

# **NOEL KEMPF MERCADO CLIMATE ACTION PROJECT**

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A Case Study in Reducing Emissions from  
Deforestation and Degradation

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## ACRONYMS

<b>AEP:</b>	American Electric Power
<b>APOCOM:</b>	Apoyo Comunitario (Program for the Sustainable Development of Local Communities)
<b>BAU:</b>	Business as Usual
<b>CAR:</b>	Corrective Action Request
<b>CCB:</b>	Climate, Community and Biodiversity standard
<b>CDM:</b>	Clean Development Mechanism
<b>CIBAPA:</b>	Central Indígena Bajo Paraguá (Bajo Paragua Indigenous Organization)
<b>FAN:</b>	Fundación Amigos de la Naturaleza (Foundation for Friends of Nature)
<b>FAO:</b>	Food and Agriculture Organization
<b>GOB:</b>	Government of Bolivia
<b>INRA:</b>	Instituto Nacional de Reforma Agraria (National Agrarian Reform Institute)
<b>NK-CAP:</b>	Noel Kempff Mercado Climate Action Project
<b>NKMNP:</b>	Noel Kempff Mercado National Park
<b>PDD:</b>	Project Design Document
<b>PIP:</b>	Plan Integral de la Protección (Integral Plan of Protection)
<b>PRODECOM:</b>	Programa de Desarrollo Comunitario (Community Development Program)
<b>REDD:</b>	Reducing Emissions from Deforestation and Degradation
<b>SCP:</b>	Site Conservation Plan
<b>SERNAP:</b>	Servicio Nacional de Áreas Protegidas (National Protected Area Service)
<b>SGS:</b>	Société Générale de Surveillance (General Society of Monitoring)
<b>tCO<sub>2</sub>e:</b>	Metric tons of carbon dioxide equivalent
<b>TNC:</b>	The Nature Conservancy
<b>UNFCCC:</b>	United Nations Framework Convention on Climate Change
<b>USJI:</b>	United States Initiative on Joint Implementation
<b>VERs:</b>	Verified Emissions Reductions

## CONVERSIONS

1 hectare (ha) = 2.47 acres (ac)

1 metric ton of carbon dioxide equivalent (tCO<sub>2</sub>e) = 44/12 metric tons carbon (tC)

1 metric ton = 1,000 kilograms (kg) = 2,205 pounds (lb) = 1.10 short (U.S.) tons

## ACKNOWLEDGEMENTS

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Cover image: Arcoiris waterfall at Noel Kempff Mercado National Park in Bolivia in South America. Photo credit: © Hermes Justiniano

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## INTRODUCTION

The Noel Kempff Mercado Climate Action Project (“NK-CAP”) is preserving the rich, biologically diverse ecosystems of northeastern Bolivia’s Noel Kempff Mercado National Park while preventing the release of millions of tons of carbon dioxide over 30 years. In late 1996, when the ecological integrity of almost 832,000 hectares of tropical forest adjacent to the park was threatened by both timber harvesting and unplanned deforestation, The Nature Conservancy and Bolivian conservation organization Fundación Amigos de la Naturaleza worked with the Government of Bolivia to terminate logging rights in the area. This land, along with three small existing conservation areas, was added to the original national park. Investments from three energy companies helped to fund project activities, in exchange for rights to a share of the verified carbon benefits generated by NK-CAP.

NK-CAP was one of the world’s first large-scale Reducing Emissions from Deforestation and Degradation (“REDD”) projects, and is addressing the drivers of both Ds in REDD: *deforestation* from conversion to agriculture by local communities and *degradation* from logging activities in timber concessions. In 2005, NK-CAP was the first REDD project to be verified by a third party using rigorous standards based upon those developed for the Kyoto Protocol’s Clean Development Mechanism.

As an early-stage REDD project, there were no precedents for the Noel Kempff Mercado Climate Action Project to follow. Instead, it was necessary to create new and innovative methods to address scientific, institutional and legal issues associated with REDD projects. Since NK-CAP was initiated, the forest carbon field has advanced in important ways. Remote sensing technology, for example,

has facilitated the development of more robust carbon accounting and monitoring. With the benefit of hindsight, it is possible to identify other areas in which the project could be improved, utilizing methodologies, legal arrangements, and conservation tools that were not readily available at the time.

NK-CAP, nonetheless, serves as an example of how well-designed REDD projects can result in real, scientifically measurable, and verifiable emissions reductions with important benefits for biodiversity and local communities. Specifically, NK-CAP has produced the following results:

- Avoided 1,034,107 metric tons of verified CO<sub>2</sub> emissions, which would have been caused by logging and deforestation between 1997 and 2005;
- Estimated to avoid a total of 5,838,813 metric tons of CO<sub>2</sub> emissions over the 30 year project lifespan;
- Preserves a rich and biologically diverse forest ecosystem, chosen as a UNESCO World Heritage Site for its outstanding biodiversity value;
- Facilitated indigenous communities achieving legal status as “Communities of Native Peoples” and in obtaining official land title;
- Provides alternative, environmentally sustainable economic opportunities for the local population via community forestry and ecotourism;
- Raised \$8.25 million in carbon financing, with additional financing possible upon sale of the Government of Bolivia’s 49% share of the project’s carbon offsets;
- Established an endowment which is used to fund project activities and preserve the park for future generations.

## PARTNERS AND CONTRIBUTORS

The Noel Kempff Mercado Climate Action Project is a joint effort, to which the following partners contributed:

Project Development	The Nature Conservancy (TNC), Fundación Amigos de la Naturaleza (FAN)
Project Management	Fundación Amigos de la Naturaleza (FAN)
Project Investors	American Electric Power Company (AEP), BP America, PacifiCorp
Country Partner	Government of Bolivia (GOB)
Carbon Measurement	Winrock International Institute for Agricultural Development, Fundación Amigos de la Naturaleza (FAN) <sup>1</sup>
Validation and Verification	Société Générale de Surveillance (SGS)

<sup>1</sup> Winrock International was responsible for initial design of the measurement program; however, FAN has since taken on the responsibility of carrying out the actual measurements.

# PROJECT OVERVIEW

## SITE DESCRIPTION

The Noel Kempff Mercado Climate Action Project (NK-CAP) was carried out in the northeastern section of the Department of Santa Cruz, Bolivia, in the Province of Velasco (Figure 1). At the time of project scoping, a 750,633 hectare protected area called Noel Kempff Mercado National Park (“NKMNP”) was already in existence. Characterized by outstanding topographical features, the park was principally defined by the



Figure 1: NKMNP - in rose. Source: GIS data from FAN, cartography N. Virgilio.

Huanchaca (or Caparú) Plateau. The immediate area of the park consisted of natural vegetation and was devoid of sizeable permanent human populations. Located in a climatic transition zone between the wetter Amazonian and the drier Chaco and Cerrado eco-regions, the park was considered one of the most biologically diverse areas of the world.

## PROJECT APPROACH

Project activities consolidated threatened areas just adjacent to the park with the park itself, creating one expanded protected area. On December 23 of 1996 the Noel Kempff Mercado National Park was extended to its natural boundaries: the Paraguá River (west), the Tarvo River (southwest), and the Itenez River (north), via presidential Supreme Decree #24457, negotiated with the Government of Bolivia by TNC and FAN. In total, the park was expanded by 831,689 hectares, more than doubling the previous size to its current 1,582,322 hectares. The expansion incorporated ecosystems not represented in the original park perimeter and improved the park's protection by establishing natural boundaries.

Between 1996 and 1997, the project bought and retired a total of three concessions from companies that had rights to log the expansion area; the 187,554 hectare Moira concession, 152,345 hectare El Chore concession, and 239,017 hectare El Paso concession (see Figure 2). Additionally, the Paragua II concession was closed, as no legal concession title existed.

The expansion area covered the former concessions, two small protected areas, an existing private protected area to the south (called “El Refugio”) and additional buffer zones. Inside the expansion zone, the area eligible for REDD (Reducing Emissions from Deforestation and Degradation) activities was 642,184 hectares of forest that had been degraded by former logging activities, was slated for future logging or predicted to be deforested.<sup>2</sup> It is this area that constitutes the carbon benefit generating portion of the project and is what is referred to as NK-CAP (see Figure 2).

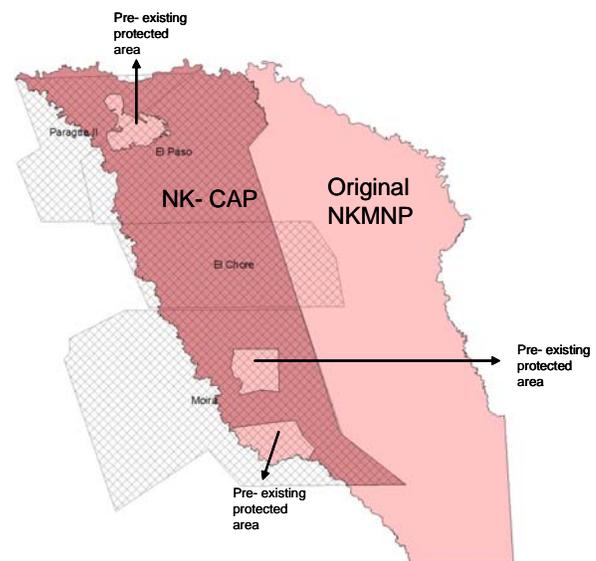


Figure 2: Current NKMNP boundaries include the entire colored area. Former timber concessions are depicted in cross-hatch. Source: GIS data from FAN, cartography N. Virgilio.

## ON-GOING PROTECTION AND MONITORING

Protecting and monitoring the integrity of the park against fire and illegal activities (logging, land clearing, hunting, fishing with nets) is an on-going activity. To this end, project funds were used to hire 11 of the 27 park rangers. New rangers' camps have also been built, and equipment has been provided, as have the necessary provisions (fuel, food) to carry out the monitoring activities. In 2008, for example, 664 river patrols, 9 airborne patrols, and 4 field monitoring trips were executed.

<sup>2</sup> Please note that the three small pre-existing protected areas within the expansion area are not included in NK-CAP (areas eligible for REDD), as they would not qualify as additional.

Remote sensing technology has been used to complement field monitoring. Landsat satellite imagery taken between 1997 and 2005 shows that deforestation within NK-CAP is being effectively limited. A 237 hectare area has been lost due to flooding of the Paragua River and 175 hectares of land have been deforested near the community of Bella Vista. These events were factored into and subtracted from the estimation of project carbon benefits (see “Carbon Benefits” section for more information).

Fires within NK-CAP are also being monitored using MODIS satellite imagery (Rapid Response System Fire Response products). A total of 115 fires were detected between 2001 and 2004, occurring mostly in savannah areas. Using this history of fire occurrence to derive a rate of loss from fires, estimated carbon benefits from reducing deforestation were discounted by 5% to cover potential carbon losses from fire.

## PROJECT STRUCTURE

Various funding mechanisms exist for REDD projects, ranging from investment by project developers, grants, and philanthropic contributions to revenue generated from the sale of verified emission reduction credits. REDD and other forest carbon projects face the same obstacle of surmounting upfront costs. In the case of NK-CAP, carbon revenue was provided upfront by three energy companies: American Electric Power Company (AEP), BP America, and PacifiCorp (see Figure 3). In return, they were guaranteed 51 percent of future certified offsets created over the 30-year project lifetime. These investors assumed the risk that the estimated quantity of verified carbon benefits might not be fully realized. The Government of Bolivia pledged support for the project plan, closed the timber concessions, expanded the park, and received 49 percent of the carbon benefits, which it agreed to use to fund community development, park management and other activities.

### DEAL STRUCTURE

Funds from The Nature Conservancy (TNC), American Electric Power (AEP), PacifiCorp, and BP America, as well as returns on the initial investment, are distributed by TNC to project partner Fundación Amigos de la Naturaleza (FAN). Project implementation costs include: the purchase and retiring of logging concessions, community development, carbon accounting, park management and protection (see Figure 4 and Figure 5).<sup>3</sup>

### ENDOWMENT FUND

An endowment fund was created to finance long-term monitoring and protection of the park. The fund was initially begun with \$1.5 million. As of 2006, it had expanded to nearly \$3 million through philanthropic contributions and returns on investments. It has been managed by The Nature Conservancy since 1999 and finances park activities in accordance with a long-term financial plan, which is approved by the NK-CAP Board of Directors. FAN serves as the executor of activities financed by the fund and submits yearly reports on the activities supported by endowment income.

After the project concludes in 2026, it is anticipated that the endowment will have funds remaining, which will be used for long-term benefit of the park.

### CARBON RIGHTS

As per the NK-CAP Comprehensive Agreement, 51 percent of the certified emission reductions were assigned to corporate investors (AEP, BP and PacifiCorp) and 49 percent to the Bolivian government. The government agreed to earmark proceeds from the sale of its share of the offsets in the following manner: 31 percent for the protection of the park, 10 percent for the national system of protected areas, and 59 percent for other purposes, including biodiversity protection activities both inside and outside the project area, improving the livelihoods of the indigenous communities adjacent to the park, and supporting other greenhouse gas mitigation strategies throughout Bolivia. Specific allocations of this 59 percent were not negotiated upfront and communities in the vicinity of Noel Kempff Mercado National Park are currently negotiating with the Bolivian Government to define their share. As of this writing, the Bolivian government had not yet sold its share of the verified emission reductions (VERs).

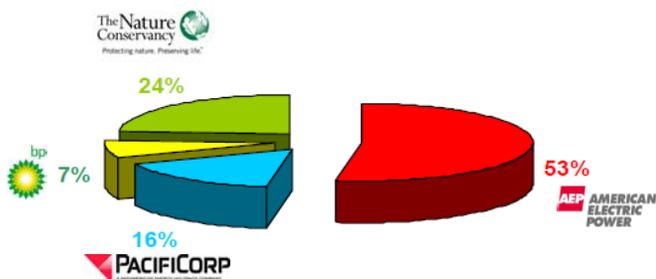


Figure 3: Breakdown of investor contributions from 1997-2006. Total: \$10.85 million. Source: FAN.

<sup>3</sup> In 2007, the Bolivian Tax Administration proposed that the investors’ share of the carbon offsets may be subject to tax obligations under Bolivian law; the financial implications of this tax obligation were unclear as of this writing. Given the pilot nature of NK-CAP, there were no precedents for forest carbon projects and tax obligations were not anticipated within the NK-CAP project structure or budget. The NK-CAP project experience highlights the need to anticipate, to the extent possible, any tax or other legal obligations during project design.

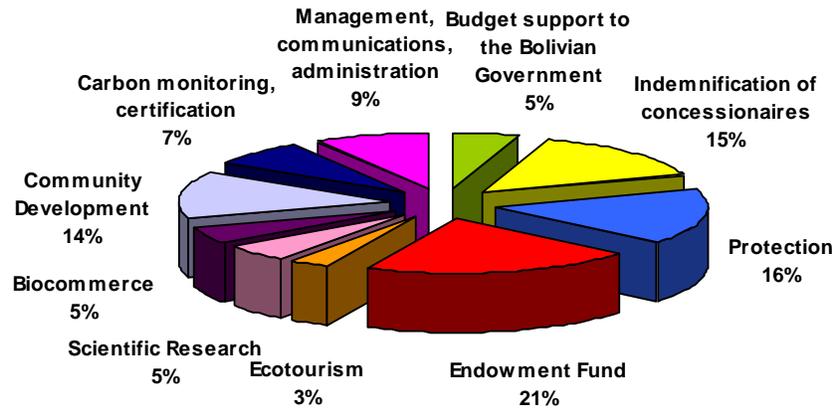


Figure 4: Project spending from 1997- 2006 totaled \$11.55 million. Please note, expenditure is greater than initial funding due to returns on the initial investment over time. Source: FAN.

### OFFSET COST

While investor contributions to NK-CAP were not structured on a per-ton basis, the cost of implementing NK-CAP, in 2009 dollars, has been estimated at \$18 per metric ton of CO<sub>2</sub>e. This estimate was based on an analysis of project financials, and several key assumptions, including: that 20% of the carbon benefits would be retained in a permanence buffer, that offsets from the project would be generated and sold at routine intervals, and that investors would seek a reasonable rate of return on the project.

Under the carbon accounting standards in place at the time NK-CAP was initiated and underwent its first verification, only a 5% permanence buffer was retained from the avoided deforestation component. Given the evolution of carbon accounting standards, the conservative assumption was made that 20% of carbon offsets would need to be reserved to comply with current

standards, such as the Voluntary Carbon Standard. Likewise, although the first NK-CAP project verification occurred in 2005, and no offsets from the project had been sold at the time of publication, the assumption was made, based upon typical practice in the market, that offsets would be verified and sold periodically (i.e., usually every five years).<sup>4</sup>

Finally, the analysis considers the project's expenses (historic and projected, capital and operating) and projected revenue from the sale of verified offsets, regardless of which parties bear the costs, or to whom the offset rights and revenue accrues. A nominal discount rate of 15% was assumed as a reasonable rate of return on the project, based upon various benchmarks. The results are particularly sensitive to the discount rate used: while a 15% discount rate yields an estimate of \$18 / tCO<sub>2</sub>e, applying a 13% or 17% discount rate results in estimates of \$15 and \$22 per ton of CO<sub>2</sub>e, respectively.

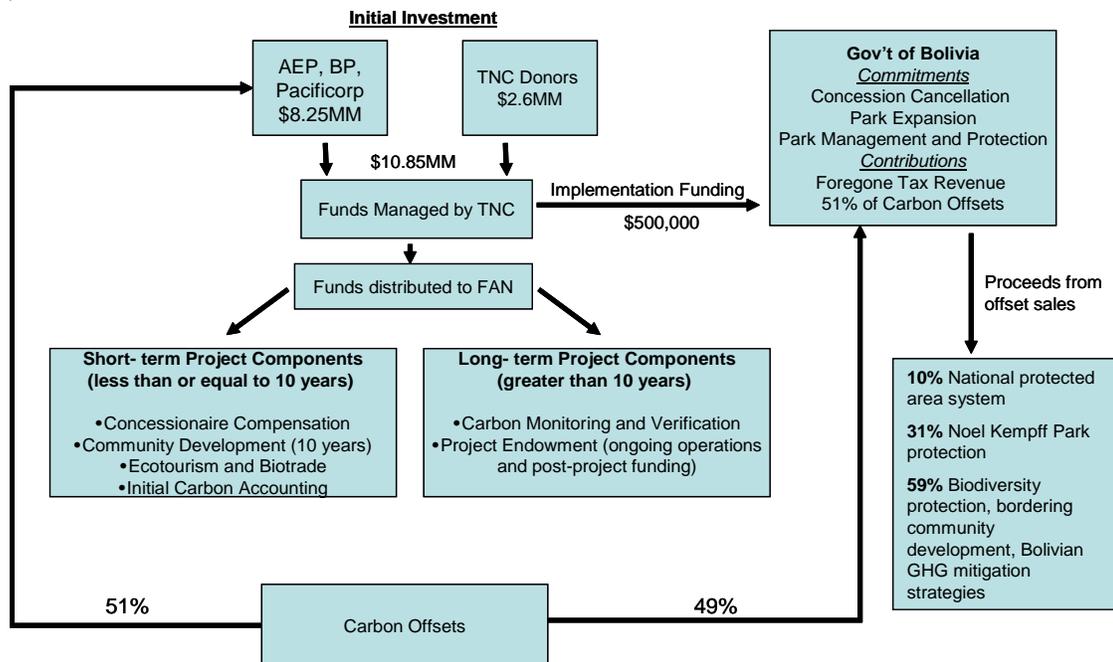


Figure 5: Deal structure for NK-CAP partners. Source: G. Fishbein.

<sup>4</sup> Offsets generated from 1997-2000 were assumed to be verified and sold in 2001. A sale in 2006 of 2001-2005 offsets was assumed, and so on for five year periods, with a final sale in 2027 of offsets from 2021-2026.

# CARBON BENEFITS

Carbon benefits resulting from REDD project activities are calculated as the difference between emissions from the without-project scenario (known as the baseline- see Figure 6) and emissions from the with-project scenario, minus any deductions for leakage, uncertainty and impermanence risk. Carbon benefits for a particular verification period are calculated ex-post, using actual data from the period in question. The carbon benefits achieved between 1997- 2005 by the Noel Kempff Mercado Climate Action Project were verified by Société Générale de Surveillance (“SGS”) in 2005, using rigorous standards based upon those described in the Kyoto Protocol’s Clean Development Mechanism. This verification made NK-CAP the first forest emissions reduction project to achieve such a standard, and demonstrates that REDD activities are capable of generating scientifically measurable, real, and verifiable carbon benefits.

Two distinct project components are generating carbon benefits within NK-CAP:

**A) Reducing Emissions from Deforestation:** By implementing an economic development program and an extended protection scheme, the project is avoiding deforestation by communities inside the project area. Baseline deforestation was modeled with a spatially explicit land use change model (called GEOMOD - see “Baseline” section for a detailed description), using Landsat imagery to estimate historic deforestation rates and modifying these rates based on monitoring from a reference area with comparable socioeconomic characteristics. As a result of the project, 763 ha were saved over the 1997-2005 verification period, corresponding to 371,650 tCO<sub>2</sub>e.

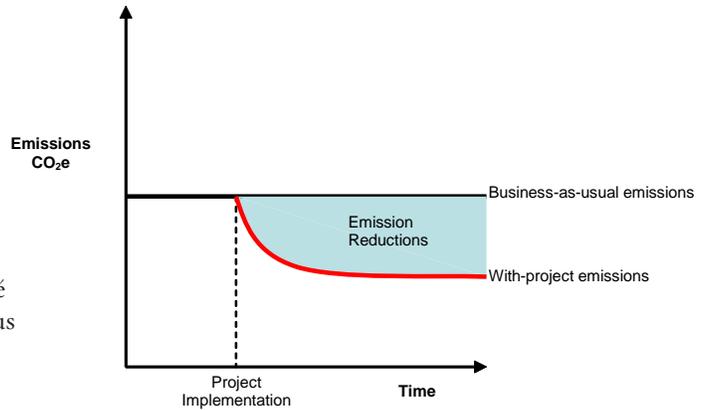


Figure 6: Generic illustration of carbon benefits (emission reductions) from project activities. Source: N. Virgílio.

**B) Reducing Emissions from Degradation:** Cessation of logging in the former concessions that were incorporated into the project area avoids future timber extraction and collateral damage due to logging. 468,474 square meters of timber slated for harvest were protected over the 1997-2005 verification period, corresponding to an avoided emissions of 791,443 tCO<sub>2</sub>e. The baseline harvest was modeled using an advanced statistical model of the Bolivian timber market (see “Baseline” section for a detailed description), simulating domestic/international timber supply and demand at different scales: national, regional, and project level.<sup>5</sup>

As a result of both activities, the project generated a total carbon benefit of 1,034,107 tCO<sub>2</sub>e over the 1997- 2005 verification period. The annual breakdown of these benefits is shown in Figure 7.

	A	B	C	D = A+B-C	E	F = D-E
Year	Emissions Avoided from Deforestation (tCO <sub>2</sub> )	Emissions Avoided from Degradation (tCO <sub>2</sub> )	Leakage Deduction (tCO <sub>2</sub> )	Total Carbon Offsets (tCO <sub>2</sub> )	Emissions from Project Activities* (tCO <sub>2</sub> )	Net Carbon Offsets (tCO <sub>2</sub> )
1997	56,401	48,180	7,264	97,317	169	97,148
1998	40,304	59,374	9,141	90,539	211	90,328
1999	39,783	69,931	10,960	98,753	282	98,472
2000	43,417	79,889	12,731	110,578	204	110,373
2001	41,158	89,298	14,454	116,003	167	115,836
2002	40,238	98,190	16,130	122,298	132	122,166
2003	33,972	107,081	17,589	123,462	109	123,353
2004	31,684	115,632	18,971	128,347	102	128,244
2005	44,693	123,867	20,277	148,282	96	148,186
<b>Total</b>	<b>371,650</b>	<b>791,443</b>	<b>127,516</b>	<b>1,035,578</b>	<b>1472</b>	<b>1,034,107</b>

\* from transportation fuel use, etc.

Figure 7: Verified carbon benefits generated by NK-CAP. Source: Noel Kempff PDD.

6 <sup>5</sup> Sohngen, B. and Brown, S., ‘Measuring leakage from carbon projects in open economies: a stop timber harvesting project in Bolivia as a case study,’ Canadian Journal of Forest Research 34 (2004), 829 – 839.

## ESTIMATED LIFETIME CARBON BENEFITS

The total carbon benefits from NK-CAP are expected to reach 5,838,813 tCO<sub>2</sub>e over the life of the project (1997-2026).

The estimate of lifetime carbon benefits has been recalculated several times since the project began, resulting in considerable reductions from initial estimates and increases in accuracy. These changes, driven primarily by adjustments to the baselines, reflect the pioneering nature of the project, which broke ground on methodologies for estimating baselines.

As a result of methodological advances, anticipated lifetime carbon benefits were ratcheted down from the initial approximation of 53,190,151 tCO<sub>2</sub>e calculated in 1996, to the current estimate of 5,838,813 tCO<sub>2</sub>e calculated in 2005. The large decrease in the lifetime carbon benefit estimate is due primarily to a shift in reliance on

interviews, secondary data sources, and reference documents from other parts of the world, to site-specific studies, local field measurements and advanced statistical models, which are more robust and accurate. Estimated lifetime carbon benefits are just that – *estimates*. Although these forward-looking estimates may change over time, *verified* carbon benefits, based on backward-looking observations of the verification period in question (in this case, every 5 years) will not change. Only at the end of the 30 year project will it be possible to know the total lifetime carbon benefits of NK-CAP.

See the “Baseline” section for a more in depth discussion of the current methodology being used to determine baselines for both the avoided deforestation and avoided degradation components of the project and the “History of Project Baselines” section for more on changes to the estimated lifetime carbon benefits.

## ADDITIONALITY

A fundamental challenge for all REDD projects is to demonstrate “additionality.” Additionality refers to the amount of carbon dioxide captured, stored or prevented from reaching the atmosphere compared to what would happen under business as usual practices. Additionality is an important concept to ensure that the claimed benefits from a carbon project are above and beyond what would have happened anyway.

Since additionality involves assessing what *would have* (but did not) happen, it cannot be measured exactly and is often subjective. Nevertheless, there are several suggested tests for determining whether emission reductions are additional, specifically: Were project activities required and regularly enforced by law? Would project activities have been financially possible otherwise? Were the project activities common practice? Were business-as-usual (“BAU”) emissions the same or lower than the with-project scenario? An answer of “no” to all four questions helps to establish additionality.

NK-CAP met these tests of additionality on all four grounds. The project was not required by Bolivian law to occur. Although there was a pre-existing park adjacent to the expansion area, expansion was not planned or required. A feasibility study, conducted prior to project implementation, demonstrated that the Government of Bolivia did not have the necessary funds or political will to close the forest concessions and expand the park. The funds provided by the project enabled changes to the status quo, by financing the buyout of timber concessions, the expansion of the park, and the community development activities aimed at reducing forest conversion. Without the project, logging would have continued in the concessions and deforestation would

have spread around new settlements and communities lacking land titles, as this was the common practice. Finally, the NK-CAP with-project scenario resulted in fewer emissions than the baseline scenario.

### BASELINE

A project baseline is the “without-project” or business-as-usual (BAU) scenario; simply put, the prediction of what would have happened had the project not taken place. As was discussed in the “Carbon Benefits” section, the methods used in determining baselines greatly influence both the magnitude and accuracy of carbon benefits, which are calculated as the difference between the baseline and “with-project” scenario. It is very important for baselines to be monitored over time and corrections to be made for situations such as changes in policy, governance, deforestation rates, and socio-economic conditions.

As the emissions reductions achieved through the Noel Kempff Mercado Climate Action Project were the result of a two-pronged strategy- avoiding deforestation and degradation- it was necessary to treat each component separately in the calculation of the project baseline. Since NK-CAP was the first forest carbon project of its kind, it was necessary for the project to create its own methodologies for calculating baselines. As such, both baselines have been re-estimated several times since the project began, as new information, refined methods and advanced technology became available, increasing the accuracy with each revision (see “History of Project Baselines” section for more detail). Some voluntary standards require that baselines be monitored and re-evaluated periodically, to make adjustments for possible changes in external factors that could influence land use practices. Moving forward, it is planned that the project

baseline will be reevaluated every 5 years, and adjusted if needed. It is believed that the largest changes to the baselines occurred in the beginning years of the project, when methodologies were still being refined, and future changes will be minimal.

**Avoided Deforestation Baseline**

The creation of an avoided deforestation baseline in NK-CAP required 4 steps: 1) determination of deforestation rates, 2) prediction of likely locations for future deforestation, 3) determination of carbon content in areas predicted to be cleared, and 4) calculation of emissions resulting from anticipated deforestation.

Using historical satellite imagery from 1986, 1992 and 1996, it was possible to observe deforestation and calculate deforestation rates in the project area. The location of future deforestation was simulated with the spatially explicit GEOMOD land use change model using this historical deforestation information. The model identified lands in the project area that were statistically the most likely to be cleared in the future, based on several deforestation drivers (distance to roads, towns, rivers, forest edge and prior disturbance). GEOMOD results provided a forecast of specific forest areas likely to be cleared over the following 30 years.

While remote sensing technology and models like GEOMOD can estimate *areas* of forest loss, estimating *emissions* from that forest loss involves measuring the carbon stocks of the vegetation in the area, since different types of vegetation (e.g., tropical forest vs. temperate forest) contain different amounts of carbon.

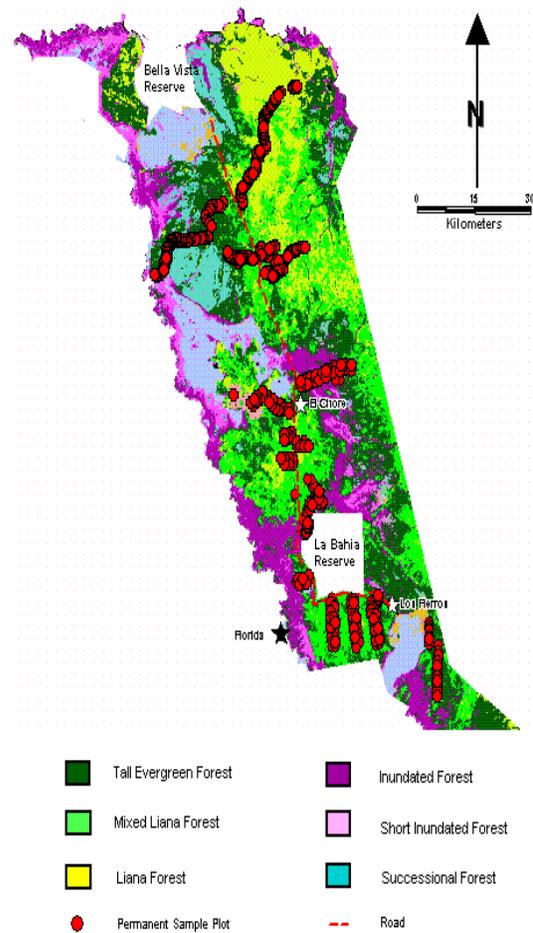


Figure 9: Map of the Noel Kempff Climate Action Project showing the distribution of the six forest strata and the location of the 625 permanent plots. Source: Winrock International.



Figure 8: Foresters and young men from the local community of Florida work together to measure the boundaries of the forest plots where logging impacts will be measured over 30 years in a forest concession (Cerro Pelado) near Noel Kempff Mercado National Park in Bolivia. Photo credit: © Margo Burnham.

In NK-CAP, the areas predicted to be cleared by GEOMOD were assigned one of five vegetation classes (e.g., high evergreen forest) using Landsat imagery and on-the-ground observations. The carbon content of each vegetation class was determined through field research, using time-tested, scientifically-proven techniques such as measurement of tree diameter and soil analysis (Figure 8). To this end, 625 permanent study plots were established in and around NK-CAP to measure and monitor carbon stocks (Figure 9). All carbon pools – aboveground and belowground biomass, litter, dead wood, and soils to 30 cm depth – were analyzed for their carbon content. Once carbon stocks were determined for each vegetation class, the areas presumed cleared in the baseline scenario were then converted into carbon emissions using established formulas.

### ***Monitoring the Baseline***

The avoided deforestation baseline will be re-evaluated every 5 years to capture any changes in institutional structure, local deforestation rates, and socioeconomic circumstances that might affect the estimated emissions for the remaining years of the project. A reference area was chosen adjacent to the Park to serve as a “control” for the estimated baseline (Figure 12). This area will be monitored over time using Landsat data and compared to the predicted baseline for the avoided deforestation component of NK-CAP. Differences between the two will be investigated and adjustments to the baseline will be made where appropriate to maintain accuracy.

### ***Avoided Degradation Baseline***

The creation of the avoided degradation baseline involved predicting the business-as-usual emissions that would have been caused by the closed timber concessions. Because timber harvesting is impacted by market conditions, the avoided degradation baseline was determined using an econometric model of Bolivian timber markets, developed by Brent Sohngen and Sandra Brown<sup>3</sup>, which predicts the volume of future harvests in Bolivia, both within the project area and the country as a whole (important for leakage analysis), and the carbon impacts of those harvests.

The model was based on the assumption that Bolivia is a small open economy which is a price taker on global timber markets and, therefore does not significantly control or effect global prices. In addition to economic parameters, the model considered many dynamics of timber harvesting activities, including forest characteristics (e.g., wood density), collateral damage due to logging, decomposition of dead wood, carbon storage in dead wood products, and the difference in regrowth between logged and unlogged areas. Aboveground biomass and dead wood were the only carbon pools included in the calculations, as soil carbon and belowground biomass (roots) were not expected to change significantly due to harvesting activities. It is important to note that a 1996 change in Bolivian law, requiring concessionaires to pay a fee per hectare of land, resulted in the reduction of nationwide timber concessions by 75%. However, when analyzed within the timber market model, it was found that this did not result in a significant change in timber output, as concessionaires simply increased harvest intensity on their holdings.

### ***Monitoring the Baseline***

In order to accurately estimate damage due to logging activities and to detect potential differences in regrowth rates over time between logged and unlogged areas, 102 survey plots (dubbed Carbon Impact Zones or CIZs)

were established in the Cerro Pelao logging concession adjacent to the project area. From these plots, it was determined that over time, the difference in regrowth between logged and unlogged areas was not statistically significant. Economic variables for the timber market model (e.g., timber prices, inflation rates) are being monitored annually to every 5 years, depending on the particular parameter.<sup>6</sup>

### **HISTORY OF PROJECT BASELINES**

As mentioned in the “Carbon Benefits” section, baselines from both the avoided deforestation and avoided degradation components have been modified several times since the start of the project. As a result of improvements in baseline methodologies and technology, the baselines have been adjusted significantly from their starting points in 1996. The biggest changes to the NK-CAP baselines occurred in the initial years of project implementation, as methodologies were still being perfected. In particular, a change to the timber extraction rate used in the initial avoided degradation baseline drove substantial adjustments in the early years of the project. Plans exist to re-evaluate the project baseline every 5 years as a part of the verification process in order to capture any changes in government, policy, deforestation rates, and socio-economic circumstances that might have occurred over that time period, with the potential to affect the business-as-usual scenario for future years.

Although there were several modifications made to the project baseline since the initiation of project activities, the largest adjustments occurred in 1999, 2001 and 2005. In 1999, refinements made to the timber extraction rate and the lying dead wood carbon stock estimate, as well as the introduction of 102 permanent plots in an adjacent concession to measure damages attributable to harvesting activities, led to a decrease of estimated lifetime carbon benefits from 53,190,151 tCO<sub>2</sub>e to 23,719,919 tCO<sub>2</sub>e. Most of the decrease was attributable to refined timber extraction rates used in the avoided degradation component baseline, and illustrates the substantial effect this parameter can have on calculations. In 2001, satellite imagery and advanced models employed for the first time in baseline estimation, as well as further refinement of the timber extraction rate, led to a reduction in estimated lifetime carbon benefits to 13,155,079 tCO<sub>2</sub>e. Again, most of the decrease was associated with the avoided degradation component of the project and was largely due to further refinement of the timber extraction rate. Finally, in 2005, the GEOMOD land use change model employed a more conservative approach to predicting the amount of land to be deforested, using a linear rate of deforestation based on historical trends. Subsequently,

<sup>6</sup> As per SGS's 2005 full verification report for Noel Kempff, pg. 29.

estimated lifetime carbon benefits decreased to 5,837,341 tCO<sub>2</sub>e.

The NK-CAP experience serves as a prime example of the importance of moving away from baseline methodologies founded on surveys and proxy data from other regions/countries, to approaches that rely on field testing, satellite data and site-specific information in the calculations. Since NK-CAP was one of the first large-scale REDD projects to be implemented, there were no precedents for project developers to follow. The experience gained through the NK-CAP baseline methodology development has helped to inform TNC's other projects and has served as a model for projects developed by other organizations, as well as in the development of project standards. For example, the Voluntary Carbon Standard, one of the most well respected standards for the voluntary market, refers to

Noel Kempff as an example for many of their methodological recommendations, including baselines.<sup>7</sup>

It is important to distinguish *estimated lifetime carbon benefits*, which are apt to change with each verification, and *verified carbon benefits*, which are confirmed as the project proceeds. Unlike estimated lifetime carbon benefits, verified benefits are based on backward-looking observations and will not change, regardless of any adjustments made to the baseline(s) for future periods (see Figure 10).

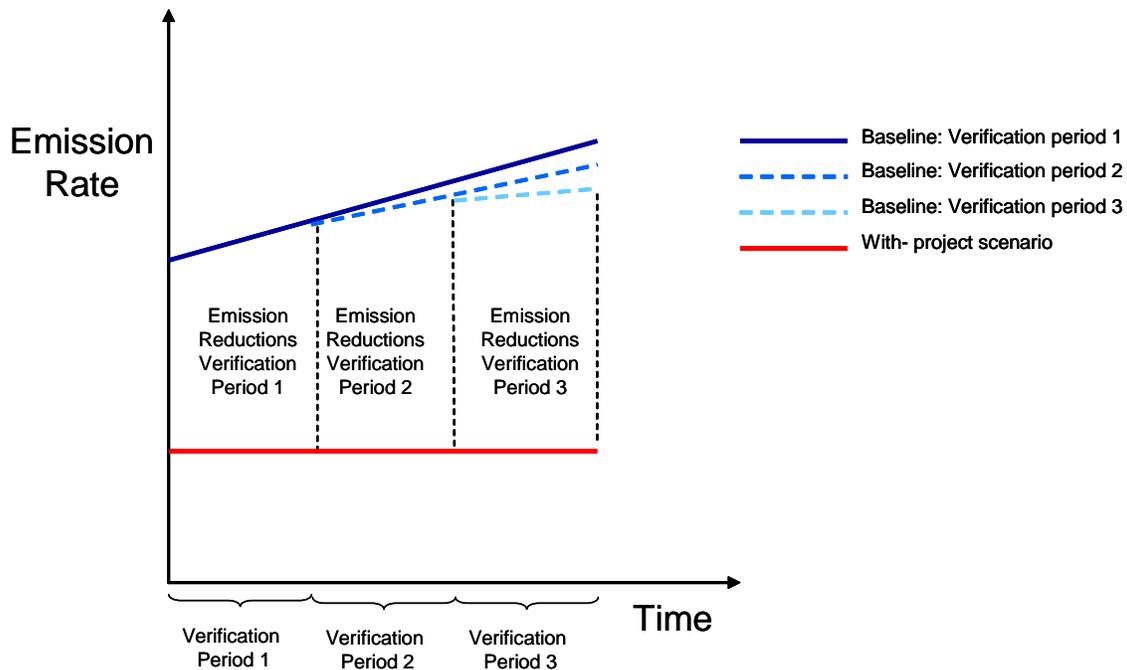


Figure 10: General illustration of emission reductions over the course of several verification periods. Source: N. Virgilio.

## LEAKAGE

Leakage comes in two forms: activity-shifting (primary) leakage and market (secondary) leakage. Activity-shifting leakage occurs when a project directly causes carbon-emitting activities to be shifted to another location, canceling out some or all of the project's carbon benefits. Market leakage, on the other hand, occurs when a project changes the supply-and-demand equilibrium, causing other market actors to shift their activities. For example, if a project constrains commodity supply, market prices may rise and other producers may increase their activities in response.

Credible carbon projects must attempt to prevent, analyze the risk of, calculate, compensate for and monitor leakage in order to accurately calculate carbon benefits.

Since it was possible that NK-CAP project activities could displace emissions elsewhere, every attempt was made to quantify potential leakage, while specific safeguards were also built into the project design to avoid leakage. As there were two emissions reduction activities occurring in the project (avoided deforestation and degradation), they were treated separately in the leakage analysis.

### AVOIDED DEFORESTATION LEAKAGE

#### *Estimation and Prevention of Leakage from Avoided Deforestation Activities*

Since the establishment of the project, the largest short-term risk for activity shifting leakage existed from subsistence agricultural expansion by the communities living along the border of the extended park area. As such, the project incorporated extensive leakage

prevention activities, in the form of community development programs including: educational campaigns, workshops in sustainable agriculture, assistance in securing legal status and land tenure, and development of a management plan for ancestral lands. See the "Community Benefits" section for detailed information on the program.

Perhaps the most successful aspect of the avoided deforestation leakage prevention program was the legal designation of a 360,565 hectare indigenous ancestral territory ("TCO") for border communities, which officially granted them property rights. Communities helped design the Bajo Paragua Native Communal Land Natural Resources Management Plan for the lands adjacent to the project and sustainable forestry activities undertaken in the TCO are lessening pressure to deforest within project boundaries.

As a result of these activities, it was anticipated that there would be no activity-shifting leakage from the avoided deforestation component of the project. Similarly, as the threat of deforestation came from subsistence agricultural expansion and not commercial agricultural expansion, no market leakage was expected.

NOTE: The sustainable harvesting activities occurring in the TCO are NOT being counted as activity-shifting leakage. As the TCO's forestry use lies almost completely inside the area of former timber concessions and outside the NK-CAP area (see Figure 11), these activities do not constitute an increase in emissions as a result of the

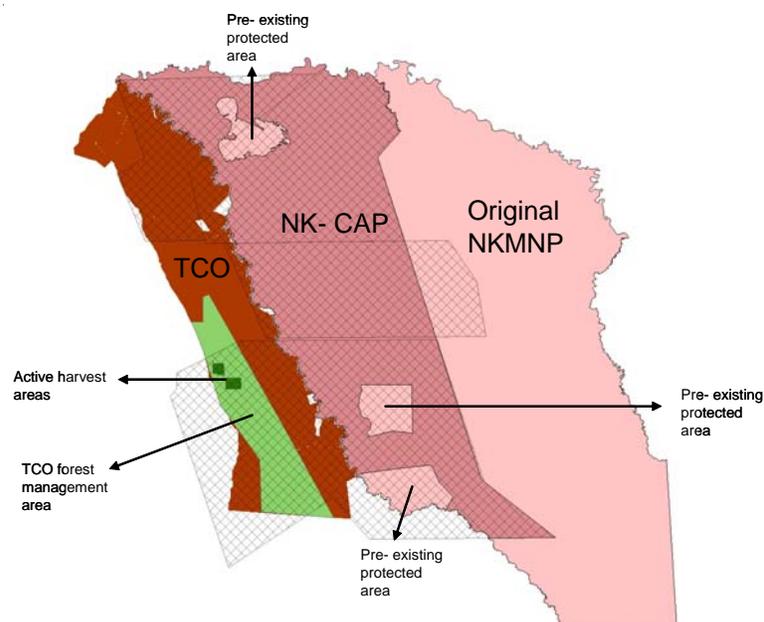


Figure 11: The sustainable forestry activities carried out by border communities fall almost entirely within the former timber concessions (cross-hatch). Source: GIS data from FAN, Cartography from N. Virgilio.

project; logging would have occurred there anyway as it was BAU within the former concessions. The community forestry activities actually result in fewer emissions than would otherwise occur in the baseline scenario, since previous harvesting activities in the former concessions were more intense and did not operate according to a sustainable management plan.

**Monitoring Leakage from Avoided Deforestation Activities**

Although no leakage was expected from this aspect of NK-CAP, project developers still monitored for any unanticipated activity shifts. The project designed a 15 km control area around the borders of the NK-CAP zone to capture possible activity shifts (see Figure 12). The rationale behind the chosen buffer width was based on behavioral theory; it was highly unlikely that subsistence farmers who were originally deforesting within the project area, without access to cars or other personal transportation, would travel large distances to deforest elsewhere.

A baseline deforestation scenario for the buffer zone was created in the same manner as for the NK-CAP itself. If leakage were occurring, the deforestation rate in the buffer area would increase from its baseline scenario and the difference between the two would be the leakage. A reference area adjacent to the buffer served as a control for the baseline deforestation rate and any detected leakage would be standardized by changes in overall deforestation rate captured by the reference area.

Subsequent monitoring has revealed that deforestation in the buffer zone is actually lower than that which was predicted in the buffer baseline, confirming the prediction that no activity-shifting leakage would occur for the avoided deforestation aspect of the project.

**AVOIDED DEGRADATION LEAKAGE**

**Estimation and Prevention of Leakage from Avoided Degradation Activities**

The risk of leakage from the avoided degradation component of the project was two-fold: that concessionaires themselves would relocate, but continue their activities elsewhere (so-called activity-shifting leakage) and that the reduction of timber supply caused by closing concessions would affect prices, resulting in increased harvesting elsewhere. The project employed several methods to prevent, quantify and monitor leakage.

The closing of sawmills, and the purchasing and retiring of harvesting equipment from concessionaires by project developers (as part of the overall concession buyout) was a key leakage prevention activity undertaken for NK-CAP. Many concessionaires take out loans when purchasing equipment, thus must harvest to generate income and pay off the loans. Purchasing and retiring the equipment took away the pressure for concessionaires to shift harvest activities elsewhere by taking away the debt

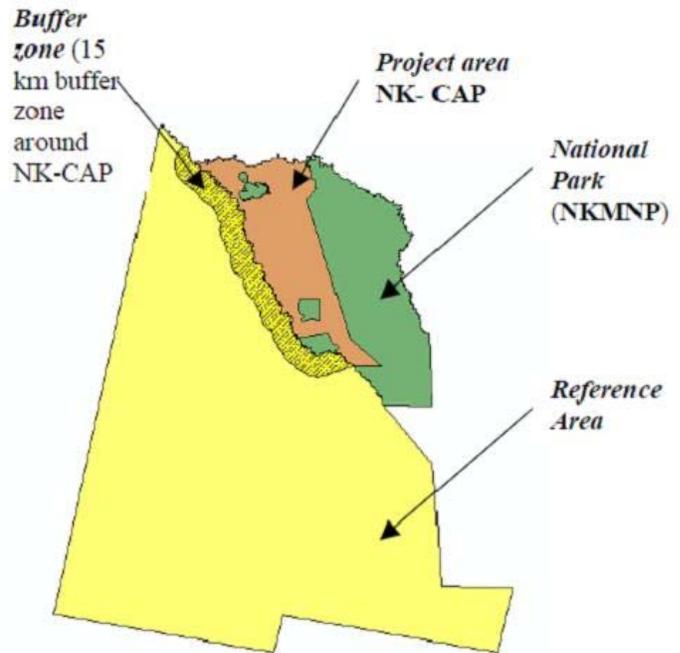


Figure 12: Map of NK-CAP project area, original NKMNP, buffer zone (for leakage analysis), and reference area (for baseline monitoring). Source: NK-CAP PDD.

associated with the equipment. Furthermore, it prevented the possibility for equipment to be sold inexpensively to other harvesters when the indemnified concessionaires left the business. As a result of these equipment purchases, as well as expense and activity tracking of the indemnified concessionaires (explained below), it was estimated that there was no risk of activity-shifting leakage from the avoided degradation component of the project.

In estimating potential market leakage from the avoided degradation component of NK-CAP, project developers employed the national timber model developed specifically for Bolivia by Brent Sohngen and Sandra Brown (see “Baseline” section for a detailed description). The model represented a landmark achievement in quantifying leakage on a national scale, particularly important for the scaling up of REDD mechanisms in the future.

The difference between the modeled total annual timber production for all of Bolivia “without-project” was compared with the modeled total annual timber production for all of Bolivia “with-project.” Various scenarios explored the interdependence between price and demand for timber, as well as upfront cost constraints, resulting in estimates of 14-44% leakage from the avoided degradation component of the project. The higher leakage estimates were for scenarios in which prices are highly sensitive to changes in supply. Because it was determined that timber prices in Bolivia are NOT highly sensitive to supply

changes (the country is considered a “price-taker” not “price-setter” on international markets), a final leakage estimate of 16% of avoided emissions from degradation (11% of total project carbon benefits) was used. This totaled 1,012,337 tCO<sub>2</sub>e for the lifetime of the project, which was subtracted from the emissions reductions from the project, resulting in an estimate of lifetime carbon benefits for the project of 5,838,813 tCO<sub>2</sub>e. Calculated market leakage from the 1997-2005 verification period totaled 127,515 tCO<sub>2</sub>e and was subtracted from the verified carbon benefits, resulting in the final number of 1,034,107 tCO<sub>2</sub>e (see Figure 7).

#### ***Monitoring Leakage from Avoided Degradation Activities***

Although no activity-shifting leakage was estimated from the avoided degradation component of the project, the activities of the concessionaires were tracked after they relinquished their holdings. The Agreement to Prevent the Displacement of NK-CAP Environmental Benefits, signed on January 16, 1997 by the former concessionaires, prevented the former concessionaires from initiating new

logging activities for a period of five years, and allowed FAN to track their activities outside the project area.

FAN closely tracked the expenditures of former concessionaires, most importantly to determine if indemnification funds were reinvested into other concessions. This monitoring revealed that the majority land holder left the timber industry entirely, while the minority holder re-invested a small amount (73% of the indemnification funds) into a nearby concession, which underwent harvests in 1997 and 1998. This was not counted as primary leakage in the analysis because a portion of the harvests had already been modeled in the Bolivian timber model, thus to count them here would be double-counting.

In the case of market leakage, economic variables used in the timber market model to calculate leakage are being monitored periodically.

## PERMANENCE

Permanence refers to how robust a project is to potential changes that could reverse the carbon benefits of the project at a future date. Although all sectors have the potential for impermanence, forest carbon projects face particular scrutiny due to a perceived risk that poor management, fire, pests, etc. can lead to the destruction of forest and the subsequent release of emissions. Various strategies can be used to avoid and safeguard against the risk of impermanence.

First and foremost, it is important that all stakeholder interests (government, communities, business, etc.) are aligned with the long-term project objectives. Specific approaches, such as the purchase of conservation easements, creation of protected areas, community development, establishment of endowments for project management and monitoring, and the use of carbon buffers can also help ensure permanence. Ultimately, strategies must be tailored to the particular project site and situation.

Permanence of carbon benefits generated by the Noel Kempff Mercado Climate Action Project is safeguarded by legal, financial and institutional means. The project area has been incorporated into a national park, as legally designated by the Government of Bolivia in a binding legal document (Supreme Decree #24457), with effective protection under the auspices of the National Service of Protected Areas (SERNAP) and FAN Bolivia as the project administrator.

The Bolivian Government has a financial stake in the project’s success and continuity, as it is entitled to 49% of the verified emissions reductions from the project. Through the project, an endowment has been established to fund the protection and management of the expanded Noel Kempff Mercado National Park, including rangers, equipment, and infrastructure to protect the park. It is expected that funds will be left in the endowment when the project’s 30-year lifespan comes to completion, and these funds must be used for the benefit of the Noel Kempff Mercado National Park according to the legal endowment fund agreement.

The robust community development aspects of the project are meant to result in long-term conservation by the communities adjacent to the park. Provided with new income opportunities, land tenure and a sustainable land-use management plan, it is expected that community members will permanently refrain from clearing within park boundaries for subsistence agriculture.

Risk of fire was considered in the calculation of project carbon benefits, using the actual occurrence of fires from 1997-2005. As a result, 5% of the estimated avoided deforestation carbon benefits were deducted as a safeguard against the risk of fire. There are no additional discounts or reserves being held for other types of impermanence risk.

## COMMUNITY BENEFITS

By conserving forests that local people rely on, well-designed REDD projects can provide important ecological, cultural, and economic benefits to communities. Some times, as was the case with Noel Kempff, local communities themselves are responsible for the forest loss that REDD activities aim to prevent. Community development and involvement is often crucial to lessening pressure on forest conversion and obtaining long-term commitment and support for the project. The use of standards such as the Climate Community and Biodiversity (CCB) standard, which supports community involvement in the design of climate change mitigation projects, can help safeguard adequate consideration of community concerns.

As of 1996, there were seven communities adjacent to the NKMNP – Florida, Porvenir, Piso Firme, Cachuela, Bella Vista, and Esperancita de la Frontera – with a total population of 1,025. Traditionally, these communities sustained themselves through subsistence agriculture; with women and children in charge of gathering firewood, fruits and medicinal plants, and men seeking income through seasonal work in sawmills, field clearing, hunting and fishing. Men working in sawmills could be expected to earn between \$66- \$133/month.<sup>9</sup> Prior to project implementation, the communities generally did not have public services; rivers provided water, health centers were in poor condition, roads were seasonally impassable, public transportation was non-existent and schools lacked adequate supplies, space and teachers.

Community development activities undertaken as part of the project, including organizational empowerment, capacity building, improvement of basic services, and development of income generating activities, are likely to result in overall long-term enhancement of livelihoods.<sup>8,9</sup> In 2005, FAN conducted a socioeconomic impact assessment which examined Human Capital, Natural Capital, Physical Capital, and Financial Capital as measurements of community well-being and concluded that, on average, the communities were benefitting from the project.

To enhance livelihoods in the communities adjacent to park, strengthen their organization and aid in leakage prevention, two sequential programs were initiated with project funds. The Program for the Sustainable Development of Local Communities (Spanish acronym APOCOM) ran from 1997-2001 and improved access to



Figure 13: Chiquitano children living in one of the local communities just outside the border of Noel Kempff Mercado National Park in Bolivia. Photo credit: © Hermes Justiniano.

basic services such as health, education, and communication. The Community Development Program (Spanish acronym PRODECOM), undertaken from 2002-2006, emphasized community development by securing land titling, assisting self-organization, and supporting income generating activities such as community forestry and micro enterprise. A Community Development Action Plan was carried out from 2006-2008 with the goal of raising the standard of living for those communities affected by the project to levels at or above those at which they resided prior to project implementation. It is expected that the Government of Bolivia will carry on future community development activities with a portion of the income it receives from marketing its share of verified carbon benefits from the project. Thus far, however, the government has not commercialized its share nor has it designated how much of the proceeds will go back to the communities bordering the park. Project developers and community leaders are working with the Bolivian Government to resolve these issues.

### ORGANIZATIONAL EMPOWERMENT

Over the course of NK-CAP's evolution, the importance of deeply involving communities in project design, ensuring adequate sharing of the project benefits, and respecting and bolstering indigenous rights has been clear. Those analyzing the project with a critical eye might cite lack of community involvement at the earliest stages of project development as a weakness in project design.<sup>9</sup> In practice, community involvement can be difficult to

<sup>8</sup> Calderón Angeleri, Natalia. Livelihood Impact Assessment: NK-CAP, Bolivia, November 2005. Annex 6 of PDD. "Livelihood" comprises the capabilities, assets (including both material and social resources) and activities required for a means of living.

<sup>9</sup> Asquith, N.M., et al. 2002. Can forest protection carbon projects improve rural livelihoods? Analysis of the Noel Kempff Mercado Climate Action Project, Bolivia. Mitigation and Adaptation Strategies for Global Change 7: 323- 337.

achieve if there is a lack of community/organizational structure, as was initially the case with the communities surrounding the Noel Kempff Mercado National Park.

As such, part of the project focused on assisting communities in creating an official indigenous organization with legal status. Project developers helped communities to access the correct government officials and prepare paperwork to group themselves into the official Central Indígena Bajo Paraguá (CIBAPA), a registered organization with legal standing representing the indigenous communities around the park. As a group with legal standing, CIBAPA was eligible to file for land tenure with the National Agrarian Reform Institute (Spanish acronym INRA).

As communities became increasingly organized, they were able to take a more and more active role in the project planning. They fully participate in the management committee of the Park, where all operational aspects of the park are discussed.

#### **LAND TENURE AND COMMUNITY PROPERTY RIGHTS**

Prior to project initiation, none of the communities bordering the park had rights to the land on which they had historically resided and which they had traditionally used for hunting, logging, rubber exploitation, etc. Article six of Supreme Decree #24457, which expanded the NKMNP, recognized and guaranteed the subsistence use and exploitation of renewable natural resources within the expansion zone by communities, subject to the park management plan. Yet, the park management plan was somewhat ambiguous as to activities allowed in the park.<sup>10</sup> In order to further protect community members' access to timber, plants and animals, FAN facilitated CIBAPA's claim to 360,565 hectares of indigenous territory adjacent to the expansion area in 1998, and this claim was accepted by the INRA (see Figure 11). In June 2006, the official title for the indigenous territory ("TCO") was granted to CIBAPA.

#### **LAND USE PLANNING AND CAPACITY TRAINING**

To enhance livelihoods and to mitigate leakage, the project financed the creation of a land use plan for the newly-titled indigenous territory (TCO). Through the efforts of a consultancy team, FAN, CIBAPA and NKMNP, the Bajo Paragua Native Communal Land Natural Resources Management Plan was developed and four communities were trained in sustainable community forestry. Agricultural promoters were educated and 5 university scholarships in strategic areas (business administration, tourism, agricultural and forest engineering) were financed, along with 7 awards for polytechnic level study.

#### **ELEMENTARY AND HIGH SCHOOL EDUCATION**

Schools in the communities of Florida, Piso Firme, and Bella Vista were refurbished and, through an agreement with the project, the Municipality of San Ignacio paid the salaries of two teachers. Significant quantities of educational supplies were also purchased. Scholarships were given to 120 primary and secondary school students to continue their studies in courses which were not available in the communities.

#### **HEALTH OUTPOST**

Prior to project implementation, operators of the Moira concession provided the community of Florida with the services of a medical doctor for half a day/week, as well as discounts on medicine.<sup>9</sup> In order to compensate for the loss of these services, project developers refurbished and expanded a pre-existing health clinic in the community of Florida, which was in very poor condition, to include living quarters for a resident nurse. Another outpost, in Piso Firme, was expanded and converted into a micro-hospital, with a delivery room, laboratory, and dental services. Project funds were used to purchase medicine which is administered by community members, and a doctor was hired to live in Piso Firme and make periodic visits to all of the communities.<sup>10</sup>

#### **INCOME GENERATION**

At the time NK-CAP was initiated, sustainable logging, extraction of non-timber forest products, ecotourism, and bio-prospecting were all perceived to be promising avenues for alternative income generation for forest-dwelling communities. The project employed all of these efforts to help raise the standard of living of surrounding communities, to varying degrees of success. While a socioeconomic impact assessment concluded that, on average, the communities were benefiting from the project, the community of Florida still maintained a negative financial impact due to loss of jobs from the Moira sawmill.<sup>10</sup>

#### ***Alternative Employment***

One of the more significant initial negative impacts of the project on the communities, particularly the community of Florida, was the loss of jobs from closed timber concessions and sawmills. In total, 20 men from Florida lost their jobs in the Moira sawmill.<sup>9</sup> Project developers attempted to compensate for these losses by creating opportunities for alternative employment. For example, approximately 80 community members have worked surveying forest resources both inside and outside of the expansion area.<sup>9</sup> Of the 26 full-time park guards, 10 are from the local communities. Furthermore, six community members were trained as tourist guides.

<sup>10</sup> Calderón Angeleri, Natalia. Livelihood Impact Assessment: NK-CAP, Bolivia, November 2005. Annex 6 of PDD



Figure 14: Park guards for Noel Kempff Mercado National Park in Bolivia. Photo credit: © Hermes Justiniano.

#### **Sustainable Forestry**

Project developers supported the establishment of a sustainable community forest concession within the TCO (see Figure 11). Community members have approval by the Superintendent of Forestry to exploit heart of palm on 11,000 ha of the TCO, as well as practice sustainable forestry in 90,000 hectares of the TCO. Today, CIBAPA is running its own sawmill and is the first indigenous community with a timber selling point in the capital of the Department of Santa Cruz. Although the sawmill is not currently turning a profit, money generated from these activities are going directly back into the communities, and help to offset employment losses from the Moira concession.

#### **Ecotourism**

A visitor center was constructed with the aim of fostering income generation through tourism activities, which would work in combination with the project endowment to fund post-project activities. Cabins were built and repaired in several communities, boats and equipment purchased, and a pontoon bridge constructed for vehicle transportation. Two communities participated in tourism activities by offering guidance, lodging, and other services. Unfortunately, it became apparent that the remote location of NK-CAP would make travel to the site by tourists both difficult and expensive. Thus, the realized benefits via ecotourism have been fewer than originally anticipated.

#### **Biotrade**

A program aimed at expanding the scientific capacities of FAN, while identifying marketable wild plants and products, was started. The GermoFAN laboratory was established with the goal of producing in vitro native plants, such as orchids, that would generate income through their sale, to be funneled back into project activities and help fund post-project activities. GermoFAN has commercially produced ornamental, medicinal and edible species. In addition, the largest scientific collection of live-plant ornamental Bolivian species was established through NK-CAP. Today, it includes 2,500 species, 52 of which were identified as new to science, and 18 of which were sponsored for further research.

Further enterprises in Biotrade have been carried out, but did not prove viable. This included the creation of “Canopy Botanicals,” a company whose aim was to develop products, supplied by the communities, in three market sectors: organic foods (coffee beans, cocoa, mushrooms, and Brazil nuts), botanicals (medicinal plants) and ornamentals (orchids). The company promoted sustainable development as well as the equitable distribution of economic benefits to supplier communities. Unfortunately, the venture ultimately failed due to low returns on its investments, and the investors incurred costs to dissolve the company. The NK-CAP experience underscores the need for robust advance business planning to determine the viability of economic development strategies and avoid losses on investments.

## BIODIVERSITY BENEFITS

Beyond climate mitigation, forest carbon projects have the potential to conserve important biodiversity, if designed with this element in mind. As high biodiversity increases ecosystem resiliency in the face of climate change, the two strategies complement and enhance each other. The use of standards, such as the Climate Community and Biodiversity (CCB) standard, which support biodiversity conservation in the design of climate change mitigation projects, can help secure this co-benefit.

The Noel Kempff Mercado National Park is located in one of the few areas in South America where several different ecosystems converge; the evergreen forest of the high lands, the cerrado's savannas, the savanna's wetlands and the forest's wetlands, making the park one of the richest areas for its heterogeneity of habitats and prompting its inclusion on UNESCO's list of World Heritage Sites.<sup>11</sup> The biodiversity of the area is one of the highest in the neotropics, with 4,000 species of vascular plants, 139 species of mammals, 621 species of birds, 75 species of reptiles, 62 species of amphibians, 250 species of fish and 347 species of insects. Rare and endangered species include tiger, puma, Brazilian tapir, jaguar and caiman, among many others.<sup>12</sup>

The Noel Kempff Mercado Climate Action Project was designed to have beneficial impacts on biodiversity and habitats in both the expansion area and original park. Local information suggests that there are many species present in the expansion area which were not present in the original park area, including 64 species of birds, the maned wolf and marsh deer.<sup>13</sup> This is likely due to major differences in habitat and vegetation between the two areas.

Despite these differences, there is general acknowledgment of an ecological interdependence between the original park and expansion area.<sup>13</sup> Migration of fauna between the two areas is responsible for



Figure 15: Blue and yellow macaw at Noel Kempff Mercado National Park in Bolivia, South America. Photo credit: © Hermes Justiniano.

significant dispersion of flora. For example, it has been documented that parrots and macaws migrate between the areas on a daily basis, nesting in one and feeding in the other, and subsequently spreading seeds between both. Aquatic and marsh fauna are found in both areas and these populations are expected to increase significantly due to the added protection of marshlands and lagoons in the expansion area. Furthermore, several large species migrate annually between the areas, following the seasonal flow of water.

### MONITORING BIODIVERSITY

Key species populations (aquatic turtles, endemic wolves, amongst others) are monitored in the park through a Site Conservation Plan (SCP), which identifies key conservation sites and targets. The Integral Plan of Protection (Spanish acronym PIP) follows the guidance of the SCP and monitoring is carried out by park guards as well as external entities, with the authorization of the National Service of Protected Areas (Spanish acronym SERNAP).

## VALIDATION AND VERIFICATION

To ensure that the benefits claimed by carbon projects are real and objectively measurable, a two-step process exists for independent, third-party review and confirmation of carbon project results. The first step, validation, is a process designed to confirm that the Project Design Document (PDD) meets the stated requirements and

identified criteria of the specific voluntary or compliance market project standard under which the project has been designed. Verification is the second step, a process by which claimed carbon benefits from a validated project are confirmed.

<sup>11</sup> IUCN. 2000. World Heritage Nomination – IUCN Technical Evaluation Noel Kempff Mercado National Park (Bolivia). See: <http://whc.unesco.org/en/list/967>.

<sup>12</sup> Killeen, T.J. and T.S. Schulenberg (Editors). 1998. A biological assessment of Parque Nacional Noel Kempff Mercado, Bolivia. RAP Working Papers 10, Conservation International, Washington, D.C.

<sup>13</sup> Halloy, S. 1994. Study to determine the biological value of the area west of the Noel Kempff National Park as a basis for its inclusion in the park. Technical Report.

When the Noel Kempff Mercado Climate Action Project was first begun in 1996, there were not any specifications for carbon project design or validation. However, the United States, as a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), had begun a program called the United States Initiative on Joint Implementation (USIJI). NK-CAP was submitted under the USIJI guidelines and received approval in 1996. After the U.S. failed to ratify the Kyoto Protocol, the USIJI system became obsolete. Since REDD projects were also excluded from the Kyoto Protocol's Clean Development Mechanism, it was not possible to validate or verify NK-CAP under a compliance regime.

Thus, in 2004-2005, NK-CAP underwent an ex-post validation and verification assessment for the voluntary market. The validation and verification processes were executed by Société Générale de Surveillance (SGS), registered as a Designated Operational Entity to the Clean Development Mechanism (CDM).

As no REDD voluntary or compliance standard existed, against which the project could be assessed, the project developed its own methodology, based upon the relevant CDM guidelines for afforestation/reforestation projects (as defined October 2005), adapting them for REDD as necessary. SGS used this methodology, as detailed in the Project Design Document ("PDD")<sup>14</sup> as the basis for its validation and verification processes.

In particular, SGS assessed the project's additionality, baseline, potential leakage, monitoring plan, environmental and social impacts against the relevant UNFCCC and Kyoto Protocol requirements (where appropriate), host country criteria and the guiding principles of completeness, consistency, accuracy, transparency and scientific appropriateness.

SGS's first validation and verification review resulted in several Corrective Action Requests (CARs), 2 major and 8 minor. These included requests to improve the PDD and to develop an action program to address the needs of the communities adjacent to the park. The requested corrections were made to the PDD, a socioeconomic impact assessment was conducted by FAN to determine the needs of the communities, and a community development action program was developed, which requires the "establishment of a conditioned benefit sharing mechanism based on a participative approach" that would help to "to raise the standard of living as a minimum up to the level that the communities experienced before the commencement of the project."<sup>15</sup> These CARs were subsequently closed out and the project received validation and verification from SGS in 2005 with a total of 1,034,107 metric tons of CO<sub>2</sub> verified by SGS for the period of 1997- 2005 (see "Carbon Benefits" section for details).

It is important to note that although all CARs associated with the first validation and verification review were closed out to SGS's satisfaction, future verifications may be in jeopardy. As of this writing, key milestones in the community development action program have not been reached. The program called for the GOB to establish the necessary legal instruments to commercialize the GOB's share of the carbon credits, to commercialize the carbon credits, and to assign carbon credit revenue according to the earmarks set out in the NK-CAP Comprehensive Agreement (which include community development – see Figure 5). Given turn over of government officials and other obstacles, the GOB has yet to complete these milestones. The NK-CAP experience brings to light the need for strong local government capacity to establish the necessary legal, financial, and institutional means to manage carbon revenue and benefit sharing.<sup>15</sup>

#### **Validation Findings**

SGS' opinion is that the project does currently meet the relevant criteria for CDM project activities and fulfills the principles detailed above.

*SGS validation statement, Executive Summary, November 2005*

#### **Verification Findings**

SGS' opinion is that the project has implemented a monitoring plan and prepared a monitoring report that determines additional sequestration and emissions reductions due to the project's activities in a manner consistent with the principles detailed above. Consequently, SGS verifies the voluntary emissions reductions claimed by this project as outlined in the Schedule of Achieved Voluntary Emissions Reductions (SAVER) that accompanies this verification opinion.

*SGS verification statement, Executive Summary, November 2005*

<sup>14</sup> The PDD is available at:

<http://conserveonline.org/workspaces/climate.change/ClimateActionProjects/NoelKempff/NKPDD/PDDZip/view.html>

<sup>15</sup> SGS UK Ltd. Validation and Verification Report Noel Kempff Climate Action Project. Summary Only. PROJECT NO. VOL 0001 DATE: 27 NOVEMBER 2005.

## CONCLUSION

The Noel Kempff Mercado Climate Action Project (NK-CAP) is one of the world's most ambitious endeavors to protect tropical forest, fight climate change by lowering carbon emissions, and contribute to the sustainable livelihoods of local people. The project was brought about through the forward-looking partnership of The Nature Conservancy, the Bolivian government, local conservationists, and three U.S. energy companies, who bought out logging concessions to expand Noel Kempff National Park and worked with local communities to design economic development activities for the benefit of both people and forest health.

Initiated in 1996, in the earliest days of the global movement to recognize the power of tropical forests to fight climate change, the Noel Kempff project pioneered many of the approaches and methodologies that underpin today's most rigorous forest carbon projects. In doing so, it became the world's first large-scale Reducing Emissions from Deforestation and Degradation (REDD) project to scientifically prove that carbon benefits could be achieved by protecting standing forest. In 2005, NK-CAP became the first REDD project to be verified by a third party using rigorous standards based largely on those developed for afforestation/reforestation projects under the Kyoto Protocol's Clean Development Mechanism. This verification underscores the fact that well-designed REDD projects like NK-CAP can produce real, measurable emissions reductions as well as important benefits for biodiversity and local communities. In fact, since its inception, NK-CAP has:

- Avoided over 1 million tons of CO<sub>2</sub>e from being emitted into the atmosphere;
- Helped local communities achieve legal recognition and title over their traditional lands;
- Doubled critical habitat for threatened species such as the Brazilian tapir and jaguar;
- Provided funding for education and healthcare services in the region;
- Created an endowment to support Noel Kempff Mercado National Park for future generations.

Despite its success on many fronts, NK-CAP is not without opportunities for improvement. In the years since NK-CAP was initiated, carbon markets, forest carbon science, and conservation approaches have all evolved in important ways. As with any early-stage project, NK-CAP broke important ground in these fields, but also holds lessons for other project developers and policy-makers to be able to improve upon the NK-CAP experience.

Notably, the methods for predicting future deforestation and calculating carbon benefits are more sophisticated than they were in the late 1990s. As is evident from the refinements made to the estimated lifetime carbon benefits from NK-CAP, newer, advanced approaches that blend remote sensing data and statistical modeling with time-tested field measurement techniques are able to produce more reliable calculations than were possible at the start of the project.

In addition to the technical advances that have come about since NK-CAP began, new thinking has emerged on the design of forest carbon projects. Innovative legal instruments (e.g., conservation easements) and credit buffers – which were only employed to guard against fire risks in the case of NK-CAP – are now seen as additional ways to address the risk of impermanence in carbon projects. The application of a nation-wide timber model to estimate leakage from cancelled timber concessions in NK-CAP helped underscore the importance of moving to national-scale carbon accounting, which many now see as a critical step to addressing leakage and achieving emissions reductions at the scale needed to avert the worst impacts of climate change.

There have also been new developments in community-based conservation and governance approaches. The use of mechanisms for involving local people, such as participatory planning processes, and benefit-sharing arrangements (e.g., trust funds) has expanded dramatically since NK-CAP was begun, and such approaches are being employed with success around the world to facilitate improved livelihoods and improved environmental outcomes. Awareness of the importance of community participation in every stage of forest carbon project design has reached new heights, although it is clear from the Noel Kempff experience that community organization and capacity are critical pre-conditions for success.

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