values is considered Tier 1 work (very low confidence), but these values have been adopted as the best practices for estimating forest carbon stocks given limited information. Use of IPCC Tier 1 default values is not without ambiguities. For instance, for areas above 1,000 meters, Table 4.7 lists insular Asia's aboveground forest biomass ranging from 50t/ha to 260t/ha, a variation of more than 5-fold. In our design document and calculations, we felt that such a wide range of default values without corroborating field measurements left too much room for subjective (and possibly biased) reporting. As is discussed next, we adopt a more conservative and nuanced method to estimate carbon stocks in the project area than the IPCC default values, that we feel is more constrained.

1.2.2 Project carbon stock estimates: more conservative, nuanced, transparent

In addition to the IPCC default table values, four other prominent biome-average models are available to estimate carbon stocks in forests throughout the world. These models include: Houghton, Olson, Achard, and Brown/Gibbs. The Olson model is based on a large compilation of literature studies and has three models for estimating carbon -high, medium and low carbon stocks per area. The Houghton model includes above ground, below ground, and ground cover carbon stocks. Values were obtained from summaries of global vegetation and from regional studies. The Achard model weighted the country biomass figures from Brown by the FAO 1990 forest area country figures. The Gibbs and Brown model estimated forest carbon stocks for Southeast Asia using a rule-base GIS analysis to spatially extrapolate forest inventory data archived by the FAO based on climate, soils, topographic, population, and land use information.

Project proponents commissioned research to estimate forest carbon in Ulu Masen using IPCC default values and these other four biome average models to see how they compared.

A recently published article provides more details on methods and global results[11]. The five models were all run using the widely-accepted 2000 Global Land Cover Map (GLC 2000). This work is the first example of a multi-model calculation of the prominent carbon biome-average models run on a standardized map to generate a range of forest carbon stock estimates at a scale of 1 km^2.

Like the IPCC values, non-IPCC models are based on a limited number of forest classes, though most models are marginally more detailed than IPCC Tier 1 default values. Thus, the aggregation of models can be thought of as a collection of "reasonably accurate" initial estimates. By averaging the four non-IPCC models and the IPCC model, project proponents estimated 188 tons of carbon on average per hectare in the Ulu Masen ecosystem, of which 20% is assumed to be below ground (150 tC above ground and 38 tC below ground). Project proponents felt that to be truly conservative, we should use the average of the five models calculated for Ulu Masen since this figure is lower (by 15%) than the carbon stock value generated using IPCC values. Of the five forest carbon models evaluated, the IPCC carbon stock values were the highest for Ulu Masen forests.

Overcoming Obvious Oversimplifications

The average carbon stock value estimated above, as an output of very broad biome-models, combines both intact and disturbed forests and does not discriminate for elevation. In fact, any casual observer to forests in Ulu Masen would clearly see that: **a**) degraded forests have less carbon than intact forests, and **b**) the biomass density of forests declines with increasing elevation. For the purposes of this report, we define an intact forest as one that has no or very limited human disturbance in terms of crown cover and biomass. Disturbed forests are ones that have witnessed some level of crown cover and biomass loss as a direct result of human activities (such as logging or harvesting). These two factors are so obvious and critical, that project proponents use the five-model average and then made three other key assumptions to improve the initial forest carbon estimates.

1st Assumption

We estimate that disturbed forests have 75% of the carbon stocks as intact forests. One remote-sending study found that logging in Indonesia resulted in a 25% reduction in carbon densities[12], although other reports suggested greater declines. Degradation in Ulu Masen tends not to be as destructive as other Indonesian forests. The evidence to support this was based on several factors. First, it was based on an expert meetings held in July, 2007 in Banda Aceh. The meetings entailed the director of AFEP (Graham Usher), Wibi Sono, John Niles, and other forestry staff. Meeting participants collectively estimated, based on their field-experience and training, that the average decline in forest carbon between intact and disturbed forests in Ulu Masen was 25%. In the absence of an IPCC value for degraded forests, project proponents felt that to be conservative in estimating potential emission reductions associated with project activities, disturbed forests should be adjusted for their lower carbon stock initial values. This approach is conservative since the difference between the baseline scenario and the project scenario using a lower carbon value for degraded forests generates fewer carbon credits than not adjusting for degradation.

2nd Assumption

We estimate 74% (558,382 ha) of the forests in Ulu Masen are intact and 26% are degraded (192,146 ha). To determine areas of intact versus degradation, FFI project staff Wibi Sono used 2006 SPOT imagery at 10 meter resolution for the entire project area. These images

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[11] *Gibbs, H., S. Brown, J. Niles and J Foley. 2007. Monitoring and Estimating Tropical Forest Carbon Stocks. Environmental Research Letters(2) 045023. Viewable at: http://www.iop.org/EJ/article/1748-9326/2/4/045023/erl7_4_045023.pdf?request-id=3MrKaL6m3BGLHs_k2wi7Kg*

[12] *Murdiyarso, D and U.R. Wasrin. 1995. Estimating land use change and carbon release from tropical forests conversion using a remote sensing technique. Journal of Biogeography (22)715-721.*

were evaluated with three techniques to assess areas of disturbance. First, the images were visually interpreted to identify areas where crown cover was diminished. Second, ground-truthing exercises were conducted that visited forest areas identified from SPOT image analysis as either intact or disturbed. Field conditions were visually observed to see if the area was either intact or degraded. This was an iterative process and though imperfect, gave project proponents a more robust understanding of where forests are intact and where they are degraded. Finally, several transects were conducted after the ground-truthing and image interpretation were complete. These transects confirmed that the classification system used was far more accurate at describing biomass with the two classes of forests compared to a carbon forest model that did not differentiate between intact and disturbed forests[13]. The output of this analysis is incorporated into project calculations.

Based on the above two assumptions, project proponents estimate values for intact and disturbed forests in Ulu Masen at 200 tC/ha and 150 tC/ha respectively. These numbers are "relatively round" only by coincidence. The estimates were derived by first using the average carbon value from the five global carbon models (one of which was the IPPC) and then dividing Ulu Masen forests into two classes (intact and degraded). Then, based on the assumed amount of carbon loss with degradation (75%) and the percent of degraded forests in the project area (74%), our average value for intact and degraded forests is estimated to be 200tC/ha and 150tC/ha respectively. The last part of carbon stock work entailed accounting for elevation.

3rd Assumption

To add a final level of detail that is both conservative and transparent, project proponents used a simple elevation approach to model variability of carbon with elevation. We assumed the 500-1000 meter altitudinal band would have the average carbon levels (200 tC/ha and 150 tC/ha for intact and disturbed forests). We then assumed that the 0-500 meter band would be 10tC/ha higher (a total of 210tC/ha and 160tC/ha) and that higher elevations would decline slightly (see **Table 2** and attached worksheet "Carbon Assumptions"). Using these two simple assumptions on top of five global carbon estimates, we populated a forest carbon model that produces unique carbon stocks estimates for forest classes based on elevation and disturbance.

Table 2. Elevation & Condition: Ulu Masen Carbon Stock Values (tC/ha)

Forest Condition	Intact	Disturbed	Area-Weighted Average
Elevation			
0-500	210	160	182
500-1000	200	150	194
1000-1500	190	140	189
>1500	180	130	180

Using these assumptions, project proponents estimate the original project area contains 140,771,670 tons of carbon in forest carbon (above-ground and below-ground) distributed in the following classes (see attached worksheet "Table 3):

[13] *FFI Ace staff have begun working and developing a cooperative agreement with the Provincial planning agency to cooperate on increasing the robustness and scientific underpinnings of forests classification and to share data. Working through the Provincial planning agency will ensure institutional capacity and longevity for understanding and mapping forest types and conditions.*

Table 3. Area and Carbon in Ulu Masen Forest Classes

Forest Type		Hectares	Total Carbon	Average tC/ha
Elevation (m)	Condition			
0-500	Intact	132,547	27,834,870	210
	Disturbed	162,759	26,041,440	160
500-1000	Intact	220,814	44,162,800	200
	Disturbed	28,078	4,211,700	150
1000-1500	Intact	143,732	27,309,080	190
	Disturbed	1,309	183,260	140
>1500	Intact	61,289	11,028,520	180
	Disturbed	0	0	n/a
TOTAL		750,528	140,771,670	188

These estimates for forest carbon stocks in the Ulu Masen ecosystem are likely to be conservative. They are lower than the IPCC's Tier 1 estimate by an average factor of 15% (188 tons of C per hectare compared with 225 tC/ha). Other published numbers for Sumatra range from 254 to 390 tons of carbon per hectare in above ground forest carbon alone[14,15]. Contingent on planned carbon research and given the current use of highly-conservative carbon stock estimates, avoided emissions are likely to be substantially higher than those outlined in this document. These figures, therefore, provide a conservative and transparent starting point for estimating forest carbon stocks and projecting business-as-usual emissions and project interventions.

1.3 Communities

Aceh today remains one of Indonesia's poorest provinces. Almost 50 percent of the population lives below the poverty line[16], compared with about 10 percent in 1996 and 20 percent in 1999. In 2002, 48 percent of the population had no access to clean water, 36 percent of children under the age of five were undernourished, and 38 percent of the Acehnese had no access to health facilities[17]. Aceh Province is typical of many resource-rich regions, in that wealth from exploitation of resources has not greatly improved the welfare of the majority of the population. Rural communities in particular have been alienated from resources to which they can claim traditional rights. Much of this failure to convert resource wealth into community development results from policies that override customary tenure often facilitated by corruption.

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[14] *Lasco, R. 2002. Forest carbon budgets in Southeast Asia following harvesting and land cover change. Science in China (Series C) V45. See Table 1.*

[15] *Also, since these calculations were performed, an error was discovered in the model that generated the lowest forest carbon stock values in the project area. This results in an increase in the five-model run (though only slightly); project proponents have not yet had time to update their calculations.*

[16] *Indikator untuk distribusi dana Bantuan Langsung Tunai (BLT) program kompensasi BBM, Badan Perencanaan Pembangunan Daerah (Bappeda) Provinsi NAD, 2006*

[17] *Aceh: Peacemaking after the Tsunami, WorldWatch Institute 2006*

The 2004 tsunami caused incomprehensible damage and loss of life to the province, with over 150,000 dead or missing, 127,000 houses destroyed and a similar number damaged, over 500,000 homeless, 230 km of roads destroyed[18], and damage to over 37,500 hectares of land[19] and 90% of surface corals and vast areas of mangroves. Aceh Jaya lost almost 30% of its population during the Tsunami[20].

Aceh Province was in difficulty even before the tsunami. For years the people and economy had suffered under civil conflict between *Gerakan Aceh Merdeka* (GAM, or Free Aceh Movement) and the Government of Indonesia (GOI), particularly during the ten year period when Aceh was declared a Military Operational Area (*Daerah Operasi Militer*, or DOM) and the Martial law (*Darurat Militer*) status which came into effect in 2003.

The province is divided into 21 districts, 5 of which (Aceh Besar, Aceh Jaya, Aceh Barat, Pidie and Pidie Jaya) encompass the Project Area (see **Table 4**). Approximately 130,000 people live in communities adjacent to forest areas of the Ulu Masen ecosystem[21].

Table 4: Population statistics of districts that form project area as of 2005.

District	Population	% Of Total Aceh Population
Aceh Besar	296,541	7.4
Aceh Jaya	60,660	1.5
Aceh Barat	150,450	3.7
Pidie	474,359	11.8

Source: Aceh Population Census 2005. Central Statistics Agency

61 Mukims surround the Ulu Masen ecosystem, as shown in **Table 5**. Within these communities there are an estimated 2,000 to 3,000 villagers participating in illegal logging[22], although there is a high level of uncertainty about this estimate.

Table 5: Mukims surrounding Ulu Masen ecosystem

District	No of Mukims	Mukim
Aceh Besar	12	Reukih, Jruek, Lamteuba, Gunung Biram, Jantho, Glee Yeung, Leupueng, Cot Jumpa, Lhoong, Glee Bruek, Lam Lhom, Lam Lheu
Aceh Jaya	15	Paya Baro, Sarah Raya, Keude Teunom, Panga Pucok, Panga Pasie, Krueng Sabee, Rigah, Lageun, Lam Teungoh, Pante Purba, Kulam Mutiara, Keude Unga, Pante Cermin, Lamno, Kaluang
Aceh Barat	11	Manjeng, Lango, Menuang Kinco, Gunong Meuh, Mugo, Meuko, Tanjung Meulaboh, Babah Krueng Manggi, Tungkop, Darul Ihsan, Woyla Tunong
Pidie	14	Geumpang, Mane, Pulo Mesjid, Layan, Tanjong Bungong, Beungga, Rubee, Blang Keudah, Metareum, Andeue Lala, Ujong Rimba, Keumala Dalam, Keumala Raya, Kunyet

[18] *Rebuilding a Better Aceh and Nias, World Bank Report June 2005*
[19] *Special Report – FAO/WFP Mission to Banda Aceh (Indonesia) December 2005*
[20] *Economic Impacts post-tsunami in Aceh, World Bank Report, 2006.*
[21] *We define people living in or adjacent to the project area as members of communities that border significant areas of forest (at least 5000ha) and/or regular use nearby forest resources.*
[22] *AFEP Annual Report for 2006*

Pidie Jaya	9	Peulandok, Peuduek Tunong, Paya Seutui, Blang Rheue, Cubo, Jalan Rata, Manyang, Beuriweueh, Ulee Gle Tunong

The vast majority of the project site is designated as national forest land (*Hutan Negara*) but as is common elsewhere in Indonesia, there is potential for conflict over land status where local communities regard adjacent forest lands as traditional / customary lands. For example when *Mukim* leaders are asked about the extent of the area under their management, they routinely claim that the adjacent forests are managed by the *Mukim*. The new autonomy roles have strengthened the role of mukims and within the structure of these customary 'adat' institutions, people are assigned to oversee agriculture, forestry and fisheries. *Mukims* are democratically elected and approved by government in their position as traditional leaders.

Typical boom-bust agricultural trends occurred in many areas at various times driven by market trends, such as the rush to produce patchouli (*nilam*) in the 1990's.
Wildlife trade has been used as an income supplement in several locations (for example several bird collectors in Geumpang capture song birds in surrounding forests when they need cash). Illegal logging has been prevalent in various locations in the project area for at least several decades. This has traditionally been highly selective, targeting locally preferred hardwood species and small scale, with no mechanization other than the use of chainsaws. Rough lumber is often extracted from the forest manually or using water buffalo. Thus, although degradation of accessible forests has occurred around Jantho, Leupung and Lhoong in Aceh Besar, Geumpang, Tangse and Jimzim in Pidie, and Pante Cermin, Meudang Ghon, Krueng Sabe, Panga and Teunom in Aceh Jaya, there has been little conversion of forests to other land uses. There are no historical data on volumes of timber extracted illegally.

The primary non-timber forest products extracted from forests prior to the peak conflict period included rattan, *jerenang* (a rattan fruit used for production of a traditional dye), honey, bird nests and a variety of bush meat. These may represent important incomes sources for individuals of different communities, and are often seasonal and market-dependent. In the past there was poaching of rhinoceros horn by specialist local hunters, but the decimation of the accessible populations means that there is probably no active rhino poaching at present. The conflict situation has also effectively prevented specialist tiger and elephant ivory hunters from other parts of Sumatra operating in northern Aceh.

In the post-tsunami and post-conflict environment, there has been a strong desire from many communities that previously lived from agro-forestry systems along the forest edge to return to their pre-conflict village areas, and revive their gardens. However, reestablishing the productivity of these systems will require investments of time and capital (e.g. for fencing to exclude goats until tree crops mature), that most of these semi-subsistence communities cannot afford. In tsunami affected areas this has been exacerbated by the influx of large amounts of donor money and the establishment of cash-for-work systems that have provided previously-unknown daily salaries and a dependency on the cash economy. Even recovering wet rice fields affected by the tsunami has been beyond the capabilities of many, especially where rice fields were covered by large volumes of sand and other debris that can not be cleared by hand. As a result, and as funding from donor agencies for post-tsunami reconstruction begins to phase out, some individuals acclimatized to the cash economy may turn to illegal logging as a substitute way to provide daily cash.

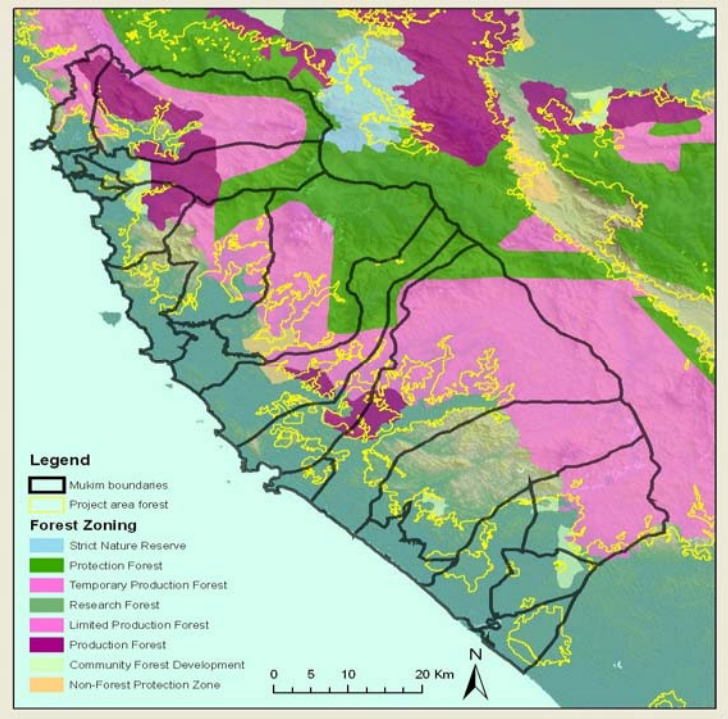
While there is potential for conflicts of forest resources within the project area, these can be avoided by involving communities and *Mukim* leaders in participatory land use planning processes, establishing jointly agreed boundaries and land use patterns, and developing a multi-stakeholder management structure. This process has already been initiated by FFI. As an example the participatory land use planning process has been completed in the district of

Aceh Jaya and the resulting spatial is in the final public consultation process before being approved by district parliament.

1.3.1 Case Study: Aceh Jaya District

Land use and governance varies throughout the districts in the project area. The Law on the Governance of Aceh (UUPA 11/2006) provides special autonomy over the use and allocation of benefits from natural resource management and formally recognizes the position of the *Mukim* in local governance. The new provincial Government has moved strongly towards the recognition of customary forest resource rights and lands and has formalized the traditional Mukim authority structure which provides a political and legal basis for equitable benefit sharing. This process has begun predominantly in Aceh Jaya District, where FFI has an agreement[23] with the *Badan Rekonstruksi dan Rehabilitasi Aceh dan Nias* (BRR) to assist in developing spatial plans. Descriptions of land use for Aceh Jaya district (current as of 2006) can be found in the **Map 4** and in **Annex 1**.

Map 4. Land Use and Classification in Aceh Jaya District as of 2006



Dominant agricultural land uses in the lowlands include coconut groves along the coast followed inland by rice paddies, rubber gardens, small holder coffee and cacao garden, complex agroforests with fruit trees and nutmeg trees, and to a lesser extend upland fields with annual crops.

In northern Aceh Jaya almost all communities have been historically based in areas with alluvial soils, conducive to wet rice production that provides the staple carbohydrate diet. This is true also for the upland communities in the Tangse-Manee-Geumpang area of Pidie where the population is concentrated around the alluvial soils of the upper Teunom watershed. Where suitable, communities have developed a variety of agroforestry systems in adjacent forests depending on local soils, slopes and rainfall. Protein needs have been met by

[23] *Document # 2233-BRR.1/VI/2006 "Brr to Fauna and Flora Intenational. 5th June 2006.*

fisheries in local rivers (e.g. in the Teunom and the many other rivers draining towards the west coast), livestock (primarily goats and water buffalo), and bushmeat (in particular Sambar deer in Jantho, barking and mouse deer and serow).

In the 1980's and 1990's, 3 logging concessions in parts of Aceh Jaya (and to a lesser extent north Pidie) operated, in some areas causing serious disruption of local river systems, for example the Krueng Sabe, Masen, Ligan and Rigah rivers, increasing sedimentation, and maximum and minimum waterflows, and also disrupting fish spawning cycles[24].

Anecdotal information from many local communities indicates that many of the forest edge communities prior to the escalation of the conflict in pre-tsunami times had relatively prosperous livelihoods based on a variety of agro-forestry and agricultural crops. For example the Pante Cermin mukim in Aceh Jaya produced a large annual crop of robusta coffee (est. at nearly 2000 tons/yr) that was used for making the locally famous Uleekareng coffee. The current annual coffee production from the area is estimated at less than 100 tons/yr [25]. From 2003 to 2006, the total population of the villages in this mukim also dropped from 1,629 to 1,476 persons, primarily due to out-migration. In the Pathek area of Sampoinet, local communities had extensive gardens of citrus and other fruits. Other areas of Aceh Jaya were dominated by small-holder rubber while Panga, Krueng Sabe and Lamno in Jaya sub-districts are well-known for durian production. Small scale oilpalm plantations have been established in Setia Bakti, Teunom, Sampoinent and Panga sub-Districts. Incidence of human wildlife conflict (primarily with tigers and elephants, but also locally with various primates, pigs and bears), was regular but relatively stable.

A conservative estimate of land availability suggests that at least 140,000 ha of agricultural and agro-forestry lands were previously cultivated in the district of Aceh Jaya. The latest demographic data estimates there are 14,602 households[26] whose major livelihood comes from farming (79% of total no of households). Based on the latest population figures this gives an average of at least 9 ha per farming household, which is more than the average household can actively manage using the non-mechanized farming and agroforestry systems currently used. This would suggest that current pressures on forests are not being driven by the need for opening of agricultural land but rather by a lack of capital (both time and financial) to reinvigorate these previously farmed lands. Similar situations are believed to exist in the other districts of the project area, albeit with less evidence and different causal factors[27].

If no action is taken, and the baseline scenario occurs, the chance of reinvigorating these lands will be loss. This is in part since the ecosystem service (hydrological normality, soil retention, pollinators, river fisheries) will all be lost. Although communities can continue to survive on a short-term cash economy timber production, it is likely that would lose productivity of soils and the opportunity to return to a more "traditional" way of life.

1.3.2 Forest-based incomes and livelihoods

Estimates of people whose livelihoods depend directly on logging and timber operations are preliminary. Some information from some districts (notably Aceh Besar and Banda Aceh) has been collected, although all of the material presented in this section has not been fact-checked or published, but was made available to the project by the Aceh Forestry staff as

[24] *Anwar, personal communication*
[25] *Oom Din, Mukim Pante Cermin, pers. Comm.*
[26] *Population and livelihood data from the Mapframe3 socio-economic database for Aceh produced by BBR, ADB, BPS and HIS, Landuse data taken from the Draft Spatial Plan for Aceh Jaya.*
[27] *Graham Usher, personal communication. 2007*

preliminary findings[28]. As such, these estimates are subject to change, as project proponents commission additional "original conditions" research and synthesis, as described in section 9.

Based on the forthcoming study, project proponents estimate that around 4,400 people are employed in the logging industry in the five project area districts. This includes a range of occupations from timber cruisers, chainsaw operators, road builders and transporters.

No	Nama Kabupaten	People employed in logging	Total
1	Aceh Besar	1430	1430
2	A. Pidie	848	848
3	Pidie Jaya	515	515
4	A. Jaya	864	864
5	A. Barat	755	755
			4,412

The income generated from forest-livelihoods is difficult to estimate with any high degree of confidence. Many people employed in the timber industry are reluctant to provide researchers with socio-economic information. Project proponents were, however, able to gather some information on incomes for chainsaw operators[29]. A chainsaw operator is probably in the upper middle range of income generation for most logging employment opportunities. A chainsaw operator is likely to receive a wage above that of an average unskilled worked but less than a machine operator, mechanic, engineer, or other skilled labourer.

Evidence collected (see project worksheet "*logger income*") from interviews suggests a chainsaw operator can process 0.5 m^3 of wood per day and are paid 450,000 rupiah per m^3 for an average daily gross income of 225,000 rupiah per day. After accounting for daily expenses of 83,000 rupiah (10 litres of fuel, oil and meals), the average net income for a chainsaw operator is 142,000 rupiah. This works out, based on a 20-day work month and other contingencies, to 2,500,000 rupiah per month in net income, or around $272 dollars per month ($3,261 per year) given an exchange rate of 9,200 rupiah per US dollar. Some of the other preliminary statistics show that other estimated annual net incomes from logging operations are: chainsaw assistant ($391/year), log transporters using buffalo ($522/year) and buffalo owner ($620/year).

In addition to those employed directly by timber extraction and transport, several thousand people are employed in wood processing facilities and companies. In Aceh Basar and Banda Aceh there are over 340 small-scale industries that use timber. In the total project area, it is likely that this number would be around 10-20% higher if all the project area districts were considered, since most timber processing jobs are in Aceh Besar and Banda Aceh[30]. Some of the key findings from this report are that total employment from these industries in the two most important districts for logging is in the range of 1,600-2,000. Of the 340 industries, only 2% had their appropriate legal permits.

[28] Summary of An inventory of Timer Processing Industries in Banda Aceh and Aceh Besar, FFI Unpublished Report (preliminary and unchecked findings).

[29] *Based on confidential, unpublished interviews with loggers in Geumpang. Wibisono personal communication.*

[30] *Wibisono, personal communication.*

Aceh Besar

No	Type of processing	Average number of workers	Numbers of company	Total employment
1	Saw Mill	12	7	84
2	Panglong	4	72	288
3	Perabot	6	144	864
4	Pl/Pr Mesin Belah	6	14	84
Total				1,320

Banda Aceh

No	Type of processing	Average number of workers	Numbers of company	Total employment
1	Saw Mill	0	0	0
2	Panglong	4	41	164
3	Perabot	6	63	378
4	Pl/Pr Mesin Belah	0	0	0
Total				542

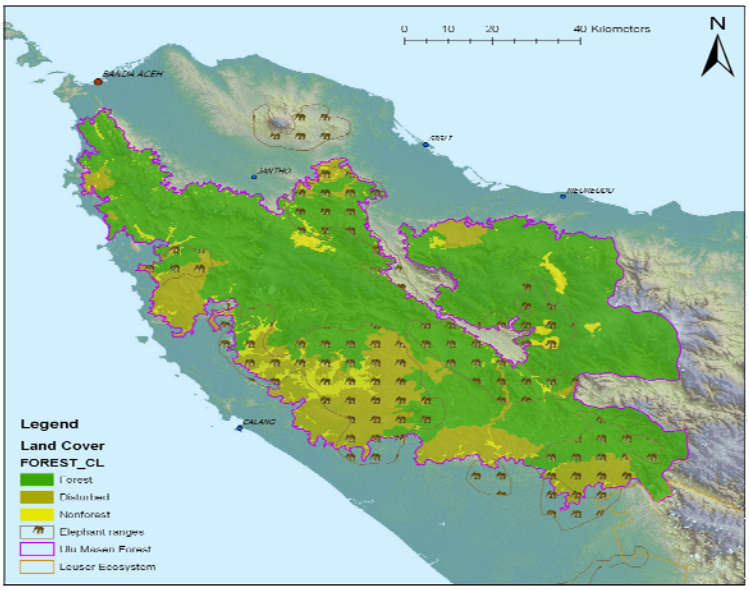
Of great importance is that the volume of timber being processed in these facilities was relatively minor (around 9,000 cubic meters per year), compared to the work and employment generated. The preliminary report shows there is significant amount of processing and added value from activities such as furniture making. This suggests that impacts from project activities' to curtail illegal logging and large concessions could be minimized, if a modest amount of timber can be sustainably sourced from the project area (as the project anticipates doing).

1.4 Biodiversity

The mountain, hill and lowland ecosystems of Aceh support high levels of plant and animal biodiversity including charismatic and endangered mega-fauna including the Sumatran rhinoceros, tiger, orang-utan and elephant.

FFI Aceh began initial elephant surveys in 1998 however in 2003 field surveys became impossible due to the heightened conflict situation. With the signing of the peace agreement between GOI and GAM in August 2005 and GAM disarmament in the months to follow, FFI Aceh began biodiversity surveys in late 2006 focused on primates, in particular the endemic Sumatran orang-utan (*Pongo abelli*, an endangered great ape which only occurs in the northern part of Sumatra), birds (over 300 species identified to date), reptiles and amphibians (87 species identified to date). A comprehensive survey programme has also begun to determine the range and abundance of the endangered Sumatran elephant (*Elephas maximus*). See **Map 5**.

Map 5 Elephant Range in Project Area



In the near future a comprehensive occupancy survey of the resident population of Sumatran tiger (*Panthera tigris sumatrae*), also highly endangered, will be conducted. Results of surveys to date, plus reports from local informants indicate that the populations of both tigers and elephants could be among the most important populations in Sumatra. In conjunction with the Leuser ecosystem (contiguous with Ulu Masen along the border of Aceh Barat and Nagan Raya districts), these populations represent the main hope for the survival of these species in the wild. It is also believed that a population of the critically endangered Sumatran rhinoceros (*Dicerorhinus sumatrensis*) live in the project area, but this is unconfirmed. Endangered and protected mammals that are confirmed or believed to occur in the project area include (this list does not include bats, mustellids, or rodents):

Taxa	English name	Confirmed (C)/ Unconfirmed (U)	Endemic
Arctonyx collaris	Hog badger	U	
Arctictis binturong	Binturong	C	
Catopuma badia	Bay cat	U	
Catopuma temminckii	Golden cat	C	
Capricornis sumatrensis	Serow	C	
Cervus	Sambar deer	C	
Cuon alpinus	Ajag	U	
Cynocephalus variegates	Colugo	C	
Dicerorhinus sumatrensis	Sumatran Rhinoceros	U	
Elephas maximus	Sumatran elephant	C	
Helarctos malayanus	Malayan Sunbear	C	
Hylobates syndactylus	Siamang	C	
Hylobates lar	White handed Gibbon	C	
Hystrix brachyuran	Common porcupine	C	
Manis javanica	Pangolin	C	
Muntiacus muntjak	Barking deer	C	
Neofelis nebulusa	Clouded Leopard	C	
Nycticebus coucang	Slow Loris	C	
Panthera tigris sumatrae	Sumatran Tiger	C	E

Pardofelis marmorata	Marbled Cat	U	
Pongo abelii	Sumatran Orangutan	C	E
Prionailurus bengalensis	Leopard cat	C	
Presbytis thomasi	Thomas's Langur	C	E
Prionailurus planiceps	Flat-headed cat	U	
Prionailurus viverrinus	Fishing cat	U	
Prionodon linsang	Banded Linsang	U	
Ratufa bicolour	Giant tree squirrel	C	
Tragulus napu	Greater mouse deer	C	
Tragulus javanicus	Lesser mouse deer	C	
Trachpithecus cristata	Silvered Langur	C	

The actual number of species for Ulu Masen is probably comparable with the Leuser ecosystem, where over 700 species of vertebrates have been recorded, including 320 birds, 176 mammals and 194 reptiles and amphibians. As in Ulu Masen, primates include the endemic orang-utan and Thomas's langur (*Presbytis thomasi*) as well as at least six other primates (2 macaque species, white-handed gibbon, siamang, silvered langur and slow loris). It is home to some 4 percent of all known bird species worldwide and threatened bird species recorded including the Argus Pheasant (*Argusianus argus*) and the Rhinoceros Hornbill (*Buceros rhinoceros*). A complete inventory of biodiversity in the project area is scheduled to occur over the next several years (see section 9.5 on biodiversity monitoring).

To date floral surveys within Ulu Masen have been limited to identification of key food species for elephants and orang-utan. Initial surveys indicate there is a high diversity of forest sub-types and subsequent floral diversity. This diversity is caused by the complex geology of the region, the variety of climate regimes, and elevation gradients. Surveys carried out in the adjoining Leuser Ecosystem have recorded 8,500 different species of plants, including Casuarina trees (*Casuarina sp*.), Wild Nutmeg (*Myristica spp*.), Camphor (*Drybalancops aromatica*), Rotan (*Calamus sp*.), and Pandan (*Pandanus sp*.), while *Pometia pinnata* grow along the many rivers. Numerous species of moss and wild flowers also grow including gentians, primula and wild strawberries, and a great diversity of wild orchids. *Rafflesia arnoldi*, the largest flower in the world and *Amorphophallus titanum*, the world's tallest flower, also occur.

Threats

Forests of Aceh are rich in tropical hardwood trees like semaram, merbau, kruing, and meranti, which fetch a high price on international markets and make logging a lucrative business. This and conversion of forested areas for new development projects such as roads and other infrastructure, and plantation crops are the major factors driving deforestation and fragmentation. Official government estimates suggest forests of Aceh continue to disappear at a rate of approximately 21,000ha per year[31]. Deforestation rates and analyses are discussed more in the next section. However, it is clear that habitat loss and fragmentation are the major threats to the biodiversity described above, particularly the mega-fauna that require large areas of contiguous suitable habitat. Poaching, which is projected to accelerate following the improved security situation in the province, also represents a serious threat for target species.

[31] *Data dan Informasi Kehutanan Provinsi NAD, Pusat Inventaris dan Statistik Kehutanan Badan Planologi Kehutanan, Departemen Kehutanan Republik Indonesia 2004*

2. Baseline Projections

2.1 Baseline Land Use Changes

Estimating the "most likely" land use scenario for Ulu Masen is complicated by several factors.

- The Province retains a forest estate of outstanding value that until recently has been "off limits" due to civil conflict between GAM and Government of Indonesia (GOI).
- These forests now face significant threats from resurgent illegal logging, renewed potential for unsustainable industrial logging practices, and conversion to plantations and farm land following the ending of the civil conflict and the post-tsunami reconstruction process.
- Large-scale deforestation in other parts of Sumatra and Indonesia has created industries that, having deforested "easier" spots, now seek new resources to exploit.

2.1.1 Indonesia

The remaining forests of Indonesia are threatened with the highest deforestation rates in the world today. According to data presented by FAO, Indonesia's annual deforestation rate has reached 1.87 million hectares[32]. This figure is lower than the official rate announced by the Ministry of Forestry, i.e. 2.8 million hectares every year[33]. Overall, Indonesia has already lost more than 72% of its intact forests and 40% of its forests completely[34]. Large scale industrial logging and illegal logging operations are mainly to blame for Indonesia's escalating deforestation problems.

2.1.2 Sumatra

Sumatra lost at least 6.6 million hectares of forest between 1985 and 1997, for an average annual deforestation rate of 2.4%[35]. Conservation International has conducted wall-to-wall estimates of deforestation in Sumatra and estimates an average annual deforestation rate for the island between 1990 and 2000 as 2.54%[36]. With many of the prime forests in southern Sumatra already logged, the Ulu Masen-Leuser forest block faces increasing pressure.

2.1.3 Aceh

In the year prior to the tsunami, 47 companies in Aceh were granted logging licenses. This was a rise of more than 150% over previous years. Since the tsunami and the end of conflict, there has been a dramatic increase in illegal and unsustainable logging, land clearance and applications for land for clearance. This has been recorded for the Ulu Masen forests as well as elsewhere in the province (FFI Aceh unpublished, 2007.). On October 13th, 2005, Department of Forestry and Plantation applied a policy on maximum annual allowable cut (RKT = rencana kerja tahunan) for concessions (HPHs) in Aceh up to 500,000 m^3 for year 2006 while it was only 47,000 m^3 in year 2005. Clearly, threats to forests in Aceh are growing and there is already a high rate of loss.The demands placed on the government to respond to the needs of the 150,000 families that lost their homes during the 2004 tsunami

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[32] *FAO 2005 'Global Forest Resources Assessment'.*
[33] *The Jakarta Post '10 regents in Kalimantan prosecuted for illegal logging' 5th December 2005.*
[34] *FAO 2005 'Global Forest Resources Assessment'.*
[35] *Forest Watch Indonesia/Global Forest Watch. 2002. The State of the Forest: Indonesia. Bogor, Indonesia and Washington DC..*
[36] *Personal communication Daniel Juhn, CABS, Conservation International*

are enormous. One estimate[37] places the requirement for reconstruction timber at 861,000 m^3. Although support from the Multi Donor Fund for Aceh and Nias helped provide some timber from sustainable sources outside of Aceh, the post tsunami period has nonetheless seen an increase in illegal logging.

New threats are also emerging with the ending of the state of emergency and the opening of the economy for much needed investment. Rapidly developing new markets for palm oil for use as bio-fuel is fuelling a surge in demand for land to establish oil palm plantations. Indonesia is planning to develop 20 million hectares of new oil palm plantations and Aceh will be a natural target for allocation of land for this purpose. In addition, various estate crop companies are actively seeking new land clearing permits to plant fibre-board trees and rubber trees in Ulu Masen.

In Aceh Province, 638,000 ha of forests are classified for tree plantations and logging concessions (Kawasan Hutan Produksi, Production forests)[38] as shown in **Table 6.**

Table 6: Classification of forested areas in Aceh, 2004

Legal Classification	Area (ha)	Percentage (%)
Conservation forests	1,066,733	30.05
Protected forests	1,844,500	51.96
Production forests	638,580	17.99
Total Forest Estate	**3,549,813**	**100**

Source: Data dan Informasi Kehutanan Provinsi NAD, Pusat Inventaris dan Statistik Kehutanan, Badan Planolgi Kehutanan, Department Kehutanan Republik Indonesia 2004.

One study estimated an annual rate of deforestation between 1985 and 1997 for Aceh as 20,796 ha/year[39]. This study, like most remote sensing outputs for the period, was unable to classify large areas of forests due to cloud cover and other factors[40]. Further, this work dates back more than 20 years, and says nothing of the past 10 years. The research was done by the Ministry of Transmigration and it was never designed as a historical analysis of land use or forest loss. Further, despite its national scope, the methods were highly variable (including everything from remote sensing data to hand-drawn maps) and the actual years analysed were variable for different areas. More recent work by Conservation International, although unpublished, estimates that between 1990 and 2000, Aceh lost on average 30,952 hectares of forest, for a province wide deforestation rate of approximately 0.86%[41]. This same report (mentioned above in section 2.1.2) found the average annual Sumatran

[37] *UNDP 2006 Timber Analysis report.*
[38] *Data dan Informasi Kehutanan Provinsi NAD, Pusat Inventaris dan Statistik Kehutanan Badan Planologi Kehutanan, Departemen Kehutanan Republik Indonesia 2004*
[39] *Department of Forestry and Plantation, based on a comparison of RePProT map in 1985 and satellite map in 1998, as cited in WWF Press Release, October 17, 2006. Viewable at: http://www.wwf.or.id/index.php?fuseaction=press.detail&language=e&id=PRS1161242880*
[40] *See Table 2.3 and explanatory notes in Annex 3 in FWI/GFW. 2002. The State of Forests: Indonesia. Bogor Indonesia (Forest Watch Indonesia) and Washington DC (Global Forest Watch).*
[41] *Personal communication Daniel Juhn, CABS, Conservation International*

deforestation rate was 2.54%. Again, since this work is unpublished, a critical analysis of its findings is impossible. Despite this drawback, the Conservation International study generates the lowest deforestation estimate of all the known published and unpublished material that project proponents identified, for any geographic scale or location around the proposed project area for any of the past ten years. For this reason, this provincial rate of 0.86% (applied to the project area) is used to generate the "low deforestation scenario" below in section 2.1.5.1.

2.1.4 Project Area

There are currently 6 logging licenses in the project area, comprising 404,704 hectares (see **Table 7**) These licenses, though currently inactive due to the conflict and Tsunami, could be reactivated by the Ministry of Forestry with support from local governments.

Table 7. Logging Concessions in the project area:

No.	Concession Name	Permit ref. / Date of Issue	Area (ha)	End of Logging Permit	Location of Operation
1	PT. Alasaceh Perkasa Timber	68/Kpts-II/1991 1 Pebruari 1991	56,500	1 February 2011	Kab. Aceh Jaya
2	PT. Aceh Intl Timber	859/Kpts-VI/1 999 12 Oktober 1999	80,804	7 July 2049	Kab. Aceh Jaya
5	PT. Lamuri Timber	863/Kpts-VI/I 999 12 Oktobec 1999	44,400	Unclear	Kab. Aceh Jaya
9	PT. Trijasamas Karya Inti	29/Kpts-II/1991 22Januari 1991	41,000	22 January 2011	Kab. Pidie
10	PT. Raja Garuda Mas Unit II[42]	799/Kpts-VI/1 998 30 Desember 1998	72,000	6 June 2014	Kab. Aceh Barat
14	PT. Acehnusa Indrapuri[43]	95/Kpts-V/1997 17 Pebruari 1997	110,000	5 August 2035 (38 Thn)	Kab. Aceh Besar, Pidie
	TOTAL		404,704		

In addition to the concessions already granted, almost 60% of the total forest area can be legally logged, whether or not they have been assigned a logging concession. A report by WWF Indonesia[44] noted some of the high threats for conversion in the Aceh are the districts of Aceh Jaya, Aceh Besar, and Aceh Barat, provinces that comprise the majority of the Ulu Masen forests.

[42] *Only the area of the concession within Aceh Barat district is given*

[43] *This concession is for Industial Tree Plantations (HTI), which will involve the clearance of natural forest and replacement with plantation trees (usually Acacia sp.)*

[44] *http://www.wwf.or.id/index.php?fuseaction=press.detail&language=e&id=PRS1161242880 see notes at end*

Map 6. Legal classification and disturbance in project area

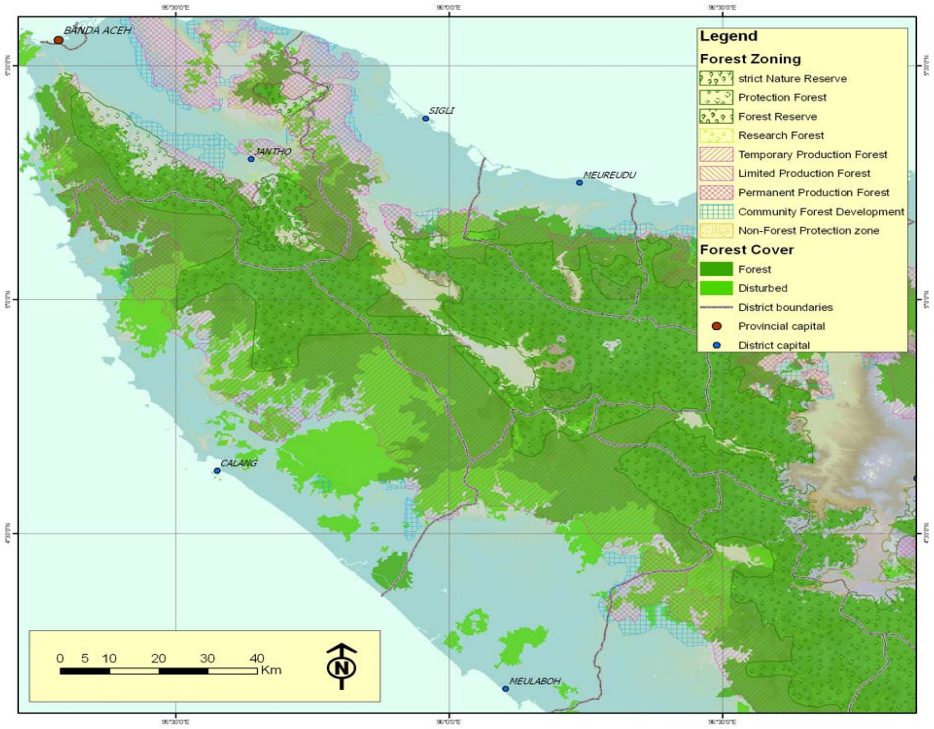


Table 8[45] shows the legal classification of Ulu Masen's forests and indicates whether they are intact, disturbed or not classified as forest[46,47]. Of protected forests, most are only partially protected, classified as watershed forests. Nearly 280,000 ha of land are weakly protected as water catchment forests. 58% of the project area is zoned for logging. Without intervention it is likely that most of these forests will be degraded or converted over the next 30 years.

Table 8. Ulu Masen ecosystem forest, classifications and condition in 2006

	Legal Classification	Forest (Intact)	Forest (Disturbed)	Forests Not Classified as Forest	Total
Protected Forests	Protected Nature Reserve (Federal)	13,086	147	2,632	15,865
	Semi-Protected Forest (Watershed)	279,727	3,598	9,316	292,641
	Protected Area (Province or District)	1,536	197	752	2,485
	TOTAL, PROTECTED	**294,349**	**3,942**	**12,700**	**310,991**

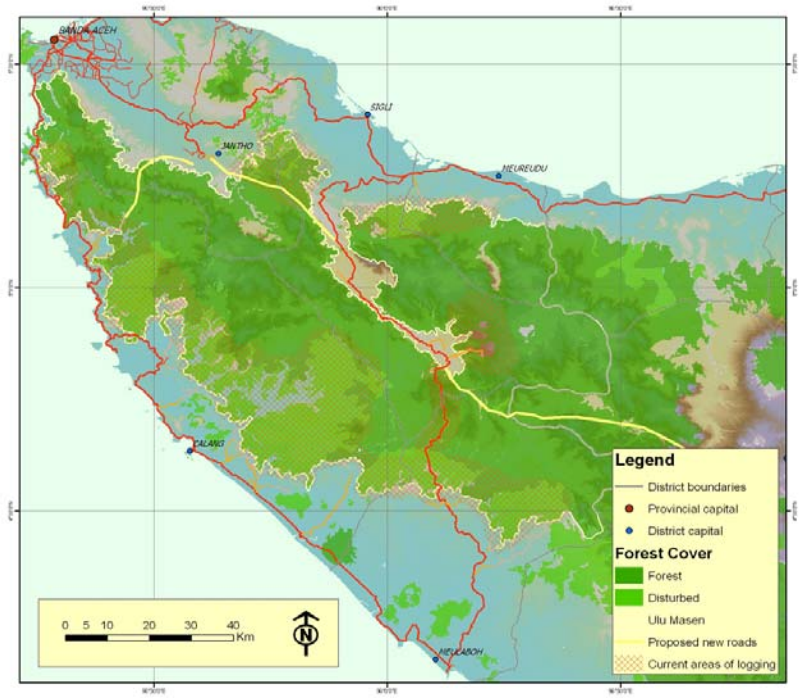
[45] *Note: Table 8 sums to a slightly lower overall forest area total than other project calculations (739,748 ha versus 750.528 ha). These analyses were made at a time when the surrounding forest blocs (outside of the contiguous Ulu Masen area) were not considered part of the project area. An update is planned for early 2008.*

[46] *2006 SPOT imagery at a resolution of 10m x 10m was used to perform the calculations in Table 8.*
[47] *Forests not classified as forests have the least conservation protection.*

Unprotected Forests	Zoned for Logging	183,949	76,994	13,245	274,188
	Zoned for Logging: Timber and Pulp	43,028	19,532	4,711	67,271
	Community Development Zones (Can be logged)	3,313	1,317	651	5,281
	Unprotected Forest (Province and District)	21,634	50,032	10,351	82,017
	TOTAL UNPROTECTED	**251,924**	**147,875**	**28,958**	**428,757**
	TOTAL FOREST ESTATE	**546,273**	**151,817**	**41,658**	**739,748**

Map 7 shows the locations of current illegal logging activities in Ulu Masen and proposed road developments. These roads will facilitate easier access for loggers, legal and illegal.

Map 7. Roads and Logging in Project Area



The unprotected nature of 428,757 hectares in Ulu Masen, existing weak conservation protection and planned roads suggests significant forests will be logged or converted unless dramatic steps are taken. However there is no clear way to estimate the time it would take for deforestation to occur. Would it be in the next five year? Thirty years? 100 years? A conservative and transparent rate of deforestation in the project area is needed.

2.1.5 Deforestation Scenarios in the Project Area

There is a lack of clarity from regulatory and policy spheres regarding technical guidance for establishing credible reference land use scenarios or reference emissions scenarios for

REDD baselines. At the most recent United Nations Framework Convention on Climate Change (UNFCCC) negotiations held in December 2007, UNFCCC Parties invited governments to make submissions on outstanding methodological issues. Two of the methodological issues countries were asked to express their views on were: "*assessments of changes in forest cover and associated carbon stocks*" and "*demonstration of emissions reductions from deforestation, including reference emissions levels*". Clearly, establishing land use scenarios and a reference emissions scenarios for REDD initiatives is unresolved. On top of the continuing UN discussion and debate, a myriad of voluntary carbon credit certifications exist, often with different baseline modalities. Meanwhile, the Clean Development Mechanism – which excluded REDD-type projects – provides no direct guidance and was also extensively criticized for its expensive and arduous forestry methodological requirements.

The technical uncertainty surrounding land- use baseline scenarios, however, should not be used to delay establishing preliminary, conservative[48] and transparent land use scenarios to begin estimating potential greenhouse gas benefits. Technical debates, which have stymied actual carbon-finance forest conservation in developing countries for years, are still unresolved. Although the recent UNFCCC decision indicates there is a growing political momentum to resolve questions about reference emissions scenarios and baselines.

On top of methodological questions, developing land-use scenarios is not a cheap or easy exercise. Acquiring and processing satellite imagery to detect historical change, or developing geographically-explicit economic models for land use projections demand substantial human and financial resources. These costs, combined with the lack of regulatory certainty about techniques or methods, could create an absurd logical outcome. Without universally-accepted baseline methodologies and credible estimates of potential emissions reductions, there can be no project finance. And without project finance, there are insufficient resources to adequately compile, synthesize and integrate the required information into a predictive and defendable land use reference scenario. To resolve this, project proponents show below three deforestation scenarios. Two are outlying scenarios – one with low deforestation based purely on Aceh's historical conditions and a second using regional/Sumatran deforestation trends, with rapid deforestation. These scenarios serve as the likely "boundary conditions", exemplifying circumstances where deforestation would be either extremely low or extremely high for the current real-world conditions of Ulu Masen. The third scenario, the ones project proponents apply in their calculations, is a land classification model with 87 discreet land classes that include projections of deforestation trends over the next 30 years.

Project proponents propose this transparent, moderate, locally-derived scenario as a "working baseline" – sufficient for now but in need of revisions and additional work. As part of their initial monitoring and measurement program (see section 9.0), project proponents will complete revised land-use and emissions scenarios. These will be completed within 18 months from the project's start date (January 1, 2008) and will take into account emerging methodological work.

For all scenarios presented below, project proponents use a linear rate – constant throughout the 30-year project accounting period. In reality, deforestation rarely follows neat mathematical models, linear, asymptotic or otherwise. Instead, deforestation worldwide and notably in Indonesia tends to follow broad insular trends which are often punctuated by "extreme events". The assumption of linearity is justified by being predictable and does not project future change (increased or lower deforestation rates over time) on top of a scenario

[48] *Conservative meaning "generating the least amount of potential carbon credits".*

prediction the project hopes to avoid. We view the "slope of change" as a second order question, mooted by a large range of possible "first order" values that could be selected.

2.1.5.1 Low deforestation scenario: 0.86% annual forest loss

A low deforestation scenario is one described by unpublished work by Conservation international, noted above in section 2.1.3. Although there is no way to discuss the merits of the work, project proponents believe the work will soon be published or available and that the work is based on sound science. More important, since we learned of this work during preparation of this project design document, we felt it was important to note this finding, even though omitting it would have justified a higher project deforestation scenario and subsequent potential carbon finance. Project proponents were not able to determine rates of deforestation in the project's defined area from this study, and thus we use the province-wide rate of 0.86% from the years 1990 to 2000 as our lowest estimate for deforestation in coming decades. We believe this is a legitimate lower boundary for several reasons.

First, Aceh was in a state of civil conflict until August 2005. Until this time, without any real political or economic certainty, Aceh was not a place for investment. This results in a low historic deforestation rate in part driven by a condition (civil conflict) which no longer exists. In 2006, as an example, the economic growth rate in the housing and construction sector skyrocketed an estimated 48%[49].

Second, and related to the first point, the 2004 Tsunami wreaked human and infrastructural disaster on a scale difficult to fathom. The tsunami caused a strong demand for reconstruction timber A recent report concluded that the Aceh-Nias Rehabilitation and Reconstruction Agency (BRR) and is partners purchased 68% of illegal timber between June 2007 and December 2007, in the process of rebuilding 100,000 homes[50]. The article also reported that Governor Irwandi's temporary 2007 logging moratorium did result in a notable decrease in supply of illegal timber and the closing of numerous illegal sawmills. But illegal-timber export was still rampant, costing Aceh Province an estimated $13.7 million during the past six months. Despite some work on sourcing green timber, there is clear evidence that much of the reconstruction timber is derived illegally, from both Aceh and other provinces. There are still thousands of homes, other buildings and construction projects that remain to be completed for a full "recovery".

Third, the post-Tsunami Aceh economy has largely been fuelled by official development assistance (ODA). With this generosity has come a competition to complete projects and increasing social expectations for a cash economy. Much of the ODA work was financed with cash-for-work payments (although it was locally called "work-for-food"). Illegal logging is usually done on a cash basis and with minimal wait between work (logging) and payment. It is thus a natural employment option for individuals that seek new work once the ODA finance begins to end.

Finally, pressures from legal and illegal logging industries operating elsewhere in Sumatra will almost certainly seek out new forests to exploit. As the remaining largest block of unprotected Sumatran forests, the Ulu Masen area will face increased pressures without targeted intervention. It is inescapable that the rampant legal and illegal deforestation that has overwhelmed other parts of Sumatra will seek to expand into Aceh and the Ulu Masen project area.

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[49] *http://siteresources.worldbank.org/INTINDONESIA/Resources/226271-1176706430507/3681211-1194602678235/aeu_nov2007_en.pdf*

[50] *An unpublished Greenomics Survey, as reported in the Jakarta Post December 13, 2007". Illegal logging in Aceh Rampant Despite moratorium".*

2.1.5.2 High deforestation scenario: 2.3% annual forest loss

If we look at rates of deforestation on the rest of the island of Sumatra, a very different conclusion is drawn. Sumatra, for the most part, has witnessed a massive amount of forest loss, fragmentation and degradation. During the period 1985 to 1997, Sumatra had the highest rate of deforestation for any island in Indonesia. In a widely-cited study by the Government of Indonesia/World Bank, Sumatra lost an estimated 28% of forest during that time[51]. This works out to an average annual loss of 2.3%. Other estimates (including one mentioned above, by Global Forest Watch and Conservation International) draw similar conclusions. Applying this deforestation rate of 2.3% to the project area is likely an overestimate of a probable deforestation scenario. For one, much of the terrain in the project area is steep and difficult to access. Second, Aceh has had time to witness the devastating impacts of widespread deforestation on surrounding ecosystems and communities and would be unlikely to allow such a massive amount of forest loss. Still, from a historical perspective, extremely high deforestation rates have occurred in Sumatra in the recent past. It is plausible therefore to assume that the largest remaining unprotected bloc of Sumatran forests will experience a substantial amount of deforestation.

2.1.5.3 Project deforestation scenario: 1.3% annual loss

To estimate a more realistic and project-specific baseline deforestation rate (ha/year), we need a transparent and conservative model that is constrained by historical and regional rates of deforestation but is driven by real, on-the-ground dimensions such as elevation, access to roads, current location of illegal logging activities, etc. These variables are the actual pertinent circumstances that face the Ulu Masen area specifically at this point in time. Our deforestation model is contained in the "calculations" worksheet and uses 87 unique combinations of elevation, legal class, condition and threat. Our threat model accounts for slope, access, proximity to planned roads and proposed developments (such as palm oil plantations), and the current location of illegal logging.

Three examples of the 87 classes and our model's assumptions and calculations are provided below – and as already noted, complete descriptions for all 87 classes can be found in the worksheet. The first example (ID Class # 107) of one of the 87 classes describes 5,378 ha of "kawasan non hutan" forests located between 500 and 1000 meters, that are currently intact, and assumed to be storing 200 tC/ha, and threatened. Project calculations assume a 60% loss over 30 years, driven in large part by easy access to illegal logging and the likelihood of shifting cultivation, except in limestone areas in the north. The second example (ID Class #58), describes 26,232 hectares of "hutan produksi tetap" (timber production) threatened and disturbed forests, containing 160 tC/ha. Project calculations predict a 75% loss given that there is currently illegal logging already occurring in these areas, they are fragmented and there are specific oil palm "threats". Other classes show significantly less forest conversion. ID Class # 44 shows only a 5% loss for timber production intact forests between 500 and 1,000 meters in elevation (and assumed be storing 200tC/ha). The relatively small deforestation in a low area legally zoned for timber production is due to very steep terrain and poor access.

Using this land class model, we estimate an average annual deforestation rate (from 2008 to 2038) of **1.28%** per year. This corresponds to an annual loss of 9,630 hectares per year in Ulu Masen, resulting in approximately 289,000 hectares of forest loss in the project area over

[51] Ministry of Forestry, Government of Indonesia and World Bank (GOI/World Bank). 2000, *Digital Dataset on CD-ROM*. Jakarta, Indonesia.

30 years. Under this scenario, 38% of the forests in the project area are assumed to be deforested if no project activities are implemented.

2.1.5.4. Summary

In summary, project proponents believe the most likely scenario for deforestation in the project area is a moderate conservative rate of 1.28%. Our model results in a deforestation rate only 0.42% higher than the lowest rate ever suggested for Aceh (during a period of armed conflict when industry could not operate). Our deforestation land use scenario is 1% lower than rates of deforestation in other parts of Sumatra. We derived our model using locally-derived, nuanced classes of forests that are built from legal status, threat, level of degradation and elevation. Using this model, we could estimate forest loss based on local conditions such as access, terrain, current logging activity and land clearing.

Finally, project proponents are committed to revising these projections over the next 18 months by using existing data, working with researchers to access unpublished information, purchasing additional images as needed and taking into account the real economic, social and political situation in Ulu Masen and Aceh.

For areas estimated to experience forest loss, we partitioned the loss into three land use outcomes – palm oil, mixed forests, and scrub. For these replacement systems, we estimated carbon stocks (see next section, 2.2, on baseline carbon emissions) which allowed us to estimate the total greenhouse gas benefits the project anticipates generating (section 6.0).

2.2 Baseline Scenario – Carbon Emissions

Based on literature review and unpublished information, we assigned carbon values for "replacement" land use categories. "Without-project" emissions are estimated to be the difference between the carbon content of existing forests and the carbon content of land use systems likely to replace these natural forests. Unlike our model for estimating forest carbon, the values for these replacement systems do not vary with elevation. The uncertainty surrounding these carbon values is driven more by the range of systems (e.g., what types of crops, trees, etc) that would replace the forest, rather than elevation.

2.2.1 Palm Oil Plantations

The carbon content for palm oil was based on the Alternatives to Slash & Burn 2000 Climate change working group report[52], Appendix 3C, information on Indonesian carbon calculations. We use the ASB report's carbon value for palm oil rather than an IPCC value, since the information was extremely well-documented and specific to Indonesia (rather than the more generalized Asia, or "tropical rainforest" ecological zones reported in IPCC default tables). This report estimates 63.2 tons of above ground carbon in Indonesian palm oil plantations. We added a 20% factor to account for palm oil roots, so as to be consistent with all other forest carbon stock estimates (for a total of **76 tC/ha**). In our scenario, almost 73,000 hectares of palm oil "replace" forests over the 30 year project period, representing about ¼ of the overall 288,907 hectares deforested.

2.2.2 Mixed Forests

Project proponents define mixed forests as all types of forests that replace natural forests, except for palm oil. Mixed forests can include forests that retain some trees that were part of the natural ecosystem as well as entirely new types of forests. Presently, in Ulu Masen forests converted to anything except palm oil, the dominant replacement species are mixed plantations, agroforestry, coconut, chocolate, kememyan, fruit trees (durian, jack fruit) and rubber

We based the carbon content of "mixed forests" on 85 t C/ha, based on the IPCC aboveground biomass value for forest plantations in the Ulu Masen ecological zone (Table 4.12 from AFOLU Chapter of IPCC). This reported value in IPCC Table 4.12 is 150 tons of above ground biomass. Making the same assumptions as above (0.47 carbon density and a 20% correction for belowground biomass), we reach **84.6tC/ha** in carbon. We feel this is the most appropriate singular value to describe what is in reality, a mosaic of replacement values. IPCC default tables are limited in their resolution –there are only so many default values defined for particular geographic and ecological zones. For the appropriate Ulu Masen ecological zone, "forest plantation" is the only other appropriate and general forest biomass stock default value available. [Technically, Table 4.8 list two straddling values for forest plantations in Asia. However, these values vary by almost a factor of two: 130 tons of above ground biomass for "Asia other" and 220 tons of aboveground biomass for Asia Broadleaf"]. Thus, using the "forest plantation" default value is our best option - in the absence of field data - for what is obviously an over-simplification of reality.

Furthermore, the value is transparent, conservative and reasonable. In our baseline land-use scenario, "mixed forests" replace 58,271 hectares of current natural forests.

2.2.3 Scrub

By scrub, project proponents mean anything that is not a forest. This all-encompassing term consists of shrubs (bushes and other low-lying vegetation), subsistence and commercial non-forest crops (agriculture, rice) grasslands, and agroforest systems that may have some trees such as coconut, rubber, coffee or fruit but can't be considered "forest". This replacement system is the most widespread in our project scenario, accounting for 54% of the total 288,907 hectares lost over the 30 year period. Non-forests is also the most diverse outcome and the value for which there is the least IPCC guidance. There is no simple IPCC look up table for non-forest replacement systems in northern Sumatra (or anywhere for that matter).

[52] *http://www.asb.cgiar.org/publications/wgreports/wg_climatechange.asp*

Project proponents felt that the value we used for encompassing all conversions from forest to non-forest, had to be exceptionally conservative[53].

To derive a credible estimate of the carbon stocks for scrub in our model, project proponents used the central value for a range of observed carbon reductions reported from natural forests to other land cover types (14-63%) as reported in Lasco's meta-analysis of Asian carbon stock changes[54]. Given some of the areas that would replace forests in our project area contain very little carbon (such as clearings) and these were not considered in Lasco's meta-analysis, we reduced this variable with an additional 10% decline correction factor (see "carbon assumptions" worksheet). The carbon content of what we call "scrub" was estimated as **65 tC/ha**. This was derived from 188tC/ha average in natural forests multiplied times 0.385 (the central reduction Lasco found from forest to non-forest) times 90% (to account for cleared areas).

2.2.4 Summary

Based on our estimated land use model and our estimated carbon per unit area, we calculate that at the end of 30 years, the Ulu Masen forests will contain 108,364,096 tons of carbon[55]. This compares to an estimated 140,771,670 tons currently[56]. This corresponds to an **annual *net* loss** – after regrowth – of **1,080,252 tons of carbon**[57]. A statistically robust carbon field inventory is planned to begin in early 2008 to test these parameters. This survey is more fully explained our monitoring section (9.0).

2.3 Baseline Scenarios - Communities

Predicting the future of communities in the project area over 30 years is an exercise in educated guesswork. The land use assumptions project proponents have created do not account for the possibility of conflict returning to Aceh[58], another massive earthquake or Tsunami, or other extreme events.

Deforestation would provide some employment, infrastructure development and economic and social benefits. Research suggests that deforestation generates around $200-$250 per hectare in logging fees, concession fees and mandatory reforestation fees, with proceeds going primarily to national and district levels, with a smaller amount going to provincial government[59]. The business-as-usual scenario for deforestation would generate hundreds and possibly thousands of jobs for this impoverished region. These jobs would include timber cruisers, cutters, drivers, heavy machine operators, administration and support, management, as well as down-stream processing and export.

This also implies that project activities which allow for sustainable logging and forestry are likely to help maintain forests industries. We assume that in the short-term, as long as the project adequately develops sustainable forestry programs, the baseline land use scenario and the "with-project" scenario will not generate significantly different employment outcomes. This is of course to subject to many factors.

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[53] *As elsewhere, for these calculations, "conservative" means the smallest difference between a forest and the land use that replaces the forest, which results in the smallest number of potential carbon credits.*

[54] *Lasco, R. 2002. Forest carbon budgets in Southeast Asia following harvesting and land cover change. Science in China (Series C) V45. See Table 3 and accompanying text.*

[55] *T134 in project calculations.*

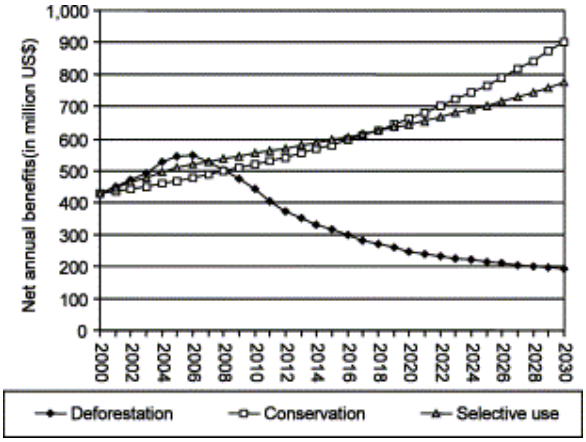
[56] *H134 in project calculations.*

[57] *T138 in project calculations.*

[58] *Core components of this project, improving land tenure and legal land certainty as well as and participatory spatial planning are designed to assist communities and remove some of the "tinder" that could erupt into future conflict.*

[59] *Greenomics Report.*

The project proponents firmly believe that on the whole, communities will be better off with this project than without. There is some empirical evidence to support this assumption. A study conducted in the Leuser National park (adjacent to the Ulu Masen project area) concluded that conservation and sustainable use of forest resource deliver far more benefits to communities over the medium and long terms. This study acknowledged one of the key challenges to conservation and sustainable forest use is that in rural poor areas, short-term financial benefits often lead to less desirable long-term outcomes. This project, through carbon finance, hopes to resolve this challenge.



Source: Economic Valuation of the Leuser National Park on Sumatra, Indonesia. Ecological Economics (2003). J.H. Peter et al.

The scale of economic opportunities created by deforestation is difficult to predict and would depend on the nature of the subsequent land use and whether logs, timber and pulp would be exported with or without processing to add value. The direct economic benefits from illegal logging for local communities is limited, as well as the benefit for the government, as illegal sawmill operators don't pay royalties.

In a study that has not been fully released[60], CIFOR and ICRAF studied Aceh Barat communities for socio-economic factors and land use factors. Their findings are preliminary but potentially indicative. They found that in rural areas (not near paved roads), the only significant correlation between a socio-economic variable and a land use variable was that the size of oil palm holdings positively correlated with poverty in a village. That is, all else being equal, families with more oil palm were more likely to be poor. They offer the following explanation for what they acknowledge is somewhat counter-intuitive: the more land and resources that villages invest in palm oil, the less they have for a diversified portfolio of income generation that can help ameliorate poverty. While the results are only preliminary, this study suggests that oil palm may be more of a curse than a blessing, at least in rural areas away from roads.

In addition to the impact of the baseline on direct community benefits, the consequences of this assumed level of deforestation would have a severe impact on the provision of ecosystem services in the region. The watershed for millions of people would be severely degraded, with almost certain declines in water quality and reliability. In addition to hydrological functions, Ulu Masen forests reduce run-off and soil erosion, reduce the risks of

[60] *S. Dewi and A Ekadinata. November 2006. Resilience, Rights and Resources: Two Years of Recovery in Coastal Zone Aceh. Village level Analyses of Poverty and Land Use/Cover in West Aceh. CIFOR unpublished.*

landslides, and help regulate the local and regional climate. These forests also provide important natural resources including fibres, foods and medicines for communities in Aceh.

2.4 Baseline Scenarios – Biodiversity

The baseline land-use scenario is likely to cause substantial declines in the biodiversity of the region. Many endangered, threatened and endemic species would experience continued habitat loss, degradation and fragmentation. In the nearby Leuser ecosystem, from 1993 to 2005, one study suggests a 50% decline in orangutan populations, associated with degradation and destruction of habitat, notably due to palm oil expansion and other crops[61]. If the deforestation continues as in the baseline scenario, biodiversity in Ulu Masen will clearly decline over thirty years. With respect to highly charismatic mega-fauna (tiger and elephants endemic to Sumatra), increasing human-wildlife conflict will occur, as habitats of species are increasingly disturbed, fragmented, and destroyed.

What level of biodiversity loss will be experienced is difficult to accurately predict. One guiding body of work, Island Biogeography, can be used to at least on a theoretical level estimate the consequences for biodiversity if, as the land use scenario assumes, 289,000 ha of deforestation occur in the project area over 30 years. Island biogeography theory shows that, all other things being equal, the number of equilibrium species in isolated habitat islands (as is the case both for Ulu Masen and Sumatra in general) increases with the amount of habitat area. The mathematical representation of this is often expressed in the species-area curve equation, where: $S = cA^z$, in which S is the number of species, A is area, and c and z are numerical constants. The constant c varies depending on the species in question and the region studied. Observed values of z are generally accepted to be in the range .20-.35.

In terms of quantitatively predicting biodiversity loss likely to occur in a baseline scenario, the theory of Island Biogeography and other tools (such as critical habitat analyses or population viability analyses) can provide a framework for consideration, but can not be used with present information to make reliable biodiversity loss predictions. There simply are no reliable estimates of the biodiversity loss that could be expected from continued deforestation in the project area. Information required for estimating this loss would include: a total number of species and their populations, the natural ranges of the species, other natural history and ecological information, specific locations of deforestation (preferably by habitat type), reliable numerical values for constants such as those mentioned above, and a host of other factors such as hunting pressures, fragmentation, etc.

What is clear and should be self-evident, is that losing more than a third of the forest area over 30 years would be deleterious to biodiversity in the project area. From project calculations, the majority of this loss would occur in elevations between 0 and 1,000 meters, where most the presumed deforestation is projected to occur. While there is significant habitat loss in higher elevations predicted, it is likely that some populations would survive, likely in difficult to access and remote terrains.

In addition to biodiversity losses incurred by deforestation, in the current post-conflict environment there are indications that poaching rings in other parts of Sumatra (e.g. West Sumatra and Riau) will increasingly target Aceh as a source for tiger parts, elephant parts and other wildlife. As other fauna and flora species have become rare and unavailable from other parts of Sumatra, Aceh is expected to be the next focus of illegal wildlife and flora trade[62]. Traders have started to turn toward Aceh. In Medan there is a well-established

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[61] *Personal communication with Helen Buldand (2006) and CP van Shaik et al. 2001. Dramatic decline in orang-utan numbers in northern Sumatra. Orxy (35). As quoted in; The Golden Crop: Palm Oil in Post-Tsunami Aceh. Eye on Aceh September 2007.*

[62] *Chris Shepard and D Matyr FFI-Sumatra Tiger Program*

market for rainforest species (e.g., the slow loris, tortoises, pangolins and other flora and fauna).

Fire is likely to increase as habitat becomes increasingly fragmented and disturbed. With increasing extremes in local climate as a result of altered micro-climate (from degradation and deforestation) as well as global climate change, potential for catastrophic fire events increase. From a relatively stable moist environment, is increasingly probable that Ulu Masen will experience a transition to a drier more fire-prone ecological state (which in of itself is more fire prone). This is likely to occur particularly in the northern and eastern zones of the project area, which are relatively drier. Thus, we would expect biodiversity losses to be greatest in northeastern portions of the project area that are relatively low in elevation and with adequate access. Other parts of the project area, such as wetter areas with less favorable access, would also experience biodiversity loss, although to a lesser degree.

2.5 Baseline Scenario – Water and Soil resources

Water contamination and soil erosion are likely to increase in the baseline scenario due to increased deforestation and degradation. Water quality is likely to decline and the risk of landslides is likely to escalate. Logging, much of it illegal, has caused a growing number of flash floods and landslides in Aceh and throughout Sumatra, damaging homes and destroying livelihoods.

In late 2006 widespread flooding hit eastern and central Aceh and the neighboring province of North Sumatra. The extensive floods resulted in damages and losses of US$ 210 million, with damage to water and sanitation accounting for US $ 6.7 million. A World Bank assessment recorded 4,042 wells were destroyed, 10,903 were heavily damaged and 11,348 lightly damaged. Soils and agricultural fields, sustained damages totaling US$ 37 million, with 2,353 hectares requiring replacement, 14,440ha were heavily damaged and 7,610ha were lightly damaged[63].

Two watersheds serve as indicative of the type of hydrological and soil damages that would occur in the baseline scenario: the Sabe and Teunom watersheds.

Sabe.
During 1980s and 1990s, a logging concession operated in upper Sabe watershed. This area largely consists of lowland forest (less than 500 meters elevation) and at first glance, is a suitable area for commercial logging. However, closer study of geological and soil parameters, show that the area consist of granodioriate batholith. This geological dome has thin and low nutrient soils and very low water permeability. Local communities observed during the logging era, that logging of this watershed led to high sedimentation, high-runoff and very quick erosion of the thin overlying soils[64]. The Sabe watershed ecosystem suffered greatly elevated soil erosion and water fluctuations. During the last seven years, following the closure of logging operations, there has been a slow return to hydrological normality. However, failure of local spatial planners to recognize the environmental susceptibility of this area to disturbance could lead to another round of deforestation and altered hydrology. It is reasonable to expect that given a recent history of logging, this time deforestation and degradation in the watershed could produce even more disturbed outcomes, since the area has already been impacted by past logging operations. This could generate severe downstream consequences.

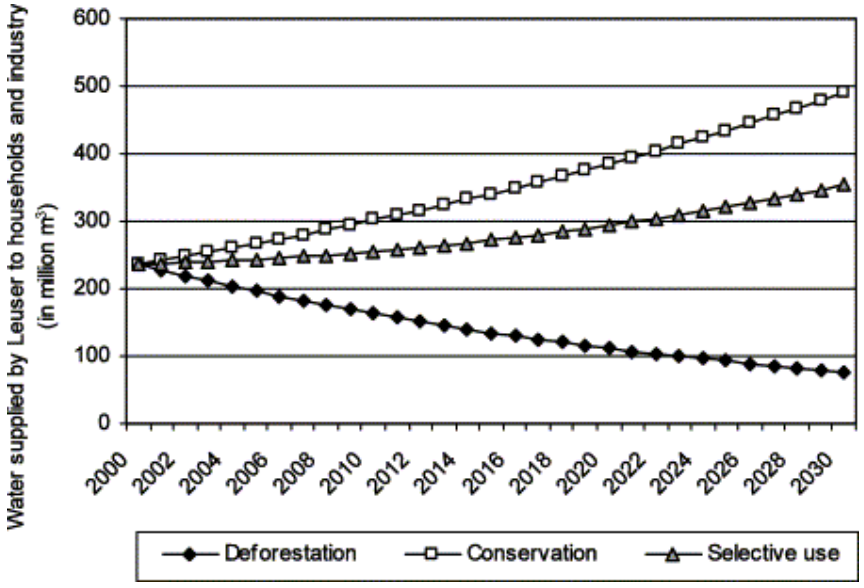
Teunom

[63] *Aceh Flood. Damage and Flood Assessment. World Bank 2007*
[64] *Several anecdotal "stories" documented during the Spatial Planning process for Aceh Jaya.*

Teunom is the largest watershed in the project area. This watershed is unique within the project area in that it spans two districts. The upper watershed is in Pidi (Tangse, Manee and Gumpang sub-districts) while the lower watershed, including an extensive flood plain lies within Aceh Jaya (Teunom sub-district). Communities in the lower watershed area already are complaining of exacerbated flooding events they assume to be caused by deforestation of the upper watershed. Unless deforestation in the upper watersheds (in Pidie Districts) is controlled, flooding events are likely to increase, making the lower watershed (in Aceh Jaya) dangerous due to the increased probability of flooding.

While these are only two examples, in the future if deforestation is not controlled in the project area, these scenarios are likely to be replicated in the many smaller watersheds of the project area. A particular concern is for the capitol city of Banda Aceh, whose upper watershed is in Aceh Besar District. Two roads are planned for this area (one from Jantho to Kemala and another from Jantho to Lamno, see **Map 7**).

A study carried out in Leuser Park concluded that a deforestation scenario similar to the one being for Ulu Masen generates substantially less water supplied to community households.



Source: Economic Valuation of the Leuser National Park on Sumatra, Indonesia. Ecological Economics (2003). J.H. Peter et al.

3 Proposed Project Design and Goals

3.1 Overview

The project proponents can, with adequate carbon finance, institute measures that will reduce legal and illegal deforestation, promote reforestation and foster sustainable community forest management. Carbon-finance funds will be established to offset al, or most, of the opportunity costs of avoiding deforestation as well as support project activities and operations. A substantial portion of carbon finance will be deposited into these funds and will directly benefit local communities and forest guardians. By preventing deforestation, project proponents will help Aceh achieve a sustainable future that also preserves critical and highly-threatened habitat for biodiversity and develop a sustainable community model for the use and conservation of forest.

As the lead project proponent, Aceh Province is seeking support for the following activities:

- Identify and document opportunities to strengthen land tenure and resource access of forest dependent communities and those with customary rights.
- Identify and document opportunities to strengthen forest management, forest governance and forest law enforcement processes at provincial, district, *Mukim* and village levels.
- Identify and document opportunities for establishing legal and regulatory frameworks to underpin trade in carbon rights and carbon credits.
- Develop provincial, district and *Mukim* level sustainable forest and land use plans, including rezoning Conversion Forest to Protection Forest or Limited Production Forest as appropriate and identifying land for community forest management, reforestation and community agro-forestry.
- Develop distribution mechanisms through consultation with stakeholders to ensure equitable and transparent distribution of benefits from carbon trading.
- Test distribution mechanisms and forest protection interventions by using ODA funds and VER revenues through direct forest protection/conservation programs.
- Support development of community forestry, agro-forestry and other livelihood initiatives that support reductions in carbon emissions and reduce risk of future emissions.
- Identify and provide technical and financial support to fill gaps in the development of capacity for carbon accounting, in particular in the development of essential tools such as using allometric relationships in the calculation of carbon sequestration in forest, agricultural and estate crop growth and other carbon storage and sequestration models, appropriate stratification of forest types, and soil carbon model development and calibration under a range of land uses.
- Develop the capacity of relevant Provincial Government, educational and scientific institutions to estimate, model and monitor forest and forest carbon stocks through technology transfer and skills development.
- Determine, based on historical trends in comparable areas, baseline rates of deforestation and forest degradation for the project area and the Province in the past as well as projections of future land use change and associated carbon emissions.
- Develop and implement project management, advisory, oversight and consultative structures.
- Coordinate activities with the "Aceh Green" program[65], an emerging platform to recruit certified, sustainable "soft commodities" such as rubber, cocoa and Forest Stewardship Council timber into degraded areas of Aceh to support livelihoods that are both sustainable and prosperous.

3.2 Major project activities

The project will help the province avoid an estimated 85%of legal logging by using carbon finance to justify land reclassification and permanently eliminate the legal possibility of land conversion and logging. With carbon finance justification, areas currently zoned for logging will be reclassified as permanent protection forests and community-managed low-impact, limited production forest areas. This process will build on Governor Irwandi's temporary logging moratorium and enable the Provincial government, in consultation with the national government, districts and *Mukims*, to design an alternative to the widely-expected continued logging and legal conversion Ulu Masen.

Project proponents believe that with adequate finance, 85% of legal and illegal logging can be stopped. We do not anticipate being able to stop all deforestation in the project area and some allowances for deforestation will likely emerge from the participatory land use planning

[65] *Green Economic Development and Investment Strategy for Aceh Province, Indonesia (Aceh Green). Unpublished Concept Note (December 16, 2007).*

process proposed. Additionally, some amount of illegal logging is likely to continue, albeit at a much reduced rate compared to the current conditions and the baseline scenario. We believe that an 85% reduction is possible given the situation in Aceh and Ulu Masen and taking into account the expected direct payment schemes proposed below.

A project implementation unit, tentatively called the Ulu Masen Implementation Board (see sections 4.3.1 and 9.1) will be established at provincial level for project management and technical assistance. Technical assistance will be provided by FFI as well as through procurement of specialized technical service contractors. Through the participatory planning process begun in Aceh Jaya under AFEP and FFI's broader Aceh programme, multi-stakeholder management boards will be established within the five participating districts to provide oversight for project implementation at district, *Mukim* and village levels.

Building on the design of AFEP in which key roles have been allocated to Civil Society Organisations (CSOs) for external and independent oversight and 'watch-dogging and whistle blowing' functions, this project will provide grants to civil society organizations for independent monitoring of project activities. This will entail monitoring the implementation of project activities and the delivery of outcomes, as well as the monitoring of government institutions and their delivery of the basic policy and operational environment for the project. Ensuring an equitable and transparent distribution of benefits amongst stakeholders will also be an important role for CSOs.

The full, active and informed support of all stakeholders will be critical for the successful development of carbon finance distribution systems, especially as these will be new, innovative, and will require flexibility in design to accommodate changes in their development and operation. FFI and its partners will facilitate a consultative process to reach agreement on mechanisms for the distribution of benefits.

3.2.1. Prevention of Legal Logging Via Land Re-Classification

The Governor of Aceh has made a commitment to reduce the areas of forest for logging and clearing in return for carbon finance. Thus the most important immediate activity is to revise provincial and district spatial plans, reduce the forest area classified as conversion forest, and increase the area under a range of formal permanent forest estate categories.

The Government of Aceh will establish an institutional framework at provincial, district and *Mukim* levels to oversee and advise forest classification and project implementation. The ongoing Aceh forest sector review process will determine the institutional structure for this and the composition of a steering committee. The steering committee will provide overall supervision of the project and will include representation from national, provincial and district governments, civil society organizations, and FFI and its partners. Carbon finance funds will provide incentives to communities, districts and the province to re-classify lands currently slated for logging. Communities have indicated a strong willingness to participate provided there are financial incentives for conserving forests. Project proponents, notably FFI, in collaboration with the national focal point for REDD, the Ministry of Forestry facilitated an initial provincial REDD consultation workshop[66]. FFI has already begun consultations with Aceh Jaya District and have the support of key government agencies in Aceh to continue this work and to expand it into the other three districts that comprise the Ulu Masen Ecosystem.

3.2.2 Prevention of illegal logging

[66] *Aceh Regional Consultation Workshop to Develop National REDD (Reducing Emissions from Deforestation and Degradation) Strategy for Indonesia. Oct 1-2, 2007.*

The project will help curb illegal logging through support for enhanced enforcement, community agreements, increased employment and income for local people, recruiting forest wardens, conducting forest monitoring and patrols, and improving synergies through law enforcement and other relevant agencies. The project will also provide alternative livelihoods to forest-adjacent communities that commit to protecting the forest. In return for funding and technical assistance, communities will agree to protect the forest. The government of Aceh has recently hired almost 1,000 new forest wardens (many whom are community-based) and plans to expand this initiative with additional project finance.

3.2.3 Reforestation, agro-forestry, mangrove restoration, fruit and coffee micro-plantations, orchards and sustainable forestry

The project will use carbon finance to assist reforestation and restoration of mangroves, fruit tree gardens, coffee plantations and woodlots. These will be developed based on needs and priorities identified in the spatial planning and community outreach process of the project. Some programs, such as mangrove restoration, have already been initiated and proponents will seek to partner with and build off existing programs. Other initiatives, such as native tree nurseries, technical assistance, and green marketing support will be developed as requested by participating communities, organizations and individuals. Where possible, project proponents will seek to enable activities that restore degraded areas and build long-term sustainable tree incomes and livelihoods in project areas. All carbon sequestered in these project will be estimated and placed in our leakage management structure. If leakage from the project area is detected, carbon sequestered through these programs can compensate off-site carbon losses.

3.3 Existing Project Activities in Ulu Masen: A focus on Aceh Jaya

To date the FFI Aceh Programme has been most engaged with communities in Aceh Jaya District. As in most other districts of Aceh, the traditional unit of community land management was the *Mukim*[67] and the FFI Programme has actively supported the establishment of the *Seurikat Mukim* (Mukim association) which provides a forum for all 21 *Mukims* in District. All Aceh Jaya *Mukims* that fall within the project area have taken part in participatory spatial planning, including *Mukim* planning and livelihood activities. *Mukims* of Aceh Besar and Pidie have contributed to spatial planning workshops, whilst *Mukims* of Aceh Barat have taken part in mitigating human-wildlife conflict and elephant surveys. More recently, the FFI programme has been concentrating on collaborating with the 15 mukims in the district (see **Table 5** above) that include large areas of forest within their boundaries.

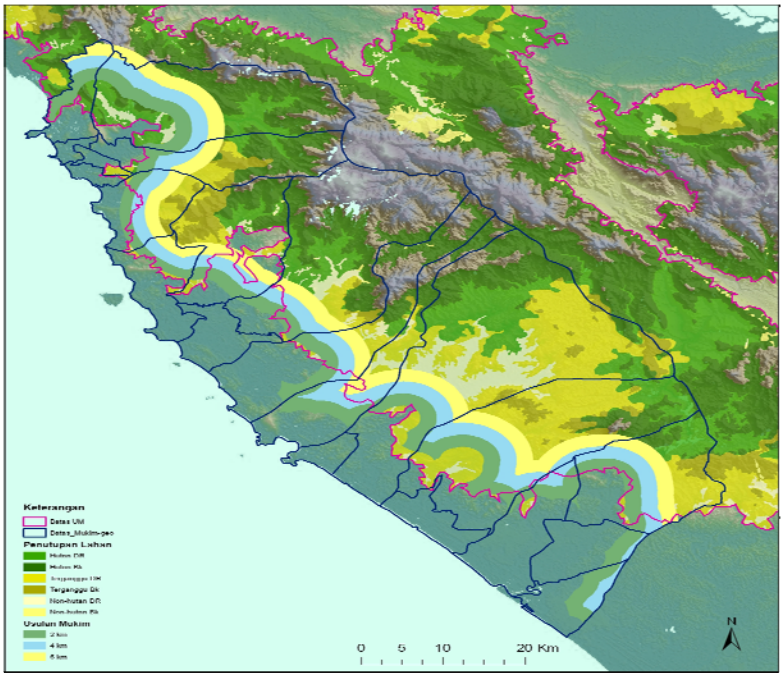
The rationale for concentrating activities in Aceh Jaya to date has been both ecological and sociological. Aceh Jaya contains 36% of the area of the contiguous forest that forms the Ulu Masen forest block, and 55% of all lowland forest (<500 m) in the project area. These lowland forests typically hold the highest biodiversity and are the most highly threatened.

Secondly, the impact of the tsunami was extremely severe in this district. Many communities that had been forcibly moved from the forest edge to the coast during the conflict, lost their homes and agricultural land during the tsunami. The communities most actively engaged in the last 12 months include: the Pante Cermin mukim (4 villages), Meudang Ghon (1 village) (all Jaya sub-District); Alue Gro, Meunasah Kulam, Blang Monlung, Crak Mong, Krueng No

[67] A *mukim* (sometimes known as *kemukiman*) considered of a number of communities or villages with a common ethnic and cultural background under the leadership of the *mukim* (or more correctly the *Imeum mukim*), a religious leader who also had secular functions. Under the *Imeum mukim* were a number of specialist community leaders such as the *Kejrun blang* (responsible for agricultural matter), the *Pawang Uteun* (controlling forest use) and the *Panglima Laot* (fisheries in coastal areas).

(Sampoinet sub-district) Lheung Gayo, Cot Trap, Batee Ro, Senebok Padang (Teunom sub-district) Panggong Padang Datar Datar Luas (Krueng Sabe sub-district). As a result of *Mukim* and community consultations, FFI has developed and begun to share principles for community spatial planning and land use in Aceh Jaya. These principles are demonstrated in **Map 8**, which shows how *Mukims* in the district have initially (broadly) suggested they would like to see their communities develop. It shows that mukims would like to continue to have access to areas they are close to and can walk into (a grey/green band on the map). As distance increase away from the main urban areas, and generally up in elevation, *Mukims* believe lower intensity forest uses are appropriate (light blue). As they go farther away from the main population and rural residential areas, still less deforesting and impacting activities would be allowed and enforced (yellow). This rational is due in part to the distance and time necessary to walk into the forest, but for other reasons such as perceived conservation benefits in general as well as for watershed conservation and flood control.

Map 8. "Principles Map" of Community Spatial Planning in Aceh Jaya.



The FFI Aceh programme also conducted elephant surveys in the other districts in the project area, particularly Pidie, where surveys were conducted in the Tangse-Manee-Geumpang sub-districts. Since the tsunami, project activities in these highland areas have been limited until recently, when a feasibility study for development of Community-based Forest Management (CBFM) in the sub-districts of Manee and Geumpang (2 mukims comprising 6 villages) was conducted in conjunction with Telapak. Pidie and Pidie Jaya districts also contain 36% of forests in project area, and include the hill and sub-montane forests that are most threatened (due to higher accessibility than in other districts). While these upland communities were not tsunami affected, they did suffer considerable economic losses and often relocation during the conflict period. And since the signing of the peace accord local communities have been engaging in illegal logging to supplement their incomes, and have begun to open up abandoned agriculture land. Income generated by illegal logging provides relatively little long-term benefit to local communities. We believe controlled sustainable and certified forestry owned or operated by the communities can provide higher sustainable incomes and greater incentives for protecting adjacent forests.

In terms of forest areas, Aceh Besar and Aceh Barat districts are of less importance than the previously mentioned districts. FFI Aceh Programme activities have been limited to elephant surveys. Recently the Programme has engaged Aceh Barat district governments to develop a solution to human-elephant conflicts, which involves stabilizing the forest edge to guarantee elephant habitat, and developing a community-government response plan to mitigate future conflicts in the three sub-districts (Kaway XIV, Sungai Mas and Pante Ceuremen) with the main forest areas in the district. In Aceh Besar, a feasiblity study has been conducted with Telapak in the outlying areas of Jantho town, (Aweek, Boeng, Data Cut, Jalin villages) for the development of CBFM. In addition, planning has begun with the local government and key Mukims for the development of an environmental education and training centre near the Jantho nature reserve, and a reforestation programme for the district. Mukim leaders have also been provided with maps of forest cover to assist them with participating in the district spatial planning process.

3.4 Location of Project Activities

Ongoing engagement with *Mukim* leaders and communities to implement AFEP activities has supported the selection of a range of suitable field sites for the design and testing of incentive based mechanisms for forest protection. All sites contain large areas of forest that are currently without, or with only weak, conservation status and are either zoned for logging or conversion to plantations or other non-forest land uses in the future.

This project proposed a landscape scale of project implementation. This will be accomplished in specific communities and on a case-by-case basis. Given the complexity and size of the proposed project and the variability of communities, a specific map of where individual activities will take place is not realistic.

3.5 Timeframe and project accounting

Project proponents use a timeframe of 30 years for accounting for changes in carbon emissions between the baseline and project scenario. However, the project will insure permanence of avoided emissions for a period of 100 yeas. This bifurcation of time intervals is done to:

a) allow for reasonable estimates of medium term (30 years) of a baseline and carbon accounting, while;
b) Also ensuring the longevity of carbon credits for a period of time that is relevant for climate change and atmospheric CO_2 levels.

The project will store a significant amount of carbon credits in a buffer account that will be used after the 30 years of the project period to continue implementing and funding core project activities, notably conservation and restoration of forests. The 30 year project accounting period will also be divided into two stages, a pre-REDD credit stage (from 2008 to 2012) where fungible early-action REDD credits may or may not be available, and a second stage after 2012. The first stage will build on and extend foundations established by FFI and its partners under AFEP. This 2008-2012 stage will focus on (in addition to project design and implementation) procuring finance from bilateral and multilateral funds, philanthropic sources, and voluntary credits. This stage will include four overlapping phases:

Phase 1*:* Information gathering, technology and skills transfer and development of project proposal and structures, institutional framework, and financing (***6 months, July 2007 to December 2007***).

Phase 2*:* Develop benefit sharing mechanisms, implement planning processes, implement legislative and regulatory changes, set up a system for forest and carbon stock monitoring, preparation for community forestry, reforestation and agro-forestry projects, re-evaluate and improve our “baseline” rates of deforestation for the project area, move toward IPCC Tier 2

carbon stock measures, and synthesize understanding of current biodiversity and livelihoods, enhanced efforts to control illegal logging in combination with forest monitoring and assessment (***18 months, January 2009 to July 2009***).

Phase 3*:* Ongoing forest and carbon monitoring including movement as practical toward IPCC Tier 3 understanding of forest carbon stocks, promotion of sustainable community forest management, forest product value adding, reforestation and community agro-forestry, monitoring 'virtual' carbon funding (ODA funds) disbursed through incentive mechanism, financed through the sale of voluntary Verified Emission Reductions (VERs) or early-action credits. (***Three years, January 2009 to December 2011***).

Phase 4*:* Continuing implementation of project activities and transfer to 2nd commitment period REDD credits or appropriate outcome of UNFCCC negotiations. (***2012***).

The expectation is that after 2012, the project will be included in Indonesia's baseline (reference emission scenario) and fungible post-Kyoto/UNFCCC carbon credits will be available. This, of course, is still a complex political process whose outcome can not be guaranteed. In the event that REDD credits do not materialize in a post-2012 regime, the first stage of voluntary, philanthropic and multilateral funds would be continued. Project proponents will also continue measuring and monitoring programs for the duration of project activities (30 years) and beyond (e.g. 100 years as this is how long project credits will be insured). In this way it would be possible to provide reasonable confidence of long-term forest carbon storage.

3.5 Project risks and mitigation measures

Identified project risks have been divided into short and long term risks as follows:

Short term

- Baseline risk
- Leakage risk
- Measurement risk

Long term

- Project implementation
- Sovereign, legal and enforcement risk
- Natural risk (fire, disease, pests etc)
- Climate change risk (especially increases in fire)
- Return of conflict to Aceh, other political instability

The most pressing short-term risks include: the loss of some project benefits through improved measurement (e.g., what we feel are conservative estimates are in fact over-estimates), identification of leakage, and baseline/REDD credit adjustment as national and project accounts and reference emission scenarios are reconciled. To manage these immediate risks, 20% of annual VERs will be reserved from sale pending such reconciliation. This number may be increased if our risk management model and insurance partners consider it necessary, see below). National baseline development is considered likely to occur over the next two to three years. Leakage is likely to be strongest earlier in the project period (e.g., the first 5-10 years) although leakage will be monitored for the 30 year project lifetime. Measurement risks are likely to be largely resolved by the end of year five (2012), when the project is expected to have completed IPCC Tier 3 biomass and carbon estimates.

Strong linkages between carbon measurement, monitoring and accounting approaches at the project and national levels will be maintained to minimize possible adjustments to the project

level accounts when final harmonization occurs. Project proponents (FFI and Carbon Conservation) continue to engage the Indonesian government on the development of the national system and the technical dimensions of national versus sub-national nesting and accounting.

For a preliminary outline of the risk management model project proponents are considering, please see **Annex II**. Risk management arrangements to protect the stored forest carbon in the long term have two elements. The first will be a "risk management buffer" of reserved credits, proposed to be 10% of the stream of VERs. The second will direct 20% of the stream of VERs into a revolving fund which will invest in other sustainable development projects which generate further emission reductions or sequestration. These s revenues will be used to develop:

- Mini and micro hydro projects
- Sustainable biofuel production and use
- Sustainable biomass power generation
- Other renewable energy projects
- Energy efficiency projects
- Reforestation with sustainable plantations
- Community based agroforestry

Reforestation and agroforestry will be particularly important in areas degraded by illegal logging carried out over the past several years and will be complimented by initiatives implemented under AFEP as part of its sustainable post-tsunami reconstruction support.

Acehnese communities will be the beneficiaries of these benefits, while VERs and/or CERs generated will be reapplied to risk management function through the revolving fund. It is expected that the total amount of verified emission reductions will increase over time. These arrangements will be implemented in addition to the core project activity of ensuring forests in the project areas are legally protected and that applicable forest law is enforced. To the extent that current legal arrangements need strengthening, negotiations will be undertaken with those responsible for relevant legislation at the provincial and national levels. Outside the project forest area, the Government of Aceh as begun to promote "Green Aceh", a program to establish environmentally, economically and socially sustainable land uses (sustainable coffee and other commodities) that build sustainable local economies, help mitigate leakage concerns, and help avoid the major negative impacts of the project on certain community constituencies (furniture makers reliant on locally-sourced timber).

These risk management arrangements are designed to give assurance to buyers of VERs and CERs of the long term integrity of the carbon offset, and to maximize the contribution of project and subsequent carbon financing to economically, environmentally and socially sustainable development. Carbon Conservation has also engaged a global reinsurance company to help estimate risks to carbon storage in some of its projects area and insure credits for 100 years[68]. This process is an innovative program to address questions related to permanence using a combination of risk analyse for calculating probabilities of carbon stores being reversed (e.g., project failure to meet activities, fires, political instability, natural events such as volcanoes, floods), creation of risk management buffers to escrow portions of carbon credits generated, registration, monitoring of credits, and retirement of credits once they are used or sold.

This system of private reinsurance allows the project to provide very long-term confidence to the public and potential investors/donors as to the climate change mitigation integrity of the

[68] *This is information project proponents consider proprietary.*

project. This system also can respond to project developments over time, as monitored carbon credits are verified and as project activities commence. In addition to solely monitoring the presence or absence of carbon in Ulu Masen forest, the institutional, political and stakeholder support or lack of support is monitored as part of the on-going risk-based insurance of the credits.

3.6 Documentation

Project proponents are committed to having key documents available on pubic websites. These documents will include revised project design documents, grievance procedures, stakeholder consultations, announcements and meetings as well as information pertaining to the AFEP program. Current critical weblinks for project documents include[69]:

- Draft project design document in Bahasa: www.nad.go.id/uploadims/
- Draft project design document in English at Climate, Community & Biodiversity Alliance Project Web-Page: http://climate-standards.org/projects/index.html
- AFEP at the World Bank: http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=73230&theSitePK=226309&menuPK=287103&Projectid=P098052
- The Government of Aceh: www.nad.go.id (general)
- Multi-Donor Trust For AFEP: http://www.multidonorfund.org/p-forest.html
- Fauna and Flora International's Indonesia program: http://www.ffi.or.id
- FFI's Aceh Program: http://www.ffi.or.id/pusatdata/11/

Project design documents and non-proprietary/non-confidential information will be publicly available in hard copies at the offices of Fauna and Flora International. The AFEP project director will be the primary contact for requesting and accessing project documents. The Governor's office has posted a Bahasa version of the draft project design document on its website and an English version is available at the CCBA website. Both of these sites will update the project design documents as they are completed, translated and made available. Public comments and validation reports will also be posted at the Climate, Community and Biodiversity website. As much as practical, information will be made available on a timely basis.

In some cases, certain information may be selectively withheld from the public for the following reasons:

- Information is pre-mature and could raise unrealistic expectations without certain project finance for implementation. For instance, in the design stage of this project, it is unwise to release detailed information project finance, so as to not raise expectations of Achenese people before there is a substantial likelihood this REDD project might commence.
- Information is not yet fully-developed or "ready" to be publicly available. Some collaborations (such as the project proponents work with insurance agencies and monitoring institutions) have not yet been fully implemented and approved by various organizations. This information will be provided once agreements have been signed and organizations have agreed to publicly disclose this information. Another example of this is an Emission Reduction Purchase agreement (ERPA) - there would need to be some constraint exercised in sharing this information at various stages in the process.
- Some project information is proprietary. Some project information is a valuable asset in confidence that project proponents have invested in that would lose value if

[69] *Efforts will be made to keep these links active in project documentation*

released. This information may be related to novel monitoring systems, financial tools, legal opinions, and other types of information.

4. Management Capacity & Experience

4.1 Management Capacity

4.1.1 Aceh Provincial Government

Aceh is democratically-elected Provincial government with a commitment to project activities as the lead project proponent. The current governor, Yusuf Irwandi, has provided overarching project leadership and vision.

4.1.2 Fauna and Flora International

Board or Trustees of the Organisation: Patron: Her Majesty the Queen (UK), President: Lord Cranbrook, Vice- Presidents: Emmanuel O A Asibey (Ghana), Lady Scott (UK), Sir David Attenborough (UK), Professor Frederick Kayanja (Uganda), Professor Grenville Lucas OBE (UK), Miriam Rothschild (UK) Ralph Daly OBE (Sultanate of Oman) David Bellamy OBE (UK) Gerard Bertrand (USA), Richard Fitter (UK).

FFI is registered in the UK, and USA as a Charity. In the UK the charity was established by the trust deed in 1903 and was registered with the Charity Commission on 13 May 1992, Registered Charity Number 1011102. The Charity was incorporated as a private company limited by guarantee on 13 January 1992, Registered Company Number 2677068. DUNN number is 068497069. FFI legally operates in Indonesia under a Memorandum of Understanding with the Ministry of Forestry and LIPI since 1996.

FFI acts to conserve threatened species and ecosystems world-wide, choosing solutions that are sustainable, based on sound science and take account of human needs. FFI has around 100 staff based in Indonesia. FFI has considerable experience in the management of civil society grant for biodiversity conservation through its management of the BP conservation award program, the FFI flagship species fund and the Arcadia fund for land purchases for conservation.

FFI has successfully implemented several GEF medium sized projects on behalf of UNDP and the World Bank in Asia (Indonesia, Vietnam, Cambodia) focused on landscape-based conservation, protected area management and integrated conservation and development. In collaboration with German Bank for Reconstruction, FFI is providing technical assistance to a 12 million Euro government implemented conservation project focusing on protected area management, forest law enforcement and community forestry in the Phong Nha – Ke Bang World Heritage Site landscape in Central Vietnam.

4.1.3 Carbon Conservation Pty Ltd

Carbon Conservation, through its wholly owned subsidiary The Carbon Pool, has over six years experience in the carbon market, and has initiated and managed a globally significant avoided deforestation project in Queensland, Australia under the Australian Government's Greenhouse Friendly initiative. Company personnel also have extensive experience in sustainable reforestation, management of carbon projects, integrated conservation projects in developing countries, international standards and methodologies, and finance.

4.2 Appropriate Scale of Management Experience

4.2.1 Aceh Government

Provincial and local governments were significantly affected by the devastating tsunami. Many government staff were killed and many government offices were washed away or severely damaged. Since April 2005 the Aceh-Nias Rehabilitation and Reconstruction Agency has worked closely with provincial government to support, strengthen and build capacity of government staff to effectively manage the province and its resources. The mandate for BRR ceases in April 2009, and the exit strategy is currently in progress. BRR's activities are focused on social development and building government capacity to ensure a smooth transition when the handover takes place. Obviously, a major thrust of the transition from a post-Tsunami Provincial economy is to a sustainable green Aceh that this project attempts to implement.

Aid agencies and NGOs have also focused many of their efforts on empowering provincial and local government capacity. Activities have been designed to develop effective and accountable governance, focusing on strengthened legislative processes, increased government competencies, transparency and eliminating corruption. These attributes of the post-Tsunami Aceh will help the project proponents continue to design and implement this proposal.

4.2.2 Fauna and Flora International

FFI in Indonesia has implemented conservation projects since 1996 focusing on law enforcement, protected area management, and buffer zone development. FFI's largest project in Indonesia, the Aceh Forest and Environment Project, is the largest World Bank funded project in the Indonesian forestry sector and with 13 million USD (including co-financing) is the largest NGO implemented project in Asia.

FFI has encouraged the provincial Government of Aceh to commit to reducing deforestation through the development of a carbon financing mechanism. FFI and associated Indonesian NGOs have assisted the provincial governments to select a portfolio of project sites eligible for carbon financing for avoided deforestation, and facilitated a district level consultation process for the development of this proposal.

FFI staff have significant experience in working in Aceh. FFI has considerable experience in the management of civil society grants for biodiversity conservation. The FFI office in Aceh has a staff of several dozen people and has been operating in Aceh for almost a decade.

4.2.3 Carbon Conservation

Carbon Conservation through its subsidiary Carbon Pool designed and implemented an avoided emission project in New South Wales, called "Minding the Carbon Store" This avoided deforestation project has given Carbon Conservation unique insights and capabilities in respect of REDD projects and the carbon trading opportunities arising. This project entailed:

- development of project documentation
- implementation of information management policies and procedures
- establishment of risk management structures
- field measurement of carbon stocks
- development of legal arrangement for purchase of Carbon Rights from landowners under relevant government legislation
- undergoing independent verification of emission abatement through the project
- trading around 1 million tons CO_2e of carbon credits, principally to Rio Tinto Aluminum

Emission reductions were verified and approved under the Australian Government's Greenhouse Friendly initiative.

4.3 Project implementation, responsibilities and budget

4.3.1 Management and Implementation

The project will be managed by establishment of an Ulu Masen Implementation Board (UMIB)[70] that comprises the three project proponents and other entities to be decided. It is expected also that UMIB will include representation from local stakeholders and will be chaired preliminarily by Governor Irwandi. The UMIB will be constituted to provide appropriate oversight, allocation of responsibilities, and monitoring of the project (financial, legal, etc). The UMIB will as early as possible, identify that the project has all the critical components and appropriately-skilled technical staff to carry out all aspects of project implementation. The UMIB will also strive to ensure a smooth transition from the post-Tsunami recovery period to a more sustainable operation. It is expected that many of the safeguard, policies, staff and other components of AFEP, as appropriate will be used in project implementation and monitoring. Some of the most pressing technical skills required by the project include: project management, legal and financial oversight, conservation and community development specialists, GIS specialists, carbon stock specialists, carbon finance experts, biologists and others.

Some of the most immediate and pressing activities the ULIB will undertake include:

1. Legal creation of the ULIB
2. Allocation and establishment of management, oversight, staff and financial resources
3. Development of several departments/committees, including:

    - A system for receiving and dispersing funds, including those associated with IUPJL licenses
    - A vigorous stakeholder process that includes early and often engagement with all relevant stakeholders in a constructive manner (including appointment of a public information office and ombudsman)
    - A science, measurement and monitoring branch, with a focus initially on collecting initial conditions, and subsequently on all the monitoring programs mentioned in section 9.0. This department or committee will have oversight and responsibility for a range of critical activities, including airborne and remote sensing image acquisition and analysis, carbon, biodiversity and ecosystem services, community impacts, leakage, and other aspects as needed.
    - Other departments as needed (e.g., legal departments, human resources, advisory boards).

4.3.2 Responsibilities

In the first stage of the project, allocation of responsibilities will primarily be as follows:

- Aceh Government. Responsible for overall direction, management and supervision of project. Lead partner on spatial planning and provincial law, implementation of illegal logging controls, facilitation with Government of Indonesia, management of UMIB.

[70] *Name may be changed*

- FFI. Responsible for community-based conservation and spatial planning in select districts and areas, capacity building, GIS, biodiversity expertise, relationships with ODA.
- Carbon Conservation. Responsible for project design, carbon stock and flux estimates, carbon finance and sales, and assistance with legal structures and partner relations, engagement of private sector.

4.4 Preliminary Budget Items (2007 to 2012)

A preliminary budget has been developed and is populated with projections on anticipated project costs. These are only representative figures and are likely to change considerably with project implementation. In terms of revenues, we anticipate around 48% will come through ODA, 5% from a strategic first partner, and 47% from sales of VERs. Project proponents have a developed sales and marketing strategy. We also anticipate significant departures from our revenue and costs estimates.

Project Activity	2007-2012 Project Costs
1. Project Initiation	
Concept origination and testing	$110,000
Partnership design and stakeholder consultation	$281,000
Institutional framework establishment	$250,000
Grant ODA writing	$256,500
Project Design Writing	$298,000
Carbon Stock Calculations (IPCC Tier 1+, 1st year; IPCC Tier 2, 2rd year)	$238,000
Initial community consultations	$143,000
GIS consulting	$140,000
Allometric and carbon stock consultant	$85,000
CCBA audit	$50,000
VER pre-sales	$88,775
Identification of beneficiaries (of the 60 mukims in five districts)	$175,000
Research deposit accounts system	$170,000
Partnership capacity assessment and development	$175,000
Policy framework for community forest mgt & certification	$220,000
Subtotal - Project Initiation	$2,680,275
2. Project Implementation and Operation	
Technical assistance	$3,950,000
Govt administrative costs	$1,500,000
External auditing and assessment	$250,000
VER sales (costs and commission)	$4,195,000
Subtotal	$9,895,000
3. Monitoring and measurement systems	
Carbon IPCC Tier 3 5th year	$275,000
Remote monitoring and information management	$610,000
Airborne monitoring (incl ultralight aircraft)	$1,500,000
Institutional monitoring	$225,000
Government monitoring	$195,000
CSO monitoring	$150,000

Subtotal	$2,955,000
4. Project Activities	
4.1 Prevention of legal logging (spatial planning & reclassification)	
Legal work to assist Provincial government	$325,000
Forest land designation	$420,000
Community forest land mapping	$340,000
Forest land demarcation	$320,000
Sustainable Timber Production Fund	$305,000
4.2 Prevention of illegal logging	
Joint Community/Ranger patrols	$360,000
Village deposit accounts	$4,750,000
Beneficiary deposit accounts	$5,750,000
Community Development Funds	$7,000,000
Alternative livelihood fund (e.g., shade coffee)	$2,000,000
4.3 Reforestation, mangrove restoration, orchards	
Technical assistance (seed banks, workshops)	$1,300,000
Community sustainable logging	$2,600,000
Community-based forestry funds	$500,000
Subtotal	$25,970,000
5. Hand-over Phase	
Analysis of lessons learned	$125,000
Legal framework for post-2012	$180,000
Brokering Financial partnerships	$275,000
Subtotal	$580,000
Grand sub-total	$42,080,275
Administration and Travel (15%)	$6,312,041
TOTAL	$48,392,316

5. Legal Status& Land Tenure

The Government of Indonesia's new legislation on forest planning, management and use (Government Regulation PP6/2007) provides a key legal basis for the implementation of this project. This regulation authorises provincial and district governments to issue IUPJL licenses (*Izin Usaha Pemanfaatan Jasa Lingkungan* - Permit for Ecological Service Utilization) for storing and absorbing carbon in both production and protection forests. The Special Autonomy Law for the Province of Aceh, passed in 2006 following the cessation of the armed conflict between GAM and the Government of Indonesia and the holding of free elections in Aceh, provides a further important legal basis for the retention and equitable sharing of funds generated through REDD carbon financing within the province.

Under present Indonesian law, it is possible for Provincial and District Governors and Regents to issue an IUPJL, a license to exploit environmental services including carbon sequestration. This law was put in place primarily to enable reforestation projects to claim carbon credits. According to preliminary legal advice IUPJL can be issued for periods longer than 30 years, where required for other environmental services. While no 100-year IUPJL license have yet been granted, project proponents are committed to working toward this outcome.

The project has the approval of the Provincial Governor and is being developed in consultation with districts, mukims and kebupaten. Governor Irwandi submitted a letter to the Government of Indonesia and approval is expected in early 2008, given the publicly-stated schedule of Indonesia for developing pilot REDD projects.

In terms of implementing laws, regulations and decrees, the Governor's Decree for new Provincial Spatial Plan (Keputusan Gubernur Provinsi Nanggroe Aceh Darussala) provides the authority to carry out most core project activities related In terms of participatory forest management process, Quanon No. 4/2003 establishes *Mukims* as legitimate stakeholders with defined roles in forest management.

This project will not require any involuntary relocation of people or communities. This project will not knowingly break any laws in its design or execution.

Project proponents have retained legal counsel that provided the project with legal opinions on key legal dimensions of the project. While we recognize that are some risks, we feel these risks are manageable and provide confidence in the project activities. The project will continue to retain legal counsel over the course of the project and has established a budget line-item for this work.

In-Migration

The project could potentially cause migrants into the project area if deposition accounts and improved livelihoods are evident enough (or perceived to be) to overcome family, community and other tiers. Project proponents believe that social norms in the area and the social cohesion that is part of everyday life in villages (in and outside the project) are strong to deter significant in-migration. Additionally, the project will have some time to develop systems to detect and respond to in-migration, since the bulk of payments will be made after rates of deforestation are verified (that is, after they occur).

6.0 Net Greenhouse Gas Changes From Project

The net carbon emission reductions from the project are conservatively estimated to be 27,546,438 over 30 years (see **Table 9**).

Table 9. Forest Carbon in Ulu Masen, Aceh (2008-2038; Baseline and Project Scenarios)

	2008 Current Stocks	2038 Stocks	Emissions	Project Emission Reductions	Worksheet Reference
Baseline	140,771,670	108,364,096	32,407,574	N/A	Worksheet H134 and T134
Project	140,771,670	135,910,534	4,861,136	27,546,438	U134 and V134

Under the baseline assumptions as stated above, at the end of 30 years there would be 108,364,096 tons of carbon. And under the project scenario, where 85% of all deforestation is stopped, there would be 135,910,534 tons of carbon. Thus, the project expects to generate 27,546,438 tons of avoided carbon credits over 30 years (the difference between baseline scenario and project scenario). This is equal to 101,095,427 CO_2 credits, using (22/6) to

convert from carbon to carbon dioxide. Assuming linear deforestation and avoided deforestation (as we do), this equates to 3,369,848 tons of CO_2 avoided per year.

In addition to the difference between the carbon emission reductions from deforestation, net CO_2 impacts must also account for two other variables: project emissions (emission generated from project activities such as monitoring flights and international travel) and leakage. As noted in previous sections, project proponents have developed substantial reserve and buffer systems to help mitigate these concerns.

6.1 Project emissions

The predominant project emissions are international flights for project staff and consultants, emissions from the project's monitoring aircraft. Lesser emissions come from domestic flights from project staff and consultants, project vehicles and motorbikes, and other activities. Over the project period of 30 years, we estimate these emissions will not exceed 29,448 tons of CO_2. To be conservative, this estimate was derived by estimating all obvious projected activity data and emission factors, and then adding 200% more emissions to be highly conservative. All documentation and calculations are referenced either in the appropriate part of this document (for example in carbon stocks and baseline sections) or are cited in the noted worksheets.

6.2 Non-CO_2 gases (CH_4 and N_2O)

The project does not expect non-CO_2 gases to be more than 15% of the project's overall greenhouse gas impact. The most likely source of non-CO_2 gases would be in avoided N_2O emissions by preventing the establishment of palm oil and rubber plantations and subsequent application of fertilizers. Project proponents are looking into whether nitrous oxide emissions from palm oil and other replacement land use systems could be more than 15% of expected greenhouse gas impact. At this point, we do not assume they are. we feel this is a conservative assumption for the following reason. It is our understanding that the predominant non-CO_2 gas associated with either the project or the baseline scenario would be fertilizer-caused nitrous oxide emissions in the 73,000 hectares of palm plantations and 158,000 hectares project to go to "scrub". Since these are emissions that would occur in the baseline and will not occur (or will occur to a lesser extent) with the project, the emission reduction estimates we project are more conservative.

6.3 Estimating and Mitigating Leakage

Current UNFCCC policy only requires emission reductions from developed countries. Depending on various national account and rules used, some of these developed countries could see the cost of forest-sector emission rise. Thus, there is already a clear form of market leakage that could drive industries to relocate from wealthy countries to less developed ones with no "caps". Often, less developed countries have lower efficiencies in forest operations, compounding the situation. Thus, any international market leakage caused by *this* project should be compared against the existing leakage potential caused by existing global climate change policy that has varying commitments for different countries. Leakage will always exist - for all sectors - in a world where not all countries are equally carbon constrained. And since we live in a day where this is not politically acceptable or possible, leakage is an inherent artefact of the world we live in. Even if leakage can not be perfectly conceived or measured, this should not be a rational for slowing down compelling climate change mitigation strategies.

6.3.1 Overview of project proponents' understanding of leakage

Concerns have been expressed that LULUCF projects may only produce greenhouse gas benefits that are illusory due to a phenomenon known as “leakage”. The Intergovernmental Panel on Climate Change (IPCC) Special Report on LULUCF defines land use leakage as "…the indirect impact that a targeted land use, land-use change and forestry activity in a certain place at a certain time has on carbon storage at another place or time” (IPCC 2000, section 2.3.5.2, p. 71). In another section of this report the IPCC defines leakage as the “unanticipated decrease or increase in GHG benefits outside of the project’s accounting boundary … as a result of the project activities.” (ibid., section 5.3.3, p. 246).

Causes: activities or policies

Although leakage is often thought of primarily as a project-based concern, unintended GHG fluxes can occur with the adoption of regulations or policies. The Kyoto Protocol and UNFCCC could push certain commercial forestry operations to relocate to developing countries where they would be unencumbered by GHG liabilities. Project proponents will employ specific project activities (such as restoration in specific areas or increased enforcement) as well as policies (spatial planning and rezoning).

Effects: positive or negative

Leakage is often considered undesirable, meaning more emissions or less sequestration. This type of leakage is called *negative leakage* and project proponents will seek to avoid this type of leakage. There are also situations where off-site outcomes may be *positive* (more emission reductions, more sequestration). For example, the Ulu Masen proposal may stimulate other areas (in Indonesia or elsewhere) to adopt integrated conservation program using carbon finance.

“POSITIVE” ECOLOGICAL LEAKAGE AND TROPICAL FOREST CONSERVATION

While most studies discuss leakage as something negative (increased emissions or decreased sequestration) from conservation projects, there is evidence that forest conservation can lead to increased sequestration or less emissions (positive leakage) in areas outside the project boundary.

Deforestation in one area can lead to “edge effects” on forests left standing. Edge effects are changes in a forest community occurring at the border of forests left standing. Edge effects are often damaging to the remaining forests. One study showed that deforestation caused tree mortality in the area deforested and contributed to substantial biomass declines, and therefore greenhouse gas emissions, in *surrounding* forests (Laurance et al, 1997) Protected forests in a project area may also maintain favourable micro-climatic conditions that aid the resiliency of other regional forests (Lawton et al, 2001).

Core protected forests also can support pollinators and insectivores (such as bats) that make nearby agricultural areas more productive (Rickets et al, 2002). Maintaining forests can also control flood and erosion. These factors may negate the need for new land conversion. Thus, there are numerous ecosystem feedbacks from forest conservation that may secure secondary benefits that ultimately can reduce emissions or increase uptake in areas outside the strict project boundary.

Mechanisms

Unintended GHG fluxes from the Ulu Masen project are likely to arise through two principal avenues:

- **Activity shifting**: A project or policy can displace an activity or change the likelihood of an activity outside the project’s boundaries. The most frequently cited example of leakage from a forest conservation carbon project is that forest protection could cause deforestation to move from protected forests to a nearby forest, with no net GHG benefit.

- **Market effects**: A project or policy can alter supply, demand and the equilibrium price of goods or services, causing an increase/decrease in emitting activities elsewhere. For example, if a large forest conservation project reduces the local timber supply so that demand is unmet, this may increase prices and pressures on forests elsewhere.

In economic terms, market-driven leakage is mediated by a change in the price of goods; whereas activity shifting is when human or other capital changes location. Importantly, these two leakage types may in some cases be inversely related (notably in the case of forest conservation). If a project displaces people and activities to adjacent areas, market leakage may diminish. This is because activity-shifting leakage moves economic activity while market leakage occurs through net changes in production for a given regional distribution of activities.

Two other types of leakage bear mentioning, even though project proponents do not intend to measure them:

- **Life-cycle emissions shifting:** Mitigation activities increase emissions in upstream or downstream activities (e.g. a forest conservation project leads to increased road traffic from tourists or a reforestation project increases the operation of machinery creating fossil-fuel emissions);

- **Ecological leakage.** Ecological leakage is a change in GHG fluxes mediated by ecosystem-level changes in surrounding areas. In an example of positive ecological leakage, stopping deforestation can prevent carbon emissions in forests *adjacent* to the intended protected forests (see Box). An example of negative ecological leakage would occur if a carbon plantation introduces a pathogen to surrounding forests, leading to their decline and a net carbon release to the atmosphere. The magnitude of ecological leakage compared to other types of leakage has not been studied.

6.3.2 Project leakage management

Project proponents will use appropriate tools for to *prevent*, *estimate*, *detect* (monitor) leakage, and then *adjust* net climate benefits as needed.

6.3.2.1 Preventing leakage

The main way this project will address leakage is by preventing it with a large-scale, integrated project. The Ulu Masen project is large enough to eliminate activity-shifting leakage from one mukim to another, though leakage may still occur outside the project area of course. Project proponents have also proposed a holistic suite of integrated activities (forest conservation, forest restoration, sustainable community forest management) which we believe will alleviate leakage and increase the overall project success. In Ulu Masen, our integrated approach may help alleviate the two leading types of leakage probable from the project: market impacts and activity shifting. This project will decrease logging of natural forests which could theoretically decreases the supply of forest products (price increase). At the same time, we are proposing accelerated planting of trees, orchards, mangroves and fruit farms as well as developing sustainable community forest management, including possibly timber production. These activities are likely to increase the supply (price decrease). These counter-acting forces could lead to a leakage-neutralizing situation, where market effects of halting deforestation offset opposite market effects of plantations and/or reforestation. The project's integrated approach could also minimize activity-shifting leakage. With more forest resources being sustainably grown and managed, there will be less need for loggers to move their operations to other areas.

The Governor of Aceh has declared a moratorium on all logging in natural forests and set in place a mechanism for the full review of the Province's forest sector. The Governor has made both implicit and explicit commitments to reduce the area of forest zoned for logging and conversion and to restructure tenure arrangements for and beneficiaries of forest

management. Spatial and land-use planning at provincial, district and *Mukim* levels and the approval of these plans by appropriate *Mukim*, district and provincial forums will ensure that forest conversion and plantation development is not simply moved from the Ulu Masen pilot area to other locations in Aceh. Leakage of project benefits to other parts of Indonesia is expected to be managed within the Government of Indonesia's REDD strategy.

6.3.2.2 Estimating Leakage

Estimating leakage is difficult with current uncertainty in academic and policy spheres regarding forest leakage understanding and methodologies. Thus, at this stage we cannot provide a scientific quantitative estimate of the amount of leakage we anticipate. This would depend on the scale that leakage must be measured to be credible, types of leakage that must be monitored, and specific methodologies required. To be conservative and transparent - without developing analyses that are counter-factual economic models in a policy environment with massive uncertainty - we estimate negative leakage from the project will be less than the positive greenhouse gas benefits the project will generate and not sell, such as those from reforestation and sustainable forest management. This will allow us (see below section 7.2.2.4) to demonstrate that when do detect leakage, we have a legitimate proposal to mitigate these impacts.

We believe the two most critical types of leakage caused by the project will be out-migration of illegal loggers (activity-shifting) and possible increases in forest products for the short-term (until reforestation and sustainable forest management programs are at sufficient scale. It is estimated that these two types of leakage will occur in the first five years of the project. As a first order approximation, we do not believe negative leakage from activity-shifting or markets will exceed 10%.

6.3.2.3 Monitoring Leakage

Since projects can not necessarily prevent leakage altogether, careful monitoring and measurement can provide the basis for adjusting GHG benefits accordingly. We will use several approaches. First we will expand the geographic scale of monitoring beyond project boundaries to capture regional effects through remote sensing or analysis of nearby (northern Sumatra) non-project areas. This method has been explored in the Scolel Te Project in Mexico. Although expanding the boundaries for monitoring may capture activity-shifting and market leakage effects, it is often difficult to isolate impacts of project leakage from other exogenous factors that affect markets and land use (e.g. demographics, access, policies, markets for agricultural products or a host of other factors). The definition of boundaries for monitoring and the interpretation of results present considerable challenge. To address this, we anticipate an evolutionary process of generating and using data, following academic and policy discussions, and designing an adaptive approach to leakage.

Specifically, project proponents will continue to monitor rates of deforestation outside the project area to see if these rates increase, decrease, or remain steady. We also may establish permanent plots of employ remote sensing techniques to try to detect activity shifting outside the project area. The project may also track *activities of resource users* affected by project activities as an effective means for capturing activity-shifting leakage. For more information, please see section 9.0.

6.3.2.4 Deducting leakage from net project greenhouse gas benefits

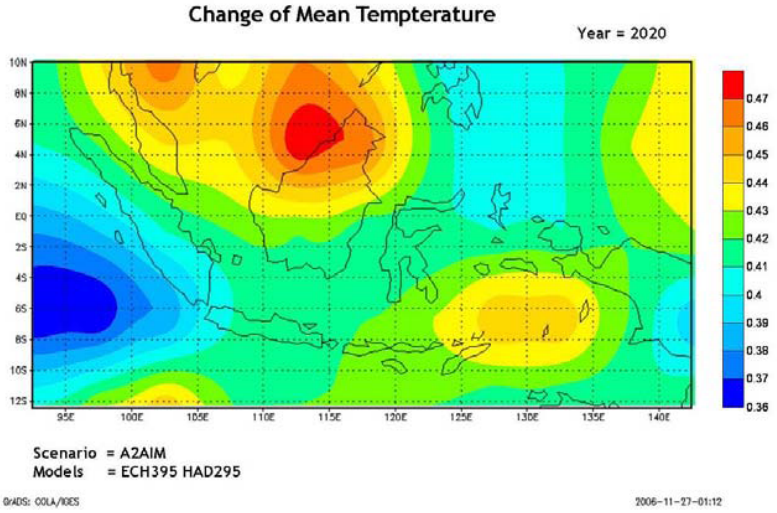
As stated in the section on risk management, a credit reserve comprising 20% of credits generated by the project will be held pending reconciliation of the project level accounts

against the national baseline. Project proponents believe this is a responsible way to ensure we can "cover" any detected leakage as the project matures.

Further, as noted in the section on project activities, while VERs from this project are generated solely from "avoided deforestation", the project is an integrated land use concept. Project activities such as reforestation, fruit and orchard support, spatial planning and community grants are noted for probably low levels of leakage71. Project proponents are not seeking to claim credit for these sequestering activities at this stage[72]. With current uncertainty regarding leakage methodologies for forest conservation projects, it is important to have a source of compelling climate benefits that can be used to mitigate, or compensate for, any leakage measured. Our working assumption is that negative leakage will be less than increased carbon storage and sequestration in other (reforestation and sustainable forest management) project activities.

6.4 Adapting to Climate Change

Climate change may alter the environment in Aceh. Although regional climate models vary in their projections, most agree that the area will get hotter on average. Indonesia is expected to witness modest rises in mean temperatures by the year 2020. An example is provided below. This project fundamentally will help Sumatran fauna and flora adapt to climate change. By conserving the largest contiguous block of Sumatra forest at the northern end of the island, the ability of climate-sensitive species to adapt will be enhanced.



Source: Susandi 2007

The project will continue to monitor climate change over the 30-year project period and respond accordingly as part of its commitment to an evolutionary adaptive management project. For instance, climate change could cause higher temperatures, an increase in pests or declines dry season rainfall. The project would ideally respond to these by encouraging measures such as planting crops or trees that are heat-, pest-, or drought-tolerant.

[71] *R. Schwarze, J. O. Niles, & J. Olander. 2002. Understanding and Managing Leakage in Forest-Based Greenhouse Gas Mitigation Projects.* Philosophical Transactions of the Royal Society, Series A **1797**:1685-1703

[72] *We reserve the right to do so depending on project and policy developments.*

7.0 Community Impacts, Stakeholders & Capacity Building

Stakeholder consultations have begun about the proposed project in multiple venues and forums. FFI has conducted a stakeholder consultation workshop at provincial level involving all 4 districts for the development of REDD pilot project including community leaders as well as local government. The land use planning process in Aceh is striving to be a fully participatory one, where communities are empowered to help plan and execute land-use decisions.

7.1 Safeguards and Stakeholder Consultation Process Framework

FFI's ongoing Aceh Forest and Environment Project which is funded by the World Bank Aceh Multi-donor Trust Fund triggers several World Bank environmental and social safeguard policies. The project has been designed to find an appropriate balance between protecting forests and providing economic benefits to local communities and has no intention to displace people or restrict their livelihood opportunities. Nevertheless, a "process framework" has been developed to document procedures, consultations and activities to ensure compliance with Bank safeguards policies. The Framework outlines the criteria and procedures to ensure that any adverse livelihood impacts are avoided through consultation or mitigated through targeted assistance efforts for affected persons. Multi-stakeholder Advisory Councils with representatives from communities, traditional leaders, and local government institutions will help to ensure appropriate transparency and consultation. FFI has the experience and capacity to understand and apply World Bank safeguard policies and devise appropriate mitigations. The framework also addresses gender issues and consultative processes for responding to gender concerns and incorporating women's voices into project activities.

The project aims to use the same "process framework" developed under the Aceh Multi-Donor Trust Fund to implement this forest carbon project. We will seek to ensure the equitable and effective sharing of benefits from carbon financing schemes such that communities living in and around the forests can improve and sustain their livelihoods. We will use the process framework to ensure communities are provided incentives to support and actively engage in the conservation and management of forest carbon. We also will consult with other stakeholders that are key to the project's ultimate goal of reducing deforestation through community driven change. For instance, we will consult local and provincial authorities to help them develop the resources and political mandate to manage Aceh's forest estate sustainably. They will be encouraged to exercise their mandate in a transparent and equitable manner

The development of equitable carbon financial distribution mechanisms requires certain key issues be addressed through a collaborative stakeholder dialogue:

- Indigenous people, local communities and civil society organizations must be encouraged and supported to participate fully and actively in the development of distribution mechanisms for avoided deforestation finances. Early on in the project implementation, the oversight body (Ulu Masen Implementation Board, UMIB) will begin a series of workshops and meetings to better define how stakeholders should be defined, identified, engaged and encouraged to fully engage project design and implementation. Preliminary categories of relevant stakeholders and definitions of these categories include:
    - Private actors, defined as persons or institutions engaged in commercial activities. These stakeholders will be essential for bringing additional resource to bear on a positive project outcome.
    - Traditional avenues, defined here as mukims, associations, and other customary organizations that already exist in the project area and can be a forum for dialogue and involvement in project design and activities.

- Traditionally under-represented individuals or groups, defined here as any person or constituency that has been or is likely to be marginalised in decision making. Groups could include women and women's' groups, illiterate and destitute people, and people whom are discriminated against. A clear emphasis will be placed on engaging individuals who are most reliant on forest resources and most likely to be negatively impacted. Governor Irwandi has devoted substantial efforts to helping tsunami-orphans.
- Government agencies, including relevant national, provincial, district, sub-district and village agencies, including law enforcement, planning, forestry, and others.
- Civil society, non-governmental and academic constituencies, including wherever possible groups that are constructively critical of the project. These groups may be formally incorporated (groups such as Telepak, CIFOR, universities) or informal organizations.
- National and international groups as appropriate.

- Prior informed consent based on customary land tenure arrangements and resource access rights of local communities must be sought prior to the establishment of carbon forests or other substantive changes in land use.
- Robust, transparent and accountable systems for the allocation and tracking of distributed funds.

A list of initial proposed stakeholders project proponents will engage are listed:

Stakeholders to be Included in Project design	**Contact**
Mukim groups of Aceh Besar	Cipta TS
Mukim groups of Aceh Barat	T. A. Hadi
Mukim groups of Pidie	M. Sabee Basya
Mukim groups of Pidie Jaya	Syarifuddin
Jaringan Komunikasi Masyarakat Aceh (Aceh Community Communication Network)	Budi
Head of Aceh Besar district	DR. Tgk. H. Bukhari Daud M.Ed
Head of Aceh Barat district	Ramli MS
Head of Pidie district	Mirza Ismail S.sos
Head of Pidie Jaya district	Salman Ishak M.Si
Agency for Development & Planning (Bappeda) Aceh Besar	Bayu
Agency for Development & Planning (Bappeda) Aceh Jaya	Baehaqi oemar
Agency for Development & Planning (Bappeda) Aceh Barat	Burhanuddin
Agency for Development & Planning (Bappeda) Pidie	Maimun Ibrahim
Agency for Development & Planning (Bappeda) Pidie Jaya	
Forestry Dept. Aceh Besar (Dinas Kehutanan)	M. Adil
Forestry Dept. Aceh Jaya	Dahlan Sufi
Forestry Dept. Aceh Barat	Ir. Rasidin Hasyim
Forestry Dept. Aceh Pidie	Amin Affan
Forestry Dept. Pidie Jaya	
Aceh Provincial Forestry Dept.	
Aceh Provincial Bappeda	
Team "Redesign" forestry in Aceh	

Institute for Natural Resources (INEF)	Fauzi Harun
WALHI NAD	Bambang Antariksa
Researchers and Scientists (CIFOR / ICRAF)	
Aceh Women's Group	
Small holders	
Private sector (loggers, sawmills, businesses)	
Representatives from other Government agencies	
Intergovernmental Agencies	
Other groups as determined by the UMIB	

Developing and maintaining a process for engaging stakeholders is critical to ensuring that the project does not engage stakeholders in a token manner, but that truly brings in the diversity and wealth of creativity and knowledge in Aceh. A serious commitment and involvement of people in and around the project area is essential to the project's ultimate success and to realization of a successful and fair new sustainable economy in Aceh. Some of the ways the project through the ULIB will seek to seriously engage a broad and deep cross-section of Aceh people, include:

- Public forums and consultations at various levels (from the Province to the village)
- Public notices and legal announcements in papers, records of law or legislature, etc
- Grass-roots channels, including civil society, non-governmental, and others
- A public information campaign that describes climate change, the proposed project, how it is being run, its main goals, ways to be involved, employment and other opportunities, explanation of incentive and payment schemes, explanation of the consequences for forest loss or degradation, monitoring systems and ways to express grievances and complaints.
- Monitoring of project activities.
- A project implementation plan that will be updated on a semi-regular basis.
- Innovative outreach programs such as children's plays, performances, art projects, religious outreach, and extension work that takes advantage of Aceh's customs and institutions.

In addition to these measures, project proponents are committed to having independent review of community engagement in the project. We feel this is important for a healthy and successful project and to build external confidence in the project implementation. There is a perception that forest carbon initiatives could lead to negative social outcomes. This project will seek to challenge that perception through concerted community engagement efforts and external and independent review.

7.2 Direct financial support to communities and stakeholders

Once project proponents acquire adequate carbon finance and or other resources, the "process framework" described above will develop a process for deliberating, discussing and making decisions about how best to engage stakeholders, and ultimately to oversee the distribution of carbon finance. The Governor of Aceh has championed the development of a policy environment and legislation that recognize the critical role that forests play in people's livelihood, and the need to recognize customary forest resource rights. At the Governors' Roundtable on Climate the Governor reinforced his commitment by signing a joint declaration

that recognizes the rights of communities to forest resources and the critical role of local communities in forest management.

Avoided deforestation financial incentive schemes will provide rewards or compensations through regular payments into community funds or community projects. However, in certain cases and depending on expressed needs, non-monetary benefits such as support for improved health care or scholarships for education might be more culturally appropriate.

The project will facilitate local communities to participate in spatial planning and the development of district and *Mukim* land use plans. FFI and its partners will conduct appropriate participatory learning (PL) processes in forest fringe communities to facilitate a public consultation process at the grass-root level to define equitable distributions mechanisms for and targets of financial benefits. The project will document stakeholder participation and emphasise the participation of often marginalised sub-groups such as women, tsunami-orphans, returning internally-displaced peoples, former GAM fighters and their families, migrants and other under-represented minorities.

To address the complexity of providing financial incentives to protect bio-carbon stocks while supporting the livelihoods of forest dependent communities, several funding mechanisms will be designed and tested. These will be based on 'deposition account' mechanisms that have been employed successfully in reforestation projects elsewhere in the region, for example by KfW in Vietnam. It is anticipated that disposition accounts may be established to channel carbon financing incentives and support to a range of initiatives including but not limited to:

- individuals and groups carrying out independent forest monitoring
- CSO's supporting oversight functions
- community development programmes
- sustainable forest management enterprises
- joint forest protection and monitoring
- formal law enforcement operations,
- project management, monitoring and evaluation.

In order to test these mechanisms for channelling incentive payments to effectively achieve protection and sustainable management of forests, the project will use ODA and voluntary carbon credit funds for these deposition accounts. It should be noted that financing these incentive payments will take up a large proportion of the project finance, estimated to be in the region of 50% of the total project costs.

This funding will allow testing of systems prior to engagement with carbon investors through the voluntary market in REDD carbon credits. It is proposed that, depending on the development of the voluntary market for carbon credits over the course of the project, systems established by the project will allow for the generation of carbon credit-based co-financing in the latter years of the project.

Release of funds will be tied to the documentation of measured reductions in deforestation provided through the monitoring systems described above, and in relation to the calculation of reductions in CO_2 emissions.

A number of accounts will be established to provide incentives to local villages for their involvement in forest protection. Determining the eligibility of villages for these various schemes will be important to their success. In the final analysis, eligibility will be determined by evidence of compliance with the forest protection and sustainable forest management

requirements that will be specified in village contracts. For community-based low impact logging operation, FCS certification and independent auditing by an accredited verifier will be important elements of determining eligibility. These may include:

7.2.1 Sustainable timber production fund

A fund will be established to support participating logging concessionaires to introduce the necessary management changes that will allow their concessions to be included in the forest estate. This fund may provide grants or operate as a revolving credit fund to support changes in concession management. The fund will also provide incentive payments to participating concessionaires based on the performance of their concessions in REDD terms.

7.2.3 Financial support to individuals and groups through deposition accounts

Payments for labour on, for example, forest establishment (reforestation and supported natural regeneration), and the involvement of groups and individuals in forest management and protection may be provided through the establishment of deposit accounts.

7.2.4 Revolving loan fund for small-scale enterprise development

These will provide financing for the development of forest compatible environmentally sustainable business, such as improved post-harvest technologies, community-based services for the nature tourism industry, and forest tree and fruit tree nurseries. Micro-credits can be made available to individuals, groups of households or cooperatives. Some of these funds will be available to assist *Mukims*, communities and other organizations that are geographically outside the project area but within its region of influence. For example, small-scale enterprise business loans could be provided to eco-tourism operators in Medan or certified sustainable coffee or timber processing facilities in other parts of Northern Sumatra.

7.2.5 Monitoring and law enforcement deposition accounts

Forest Protection Funds will be established at provincial and district levels to support a wide range of basic operational requirements, including the maintenance and running costs of equipment, patrol and law enforcement incentives, legal and prosecution costs, and other operational requirements currently chronically under-funded. This fund will be established to support and is likely to be managed jointly by the *Dinas Kehutanan*, (Provincial Forest Service, *the Balai Konservasi Sumber Daya Alam - BKSDA* (Nature Conservation Department) and a range of Civil Society Organizations.

7.3 Risks to communities and community members in Ulu Masen

There are two types of risks community members theoretically face – those that occur in the absence of the project and those that occur due to the project. Previous sections have noted the impacts communities will face if unsustainable logging and land use continue.

While the project expects to generate substantial net improvements to the communities in the project districts and province of Aceh, there are some risks to community members from the project. The main risks project proponents have identified are:

1. Loss of employment in unsustainable logging and downstream industries (legal and illegal)
2. Loss of employment in illegal poaching industries

To mitigate these risks broadly, project proponents have in general, tried to ensure that clear and direct benefits from the sale of carbon credits are provided to affected communities. Indeed, the fundamental premise of this project is that with ODA and carbon finance,

communities will live more sustainable and more prosperous livelihoods. For instance, if there are illegal loggers operating in one community, the project hopes that some of the deposition accounts will flow to these individuals. This will be difficult to guarantee upfront, but project proponents are aware that this project will only succeed if people deem it in their best interest to not deforest, whether legally or illegally.

Even if this model of development for Ulu Masen is true and effectively implemented, there will still be certain individuals who face increased hardships and loss of livelihoods due to the project. To help specifically these individuals, modalities for distributing funds from the deposition accounts will be developed in their early phases of the project to identify and assist individuals who are currently deforesting.

7.4 Off-site Community Impacts

As for negative community impacts, the most likely negative *offsite* community impacts will be lost incomes and livelihoods from a reduction in legal and illegal logging in the project area, notably in small-scale wood industries. There may also be some declines in offsite livelihoods of illegal poachers and, processors or traders, as well as users of plants and animals.

Illegal logging and plant and animal trade is something the project inherently is working to reduce. While there may be off-site impacts from reductions in illegal activities, mitigation of these impacts by the project would be difficult to understand since the trade is illegal and difficult to track. The best way for the project to mitigate these harms (setting aside any ethical questions) is by contributing to an overall economy in the region that relies on sustainable use of resources.

The project's most important responsibility for mitigating off-site negative community impacts is for changes outside the project cause by reductions in legal logging from the project area. To help mitigate these, the project will make some of the small-scale community enterprise loans (see section 7.2.4) available to companies, collectives or individuals outside the project area but in northern Sumatra.

7.5 Capacity-Building and Best Practices

Project proponents will strive to bring critical capacity in sustainable forest management to the area. By moving forward with this project, area citizens, academics, government officials and others will have the opportunity to engage a variety of skills and emerging ideas for forest conservation and management.

7.6 Grievances & Complaints

Project proponents are committed to hearing from people and communities in the project area about grievances and complaints they have about design and implementation of the project. The project believes that taking risks and making mistakes is a natural component of such a large endeavor. We believe that an early and effective system for hearing and responding to grievances will help the project respond to issues in a way that can help the project understand and adapt to community concerns.

The project will build off the "process framework" described in section 7.1 to ensure community and individual concerns can easily be directed to the project and are ensured a timely and fair process for review and project modification if necessary. Specifically, proponents will maintain telephone and email complaint channels that are already operational through the process framework. Thus far, the majority of communication through these avenues has been regarding job applications, so there will be greater effort to inform the community how concerns can be addressed (and for that matter, how job applications can be more easily submitted). In addition to these lines of communication, multi-stakeholder advisory councils (see 7.1) will be maintained so concerns can emerge from person-to-

person meetings, rather than through only phone and email systems. These councils strive to help individuals without phone or email access express concerns.

The project will also, as part of the monitoring-arm of the Ulu Masen Implementation Board (UMIB), maintain a list of grievance and concerns received. Whenever appropriate, responses to concerns will be addressed and replied to within 30 days. Every effort will be made to log the complaints and maintain a record, as well as any replies or responses. Finally, the ULIB will appoint an ombudsman for community and individual concerns. This person will not be responsible for handling concerns and maintaining records, but will review these systems and be a strong voice and advocate for community members as regards project design and implementation.

8.0 Biodiversity Impacts & Ecosystem Services

Overall the project expects to create significant improvements to biodiversity conservation by avoiding habitat loss and degradation in northern Sumatra.

8.1 Net Biodiversity Impacts

The net benefits for biodiversity of the project should be largely self-evident and are described in earlier sections. The baseline scenario will witness a substantial amount of forest habitat being destroyed, degraded and fragmented. These outcomes would present an immediate threat to the viability of many species in the area. The project's goal of reducing deforestation by 85% will have clear and compelling biodiversity benefits.

8.1.1 Non-Native Species

The project will use non-native species in community gardens, orchards and other areas of restoration. Non-native timber is likely to be used in sustainable community forestry, as appropriate to the area. The reason for this is that there tends to be better growth rates and more local knowledge about planting some of the non-native species.

8.1.2 Genetically-modified species

The project will not use any genetically-modified species in its operations.

8.2 Offsite-Biodiversity Impacts

The project does not anticipate any off-site negative biodiversity impacts. Most off-site impacts will be positive since larger habitat and forest areas will improve the long-term viability of populations off-site.

8.3 Water and Soil Resources

It is commonly expected that reducing deforestation in natural forests will improve the water and soil resources in the area. Project proponents will collect information on soil and water resources in the "with-project" scenario. Every attempt will be made, by comparison with studies in non-project areas (especially in Sumatra) and a literature review, to determine if the project is having a discernible impact on water or soil resources. For more information, see monitoring **section 9.5.**

9.0 MONITORING

The project has many things to monitor over time, including: deforestation rates (including legal and illegal logging), biodiversity, livelihoods, leakage (especially offsite climate and community impacts), impacts of climate change on the project area (notably fires), participation of stakeholders and civil society in the evolving project design and implementation, and in-migration (people from surrounding communities coming into the project area for instance, just to receive carbon finance).

In addition to monitoring over the project life time, project proponents will continue to improve and revise their understanding of existing community livelihoods, carbon stocks, baseline land use history and assumptions (including a re-evaluation of our "pre-2008" baseline" rates of deforestation for the project area). We will follow discussions on emerging methodologies and combine remote-sensing images, analyses and other methods to generate a more robust deforestation scenario. The project also intends to commission work to understand the contribution of non-CO_2 gases to total greenhouse gas project impacts as well as coarse woody debris and understory vegetation's contribution to carbon stocks. These factors are considered part of the "existing conditions" and work will be accelerated in these areas in order to avoid confounding the existing situation with that of the project.

Development of measuring and monitoring systems, however, are expensive. Carrying out such a wide range of activities will require money, coordination and external review as well as institutional commitment to carry out measurement and monitoring activities and to make such results available (ideally in a peer-review fashion). Fortunately, AFEP has already funding and requirements in place to carry out much of this work. For instance, in terms of monitoring illegal logging and forest change, FFI has already ordered a plane (see below) and begun developing plans for digital images to be used in both detecting (and reporting) illegal logging as well as in estimating land use change. In terms of community and stakeholder involvement, and indigenous rights, Annex 4[73] of AFEP requires several procedural steps (noted below). Wherever possible, project proponents will seek to engage academic or philanthropic resources to assist with monitoring components and to build off of existing studies. Project proponents will place a priority on developing indigenous capacity and learning at local and national universities and institutions. If possible, findings from monitoring activities will be reviewed and published in peer-review journals.

9.1 Development of a Complete Monitoring Plan

Once appropriate ODA, VER, or other (carbon or non-carbon) finance are realized, the Ulu Masen Implementation Board (UMIB) will develop no later than December 2008, a monitoring plan for the project. This plan will synthesize and evaluate pre-existing structures (notably AFEP) and identify gaps in monitoring and measurements. This plan will be a publicly available document (even if it is a "living document" that changes as part of an adaptive management philosophy). One of the primary monitoring activities the project will do includes establishing, equipping and training provincial GIS Units based at provincial forest service offices (*Dinas Kehutanan*) Banda Aceh and other institutions as appropriate. The project will provide training and briefings for provincial and district agencies to familiarize them with the GIS systems and analysis methods. FFI is already providing GIS training to government officials and NGO representatives in Aceh through AFEP and will continue this key activity.

9.2 Monitoring Land Use Change/Illegal Logging

[73] *Process Framework for Complying with World Bank Policies on Indigenous Peoples and Involuntary Resettlement.*

Monitoring in the mountains of Aceh is difficult because of the frequent presence of clouds and the size of the area. Experience in Kalimantan has shown that radar imagery can overcome these difficulties. Radar imagery, likely to be available through GOI from the Australian Government, will be used to assess changes that have taken place over time as a result of forest felling, road building, or even landslides and natural tree falls. Appropriate technical assistance and training will be provided for forest service staff seconded to the GIS Units. The project will equip and train the airborne monitoring teams that are being established by FFI with support from AFEP. This will allow the employment of 'Ultra Light' aircraft and high resolution photography in the assessment and monitoring of carbon stocks, both in the pilot areas and in surrounding forest blocks. This approach will provide even more reliable and timely monitoring capability than radar data, and has been used in Kalimantan over the last few years under the EU-funded "Illegal Logging Response Centre" project. It has proven effective in identifying locations of forest change and assisting government agencies' forest protection efforts.

The *Flight Design* aircraft (**Figure 1**) and photographic monitoring system (**Figure 2**) is currently being developed and tested under the Aceh Forest and Environment Project team by FFI, LIF and partners. It is anticipated that this system will be operational within the next six months.

Figure 1 German engineered CT2K aircraft for monitoring forest cover changes and illegal logging.

Figure 2 Image from Nikon D2 camera mounted on ultra-light aircraft.

Existing airstrips that have been improved and equipped by AFEP will be used as bases for these aircraft and small hangers will be constructed to protect them.

Airborne monitoring will be conducted on a regular basis to allow cross-checking of data provided by analysis of radar imagery. Planes will be equipped with high resolution digital cameras. Proponents are working to see if photographic images can be processed for biomass and carbon stock assessments. Additionally, forest crimes detected during monitoring flights will be reported to participating CSOs, joint community-ranger monitoring teams and forest law enforcement agencies for investigation on the ground.

A range of institutions will be supported or established by the project to provide the necessary capacity to monitor the status of carbon forests and support the assessment through ground truthing of carbon assessments, as well as to support the ongoing protection and management of the forest estate. This may include a Joint Community-Ranger Forest Monitoring program. The program, already partially funded by the Provincial government will establish, equip, and train teams comprising community members and government rangers to monitor and report on forest cover and condition, and human activities, verify information from remote sensing on the ground, and provide a visible presence to support the protection of carbon forests. FFI has extensive experience of the establishment of such teams in Indonesia and the broader Asia region and has found them to be effective. The project will support management of the community forest monitoring programme in collaboration with local communities, district government, *Mukim* leaders and responsible forestry agencies (*Dinas Kehutanan*).

9.3 Climate and Carbon

For carbon stocks and other non-CO_2 gases, project proponents plan and have budgeted to develop IPCC Tier 2 estimates by the end of 2009 and move toward IPCC Tier 3 estimates by 2012. This is an ambitious timeframe and field conditions are rugged in the project area. Our ability to carry this out will be in part be determined by resources available. In addition to tasks outlined in the budget, project proponents will engage academic and philanthropic groups to assist and advise.

To initiate our improved understanding of carbon stocks, project proponents through a monitoring-task force of the ULIB, will develop and implement:

- Use of best practice methods for carbon and biomass measurement, including remote sensing and field based methods for measuring carbon in above- and below-ground tree biomass, soil, litter, dead biomass, and understory vegetation (to see if these are likely to be significant sources of emissions);
- Forest stratification systems based on remotely sensed data to facilitate forest carbon estimates;
- Undertake forest sampling along with data from literature to develop appropriate allometric relationships/equations and area-based biomass estimates of standing and below ground biomass;
- Continued development of allometric equations, partitioning ratios and expansion factors to directly and/or indirectly estimate biomass (from total volume) for forests;
- Development of carbon leakage monitoring, including establishment of off-site representative permanent plots;
- Identify gaps in the information required for measurement and modeling of carbon stocks in forests.

Based on these results, the UMIB will decide how and if to proceed to Tier 3 levels which provide understanding of statistical confidence intervals. Project proponents expect there to

be more developed international baseline methodologies as well as Government of Indonesia modalities developed over the net few years. As part of our monitoring program, we will continue to watch fire rates in the project area, likely to be the most discernible evidence of climate change impacts in the project area.

9.4 Community

In terms of understanding community livelihoods, FFI, AFEP, and other post-Tsunami and post-conflict researchers have been collecting information. Proponents will compile a more complete understanding of communities by the end of 2008 to serve as the original conditions, before core project activities begin to avoid confounding existing or historical conditions with either the counter-factual baseline or the "with-project" future we hope to achieve.

Project proponents are building off AFEP requirements to develop a plan to monitor community outcomes from the project, both within and outside of the project area. We will also develop a system to detect if significant in-migration to the project occurs. Since the project is being led by the Provincial government, project proponents will work to ensure that benefits are shared within and outside the project area to avoid any potential in-migration.

9.4.1 Monitoring forests and timber trade by GOI forest protection agencies

The project will support GOI forest protection and conservation management agencies to strengthen their capacity to carry out their responsibilities. This support will include equipment, facilities and training for protected area and protection management agencies at district level, including support for ranger stations and essential equipment. The project will also provide support to assist GOI forest protection and conservation agencies in the performance of routine monitoring and field patrolling activities.

9.4.2 Participation of civil society organizations

Civil society organizations (CSOs) will be supported to conduct independent monitoring of forest crime (e.g. illegal local timber processing capacity, locations and activities of illegal sawmills, and illegal timber exports and transportation). This will be done by CSO monitoring groups through routine presence in project areas, discussions with local communities, and visual inspection of satellite and aerial imagery. CSOs will also be supported to play a role in monitoring the performance of logging concessions and low-impact community logging groups participating under the various incentive schemes described in this document.

The project will also provide small grants to support the participation of CSOs in monitoring forest protection activities and official responses to forest crime, to facilitate public consultation processes, and to under-take follow up activities with local government agencies. This involvement will increase transparency and accountability in the forest protection process.

Telapak, a local NGO currently supporting FFI's implementation of AFEP has considerable experience in training CSOs and environmental monitors to document forest crime. It is anticipated that Telapak will play a key role in training forest investigators, monitors, and verifiers. Grants will be disbursed through *Mukim* leaders and other structures established under AFEP.

Community monitoring teams operating in the field will demonstrate the support of local socio-cultural institutions for forest protection and the majority of forest monitors will be known members of the community, selected through transparent processes by recognised

local leaders. Forest monitoring teams will also be involved in a range of education and outreach initiatives. This approach is modelled on successful experiences of community monitoring and GOI-NGO co-management activities in Leuser, Kerinci, Gunung Palung, Komodo, and Bunaken National Parks, as well as the Sungai Wain Protection Forest, managed by the City of Balikpapan.

Community monitoring teams will not carry weapons. If routine monitoring detects illegal activity, the incident will be reported to the appropriate local authorities through appropriate channels. Formal reporting formats and communication channels will be established through discussions with appropriate forest management and protection agencies.

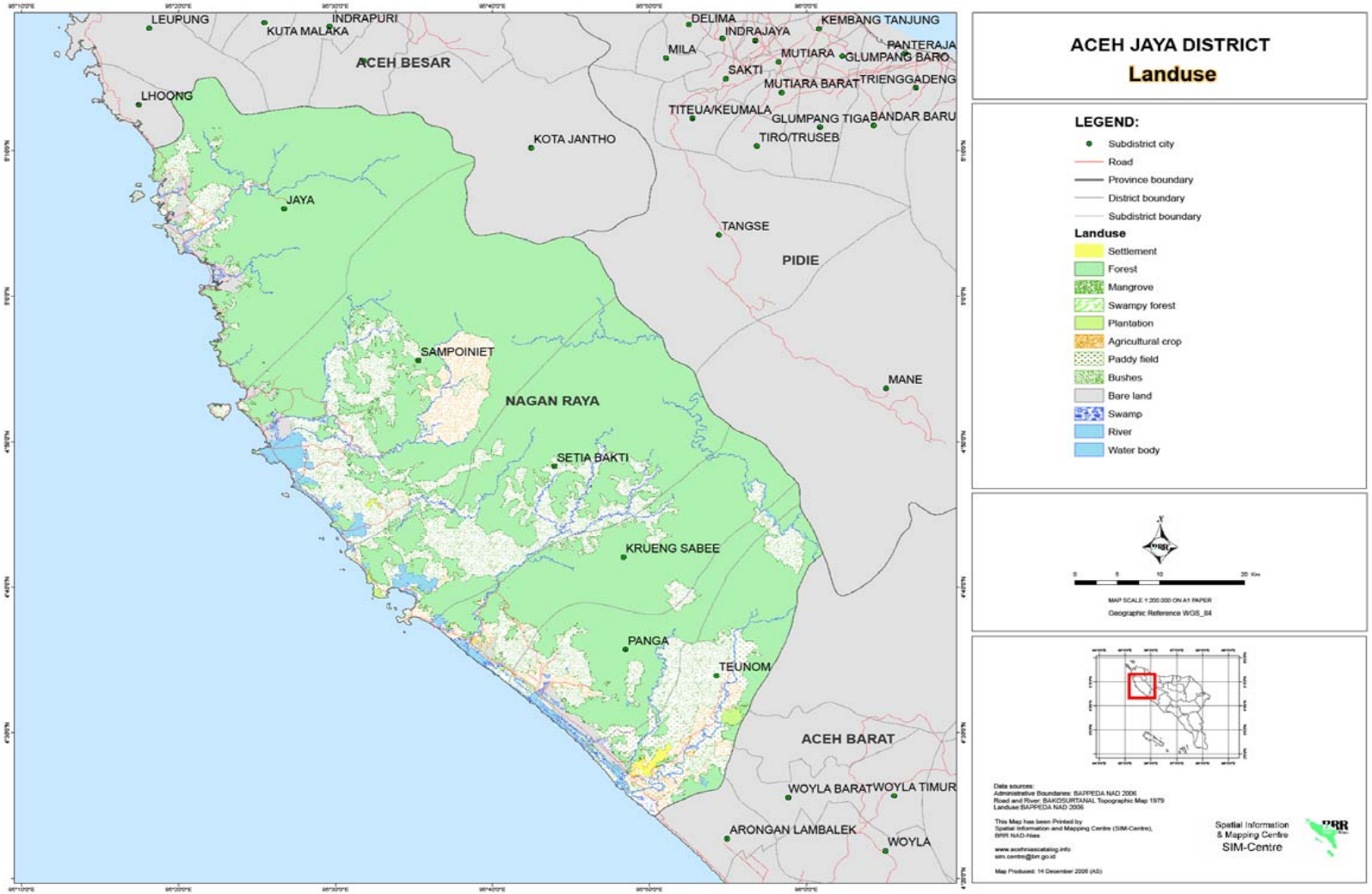
9.5 Biodiversity & Ecosystem Services

A full camera trapping program will also be conducted starting in December 2007, to obtain more complete mammal and ground bird species lists. FFI Aceh will also be expanding its species program in 2008 to include wildlife trade monitoring particularly for the Sumatran rhino and tiger. Since 2006 FFI Aceh has been working closely with Syiah Kuala University (Unsyiah) and Forestry University (STIK) to build long-term capacity of faculty and students to conduct biodiversity and monitoring surveys. Project proponents are still determining which variables and frequency of biodiversity monitoring are most appropriate. Our biodiversity monitoring plan will build off the above noted monitoring programs initiated by FFI in the project area using appropriate statistical and scientific methods. We will strive to measure biodiversity variables that are representative of the overall ecological health of the Ulu Masen area, including some of the mega-fauna, some flora and other indicators.

In addition to measures of flora and fauna, project proponents will measure water quality and quantity variables from select watersheds in the project area. Preventing deforestation and degradation will almost certainly maintain historical hydrological regimes compared to a forest-loss scenario. The magnitude of any ecological benefit this maintenance will provide is difficult to predict. Similarly, maintenance of natural forest cover is also likely to maintain soil compared to a scenario of forest loss or degradation. In addition to water and hydrological studies, soil surveys in critical watersheds will be carried out. This may be done as part of our soil carbon monitoring (section 9.3), The goal of the water and soil surveys will be to monitor whether the project is having a discernible (and hopefully positive) impact on these resources. Project proponents will seek to test whether improved forest retention does in fact have any positive bearing on soil and water resources.

Annex 1. Land Use Maps of Aceh Districts

The next 4 maps show current land use in the key Ulu Masen districts.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MILA
MUTIARA
PANTERAJA
GLUMPANG BARO
SAKTI
MUTIARA BARAT
TRIENGGADENG
TITEUA/KEUMALA
GLUMPANG TIGA
BANDAR BARU
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MANE
SETIA BAKTI
KRUENG SABEE
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WOYLA TIMUR
ARONGAN LAMBALEK
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ACEH JAYA DISTRICT
Landuse
LEGEND:
Subdistrict city
Road
Province boundary
District boundary
Subdistrict boundary
Landuse
Settlement
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Mangrove
Swampy forest
Plantation
Agricultural crop
Paddy field
Bushes
Bare land
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Spatial Information
& Mapping Centre
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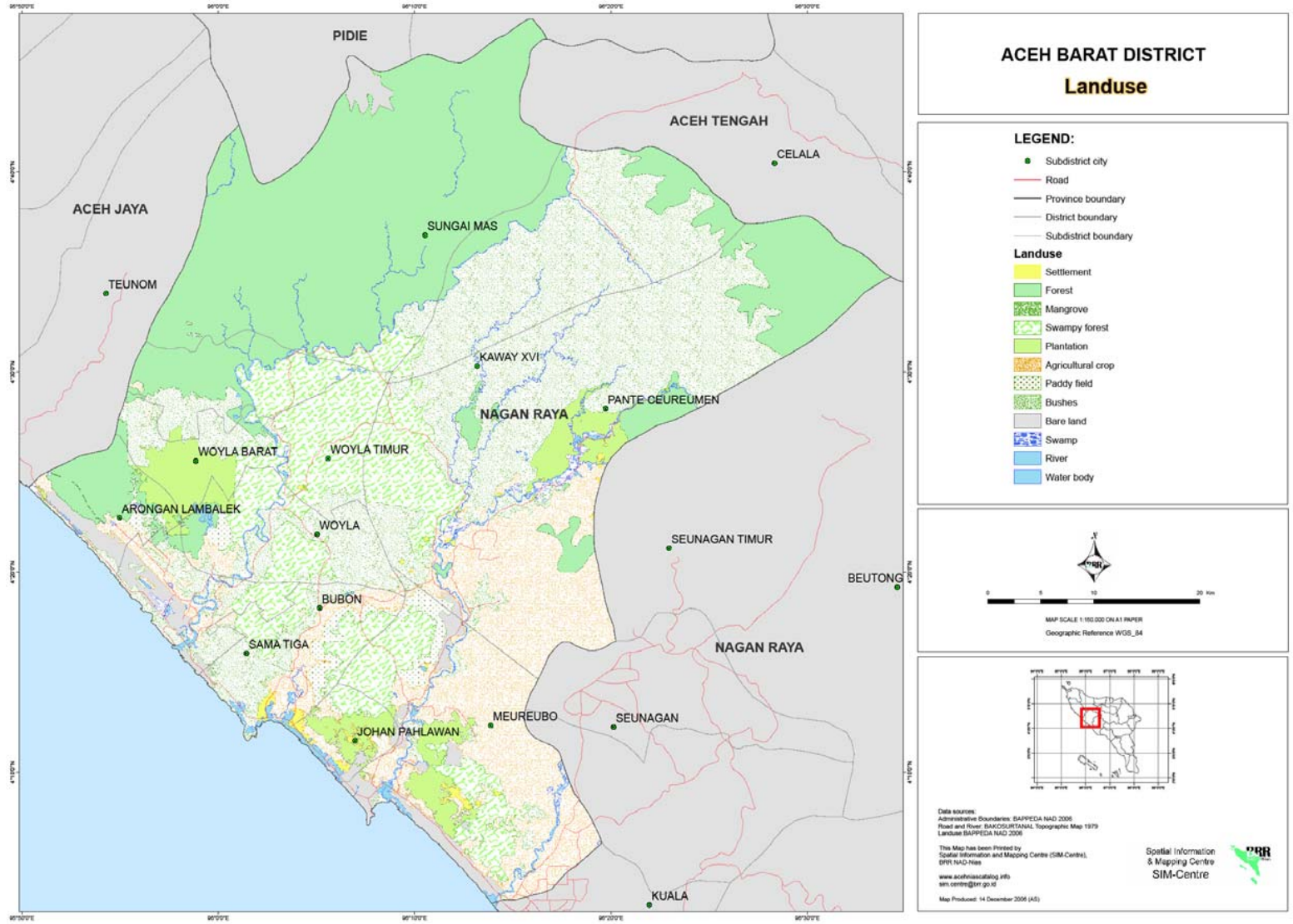
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WOYLA TIMUR
ARONGAN LAMBALEK
WOYLA
SEUNAGAN TIMUR
BEUTONG
BUBON
SAMA TIGA
NAGAN RAYA
MEUREUBO
SEUNAGAN
JOHAN PAHLAWAN
KUALA
ACEH BARAT DISTRICT
Landuse
LEGEND:
Subdistrict city
Road
Province boundary
District boundary
Subdistrict boundary
Landuse
Settlement
Forest
Mangrove
Swampy forest
Plantation
Agricultural crop
Paddy field
Bushes
Bare land
Swamp
River
Water body
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Geographic Reference WGS_84
Data sources:
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Road and River: BAKOSURTANAL Topographic Map 1979
Landuse BAPPEDA NAD 2006
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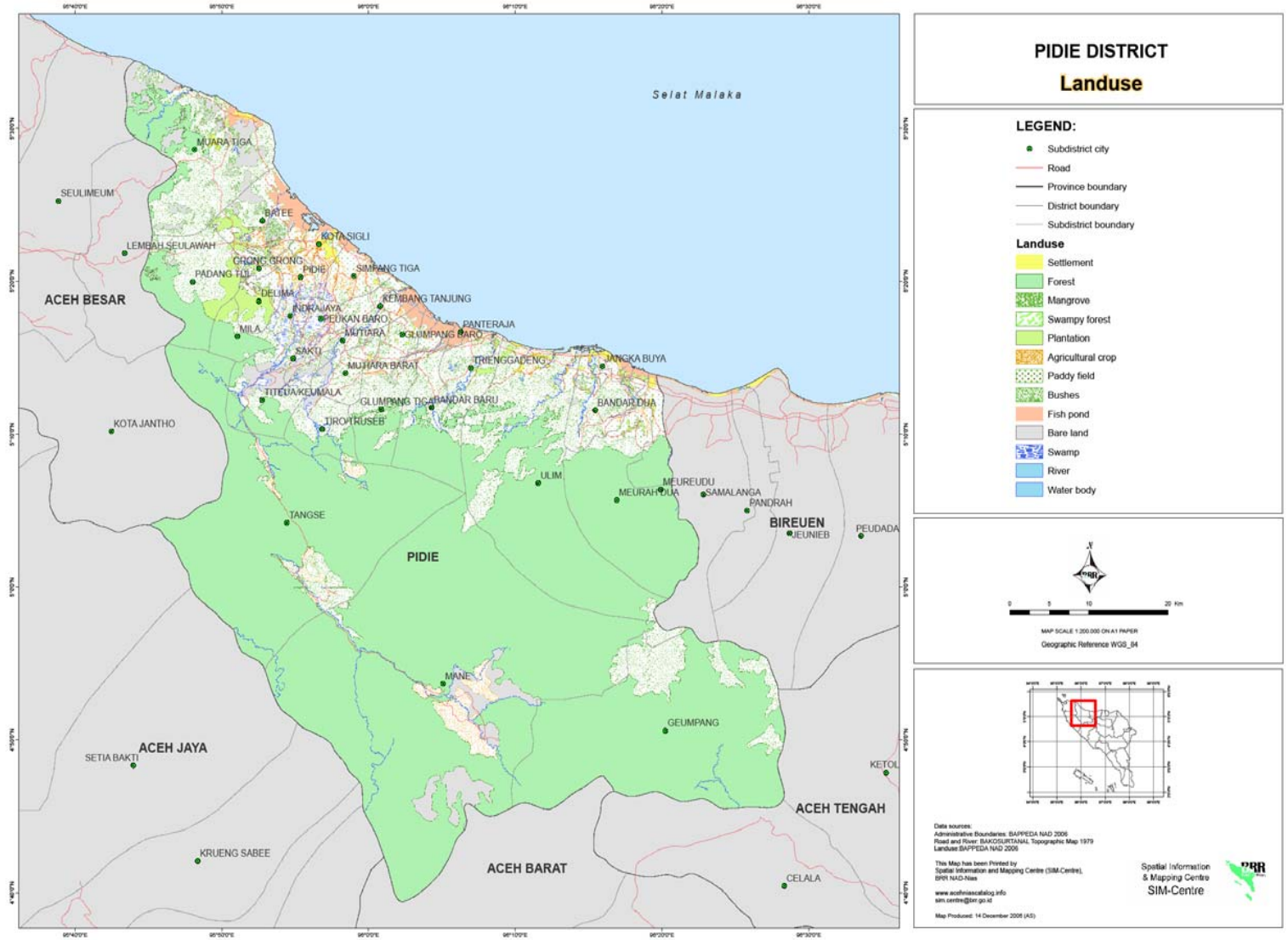

PIDIE DISTRICT

Landuse

LEGEND:

- Subdistrict city
- Road
- Province boundary
- District boundary
- Subdistrict boundary

Landuse

- Settlement
- Forest
- Mangrove
- Swampy forest
- Plantation
- Agricultural crop
- Paddy field
- Bushes
- Fish pond
- Bare land
- Swamp
- River
- Water body

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MAP SCALE 1:200.000 ON A1 PAPER

Geographic Reference WGS_84

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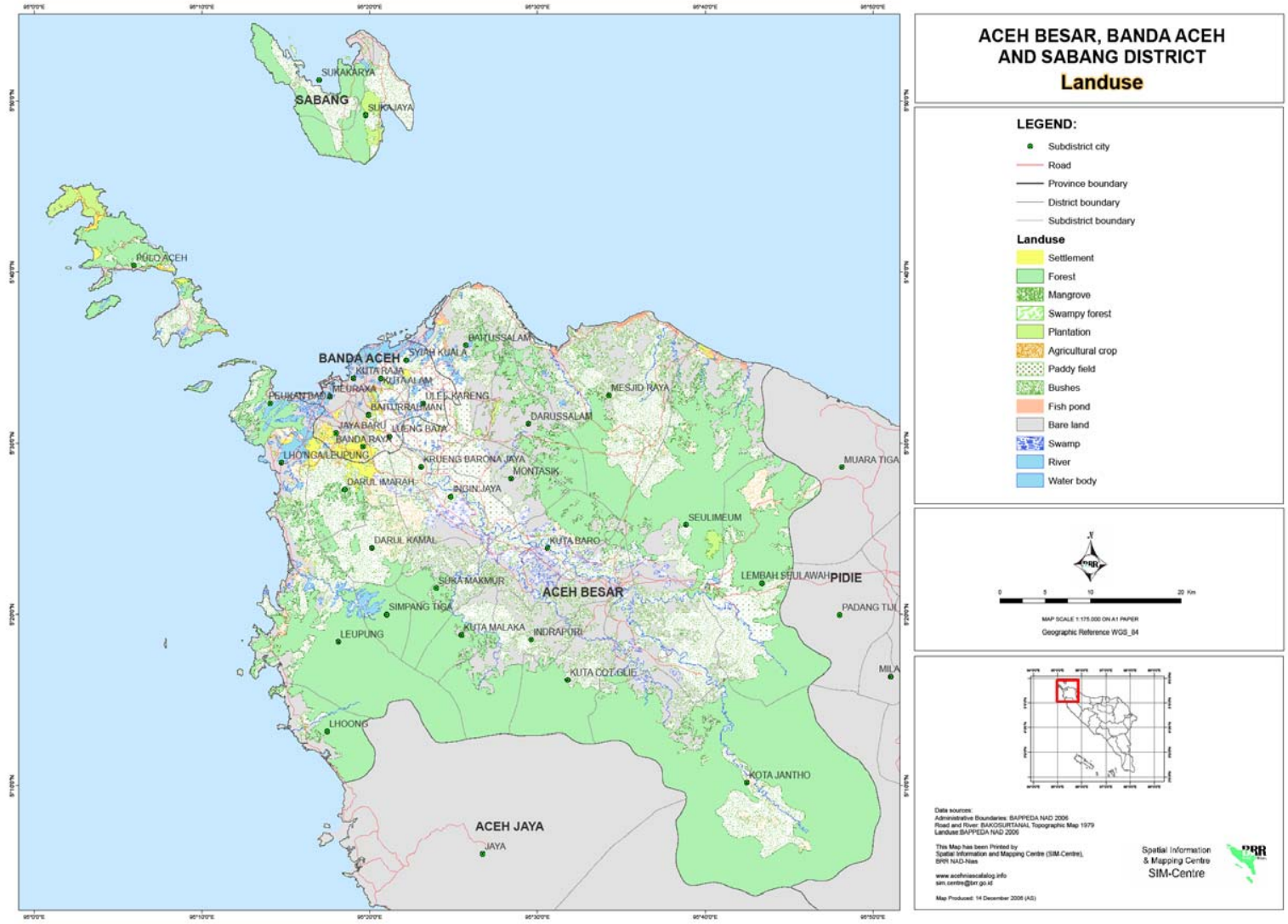
ACEH BESAR, BANDA ACEH AND SABANG DISTRICT
Landuse
LEGEND:
Subdistrict city
Road
Province boundary
District boundary
Subdistrict boundary
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Settlement
Forest
Mangrove
Swampy forest
Plantation
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Paddy field
Bushes
Fish pond
Bare land
Swamp
River
Water body
SABANG
SUKAKARYA
SUKAJAYA
PULO ACEH
BANDA ACEH
BAITUSSALAM
SYIAH KUALA
KUTA RAJA
KUTAALAM
MEURAXA
PEUKAN BADA
ULEE KARENG
MESJID RAYA
BAITURRAHMAN
DARUSSALAM
JAYA BARU
LUENG BATA
BANDA RAYA
LHOONG/LEUPUNG
KRUENG BARONA JAYA
MONTASIK
MUARA TIGA
DARUL IMARAH
INDRAJAYA
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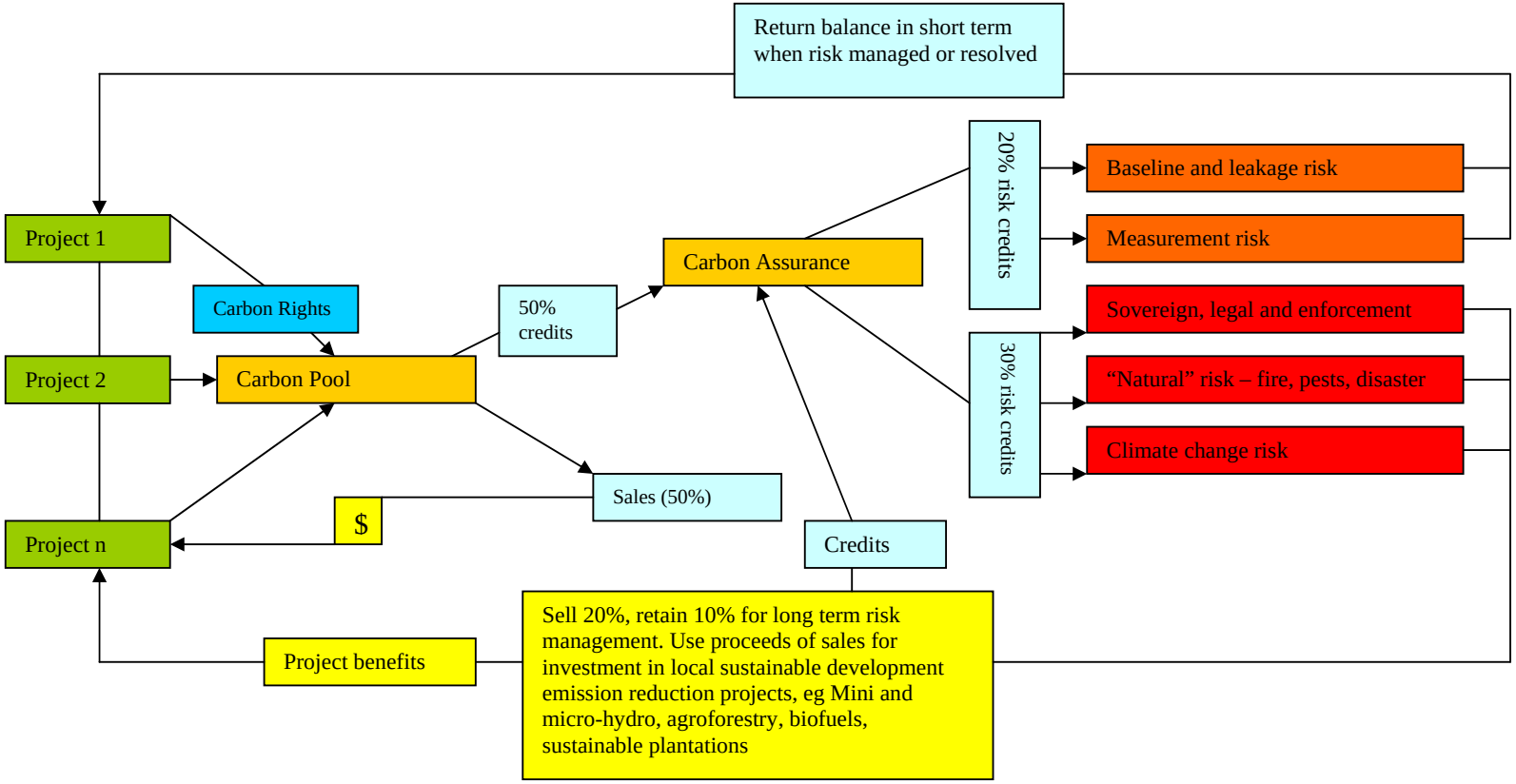
Annex II. Risk Management Model



Risk management model

For illustration only: numbers and project structure may vary.