The Paraguay Forest Conservation Project

Reduction of GHG emissions from deforestation and forest degradation in the Paraná Atlantic ecosystem - Forest Protection in the La Amistad Community, San Rafael

Project Design Document
for validation under
Climate, Community and Biodiversity Alliance Project Design (Second Edition) Standards

October 2010
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Other Associated Bodies
- Secretariat del Ambiente (SEAM)
- The National Institute for Rural Development and Lands (INDERT)
- The La Amistad Community Council
- The Municipality of Alto Vera
Executive Summary

Project Aim
The overall aim of the Paraguay Forest Conservation Project is to protect sufficient forest demonstrably threatened with clearance to prevent the emission of 800,000 tCO₂e (expressed as Voluntary Carbon Units or VCUs) into the atmosphere over a 20 year period, with a maximum project budget of US$ 7 million. Forest conservation in the La Amistad community is an initial contribution to that aim.

Project Origin
The project proponent is Swire Pacific Offshore (SPO), a leading service provider to the offshore oil and gas industry. SPO has a strong CSR policy of long standing and has made the policy decision to become ‘carbon neutral’, introducing a comprehensive programme of energy efficiency in its operations. As part of this commitment, SPO seeks to reduce the carbon footprint of its operations as far as possible and to offset its unavoidable emissions, estimated at a minimum of 800,000 tCO₂e over a 20 year period.

The World Land Trust (WLT) is contracted to develop the project in collaboration with its Paraguayan project partner Guyra Paraguay (GP). WLT is an international NGO concentrating on biodiversity conservation, based in the UK but working with a network of partners around the world. It supports GP by channeling funds into the expansion and management of the GP private reserve network in San Rafael, the Chaco and the Pantanal and has entered a tri-partite agreement with GP and the government agency responsible for protected areas, the Secretariat del Ambiente (SEAM), for the long-term management of the Defensores del Chaco, Chovoreca and Rio Negro national parks in Alto Paraguay.

The project design marries SPO’s Corporate Social Responsibility (CSR) policy, WLT’s expertise in developing voluntary offset projects with benefits for biodiversity and communities, and WLT’s local partner Guyra Paraguay’s experience of managing conservation projects on the ground in Paraguay.

The following criteria have also been set:

- Emissions reduction benefit must be of the highest quality, demonstrated by independent validation and verification using international standards for voluntary emissions reduction. VCSA guidelines will be followed, to be validated as a separate exercise.
- The VCUs produced must be transferred to SPO, in order to meet its corporate policy of carbon neutrality.
- The project must deliver demonstrable social, biodiversity conservation and other environmental benefits, both to demonstrate the broad value of REDD and to ensure sustainability of the climate mitigation benefits attributable to the project. This will be demonstrated by independent validation and verification under CCBA procedures.

Additional considerations are that:
• The primary purpose of the emissions reduction is to counter-balance emissions from the operational activities of Swire Pacific Offshore (SPO), meeting the commitment to carbon neutrality under its Corporate Social Responsibility programme (PA-Annexe 4). They are produced to marketable standards as a sign of quality but are primarily destined to be retired rather than traded.

• Nonetheless, SPO retains the right to trade or otherwise dispose of any VCUs in excess of its offsetting need. This is seen as part of the demonstration value of the project.

• Project design must allow for expansion and replication, to cover any future needs to cover additional emissions from growth in SPO operations.

Project Design
The full programme has two components, concentrating respectively on San Rafael in the Eastern (Atlantic Forest) region and on the Quebracho forests of the Chaco-Pantanal transition in eastern Alto Paraguay. Both areas are of extremely high conservation value, are of fundamental importance to indigenous peoples and are highly threatened. The fate of both is of national and international concern. The components are treated as separate projects for the purposes of CCBA validation, with the La Amistad initiative as the first in the programme. Within this Project Design Document (PDD), all prices are expressed as US$ at constant 2009 value. Trust funds will be established for both project components in order to maintain project actions beyond an initial 5-year investment period over the full project life, with interest set against inflation.

The project concentrates on the La Amistad small-holder community, established in 1997 within the forest bloc but excised from the area reserved for conservation management. Project activities include:

Establishing a ‘Payment for Environmental Services’ (PES) system to the La Amistad community to conserve remaining forest on its land
Approximately half of the total area of La Amistad remains forested at this time. The approach is to pay community members to retain and improve the quality of forest on their land in preference to clearance as planned. Incentives are also included for community participation in forest protection as a leakage mitigation measure, given that any degradation in the surrounding forest attributable to community members must be deducted.

The scheme will be voluntary, with individual community members contributing parts of their parcels to a community forest reserve. A high uptake is, however, desirable and payment levels are set accordingly, based on an annual US$ 170 per hectare of standing forest and US$ 65 per hectare for reforestation. These rates are designed to compete with cotton as an alternative land-use. It is proposed that 75% of the payment be made to individual land occupiers and 25% to actions benefitting the community as a whole.
**Extension services and technical support for sustainable forest management and enhanced agricultural output.**
These actions are designed to address the need i) to manage the community forest reserve as a community resource and ii) to compensate for loss of agricultural land by more efficient use. The project provides a budget for regular technical support by local experts. Capacity building is also provided for through participation in forest management programmes, including regular monitoring of carbon stocks. Total management costs are estimated at US$ 28,600 p.a.

**Establishment of the San Rafael Long-term Management Fund**
The project will invest a total of US$ 421,000 for project activity over the first five years plus US$ 1.2 million to the Long-term Management Fund to maintain activity for the remainder of the project life. The fund is being established in consultation with the Global Conservation Fund, which will also contribute a substantial sum to conservation in San Rafael as a parallel action facilitated by this project. The GCF fund is important in providing for permanence of benefits beyond the project life.

**Conclusion**
It is estimated that project activity will sequester 120,490 tCO$_2$e net of deductions and reserves at a total cost of US$ 1.68 million. This is expensive but delivers high social and very high biodiversity conservation gains while unit costs may be reduced when project benefits from improved conservation in the main forest bloc are taken into account. The important immediate benefit is that it sustains a programme component in San Rafael, which offers important opportunity for future project expansion in collaboration with the Mbyá Guarani, the indigenous inhabitants of the area. Communications between Guyra Paraguay and representatives of the Mbyá will therefore be maintained.
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BIBLIOGRAPHY (not included in Annexes)


Yanosky 2008. Áreas importantes para la Conservación de las Aves en Paraguay Ia edición. Guyra Paraguay/BirdLife International. Asunción
LIST OF ACRONYMS

ACIDI - Asociación de Comunidades Indígenas de Itapúa
AFOLU - Agriculture, Forestry and Other Land Uses
ARR – Afforestation, Reforestation and Revegetation
BAAPA - Bosque Atlántico de Alto Paraná
CAPI - Coordinadora por la Autodeterminación de los Pueblos Indígenas de Paraguay
CATIE - Centro Agronómico Tropical de Investigación y Enseñanza
CCBA – Climate, Community and Biodiversity Alliance
CIDA - Canadian International Development Agency
CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNF - Canadian Nature Foundation
COP – Conference of the Parties
CSR – Corporate Social Responsibility
DBH – Diameter at breast height
ETM – Enhanced Thematic Mapper
FAO – Food and Agriculture Organisation
FSC – Forestry Stewardship Council
GCF – Global Conservation Fund
GHG – Greenhouse Gas
GIS – Geographic Information System
GMOs – Genetically Modified Organisms
GP – Guyra Paraguay
HCV – High Conservation Values
IBA - Important Bird Areas
IBR – Instituto de Bienestar Rural
IDEA - Instituto de Derecha y Economía Ambiental
IDESAM – Instituto de Conservacão e Desenvolvimento Sustentavel do Amazonas
INDERT - The National Institute for Rural Development and Lands
INDI - Instituto Paraguayo del Indígena
IPCC – Intergovermental Panel of Climate Change
IUCN – International Union for Conservation of Nature
KBA – Key Biodiversity Area
MSS – Multi-Spectral Scanner
NATURAL - Natural Land Trust
NGO – Non-governmental Organisation
NP – National Park
OLT - Organización Lucha por la Terra
OPIT - Organización Payipie Ichadie Totobiegosode
PDD – Project Design Document
PES – Payment for Environmental Services
PRO COSARA - Asociación Pro Cordillera San Rafael
REA – Rapid Ecological Assessment
REDD – Reduced Emissions from Deforestation and forest Degradation
REDD+ - Reduced Emissions from Deforestation and forest Degradation +
SEAM - Secretariat del Ambiente
SPO – Swire Pacific Offshore (Pte) Ltd
tCO2 – tonne of CO2 - describes emissions
tCO2e - tonne of carbon dioxide equivalent – describes offsets
TM – Thematic Mapper
TNC - The Nature Conservancy
UN – United Nations
UNAP – Unión de Nativos Ayoreos del Paraguay
UNDP – United Nations Development Programme
UNFCCC – United Nations Framework Convention on Climate Change
UN-REDD – United Nations collaborative initiative on Reducing Emissions from
Deforestation and forest Degradation
UTM – Universal Transverse Marcator
VCS – Voluntary Carbon Standard
VCSA – Voluntary Carbon Standard Association
VCU – Voluntary Carbon Unit
VER – Voluntary Emission Reduction
WLT – World Land Trust
WWF – World Wildlife Fund
General Section

G1. Original Conditions in the Project Area

G1.1. Project Location and Physical Parameters

The project zone consists of the forest of San Rafael, lying in the Eastern Region of Paraguay (Map 1), including lands in the Departments of Itapua and Caazapa. It represents one of the most extensive remaining patches of relict Atlantic Forest remaining in Paraguay, covering c. 69304 ha (by 2009 GIS measure) and centred on UTM S625 740 W707 3135.

Map 1 – Location of San Rafael at national scale.
Within San Rafael, the initial project area consists of land purchased under the Agrarian Reform programme and re-assigned to members of the La Amistad community in 1997. The area, excised from the main San Rafael forest bloc, covers 1182 ha in a narrow strip running into the central part of the forest (Map 2), centred on UTM S617 166 W707 1576. It is thus almost completely surrounded by forest, excepting a narrow western frontage on the Tebicuary River. Administratively, La Amistad lies in Alto Vera municipality within Itapua.

Map 2 – The La Amistad enclave within San Rafael (in red).

Topography and hydrology
Cerro San Rafael consists of a low range of undulating hills, aligned approximately north-south. The eastward portion of the reserve is a somewhat elevated plateau, extending beyond the forest boundary into the soya-growing lands of Itapua. The
The western portion is essentially the fall-away from the plateau edge onto low-lying land (Map 3).

*Map 3 – Topography and drainage.*

The drainage of the entire area is primarily westward, as tributaries (e.g. Arroyos Kavakua, Karumbe’y, Takuary, Kambay and Paso Naranja) draining into the Tebicuary, an important tributary of the Paraguay River. To the east of San Rafael, flow from the relatively elevated plateau of western Itapua is eastward to the Paraná but this system is peripheral to the forest bloc.

In addition to the surface flow, the hills are also a recharge area for the Guarani aquifer, one of the largest in the world and of major economic importance in Paraguay, Brazil, Argentina and Uruguay.
**Geology and soils**

San Rafael is underlain by sandstones, with basalt on its eastern fringe. There are four soil types in the general area, all readily distinguished on colour: the Asuncion Series (reddish); the Carmen Series (dark grey to black); the ‘Valle y Llanos’ Series, in wetlands and favoured for rice; and the dark Alto Paraná Series. Within San Rafael, the practical approach is to distinguish red, white or black soils, all formed in direct relationship to the topography.

The red soils form in the uplands on slopes of 7-40%, sandy to sandy clays in the upper 80 cm and sandy from 80-120 cm depth. The white soils form on the lower slope of 0-7%, are shallow (to 30 cm deep), sandy throughout and of low fertility. The black soils underlie the savannah grasslands and wetlands in the valley bottoms. The division between red and white soils is important in terms of potential and actual land use, the poor white soils being predominant in the project area.

**Climate**

The climate is humid sub-tropical with warm summers and rainfall distributed throughout the year. Average temperatures are 21-22°C. Cool conditions are associated with fronts from the south. These can occur at any time but most usually from May-September (i.e. the southern autumn and winter) with the coldest period in June-August, when 4-5 frosty nights normally occur. Annual rainfall varies from 1600-1800 mm p.a., decreasing across the forest from east to west and highest in the southern summer. Relative humidity varies from 60-90% throughout the year and the average evapo-transpiration potential is 1100 mm p.a.

**G1.2. Vegetation Types and Condition**

The dominant climax vegetation of San Rafael is Upper Paraná Atlantic Forest (Bosque Atlántico de Alto Paraná or BAAPA). Western San Rafael lies in the transition zone between Atlantic Forest and the Pampas grasslands, forming a mosaic of wooded rises and grassy valleys. The natural vegetation types are described in detail in the annexes (A-Annexes 2, 3, 15). Key points are that true forests predominate, with primary forest shifting from a wet semi-evergreen type c. 30 m tall in the east to a moist semi-evergreen variant c. 20 m tall in the west. This reflects the decline in average rainfall across the forest and the shift from the more fertile red to the poorer white soils. La Amistad lies in the ‘moist semi evergreen’ area and all carbon estimates are also based on field measurements from this western sector. Other woody vegetation types comprise riparian (low) forest, secondary forest and bamboo stands. Non-woody types include savannah and wet grasslands, grading into wetlands.

The high forest has a long history of timber extraction and it is reckoned that the populations of c 30% of the tree species are now residual (San Jurjo, 1992 quoted in A-Annexe 2), indicating heavy selective logging of merchantable timber to the point of significant alteration of forest structure and floristic composition. The forest is recovering from that condition where it is effectively protected. Elsewhere the pressure is maintained by extensive illicit timber removal (see A-Annexe 10 for recent cases). It is, however, modified throughout.

The high forest has also been subject to widespread clearance. As of 2009 (Table 1) 9.4% of the area was cleared for agriculture and a further 17.8% was secondary forest.
in various stages of recovery but still distinguishable from the high forest. Some 18.7% of the area is grassland, mostly natural but including paddocks cut from high forest and sown with introduced grasses for cattle fattening. These conditions apply to La Amistad as well as the forest as a whole. The processes involved are described in more detail, with maps, in section G 1.4.

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<th>Land Cover</th>
<th>San Rafael (ha)</th>
<th>La Amistad (ha)</th>
<th>Total (ha)</th>
<th>%</th>
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</tr>
</tbody>
</table>

Table 1 - Land cover in San Rafael (including La Amistad) in 2009 (from Leiva 2009 plus Guyra Paraguay GIS measurements for La Amistad, Maps 7A-C).

G1.3. Project Area and Project Zone Boundaries

The boundaries of the project zone consist of the area defined in Decrees 16.610/02 and 5.638/05 (Map 4), inclusive of La Amistad which was excised from the forest bloc in 1997. Earlier laws relating to San Rafael did not define the boundary with precision. It should be noted that the 2002 and 2005 decrees give an estimated area of 70,141 ha for San Rafael (excluding La Amistad) but the recent GIS work gives 69,304 ha. The latter figure is therefore used for project purposes.

The project area is defined by the cadastral survey lodged with the land department by IBM, the forerunner of INDERT (Map 5).
Map 4 - Boundaries of San Rafael and constituent land parcels (from draft San Rafael Management Plan, unpublished).

Map 5 - Cadastral survey map, La Amistad.
G1.4. Carbon Stocks and Methods

**Methodology and sources**
A series of studies track patterns of land use change, including deforestation, at different scales in the San Rafael area. The studies also assess carbon stocks and estimate historic CO₂ emissions attributable to land use change. The methods are based on the IPCC Good Practice Guidelines current at the time and using Tier 2 methodologies plus site-specific (Tier 3) data from field measurements.

*Huang et al., 2009* (A-Annexe 1) tracks change in the Eastern Region of Paraguay from the 1970s to 2004. This study, conducted by the University of Maryland with Guyra Paraguay and Conservation International participation, gives the regional context using systematic sampling from Landsat Multi-Spectral Scanner (MSS) imagery for the 1970s and Thematic Mapper (TM) for the 1990s, plus ‘wall-to-wall’ mapping from Enhanced Thematic Mapper Plus (ETM+) for the 2000s. The Landsat imagery was selected as being the most comprehensive, the earliest and the best available, allowing analysis to a minimum 92% accuracy.

*Guyra Paraguay* continues to monitor deforestation at a national scale through analysis of satellite imagery. The programme provides monthly updates for interested parties, including the Government of Paraguay.

*Parra et al., 2004* (A-Annexe 2) is the technical report estimating the potential of San Rafael for carbon sequestration under the project ‘Diversification of revenues, conservation of rare habitats and carbon sequestration in the Atlantic Forest’, undertaken by Guyra Paraguay with the support of the Canadian Nature Foundation, Canadian International Development Agency (CIDA) and the Centro Agronómico Tropical de Investigación y Enseñada (CATIE). The study (‘the CIDA project’) is a key founder resource for the present project, which it prefigures. Indeed, the explicit intent was to provide baseline data for a future project.

The methodology consisted of:

A. Stratifying the land cover into recognisable mapping units with different structures and carbon stocks. The units comprised Modified Primary Forest, Low Forest (essentially the riparian areas), Secondary Forest (also low, still distinguishable structurally from the high primary forest), natural grassland and man-made pasture, cultivated land, and water.

B. Comparative analysis of Landsat imagery acquired on 19.04.89 (TM) and 03.02.02 (ETM). The images were geo-referenced, ground-truthed by reference to inventory plots located in the various mapping units, then mapped using Erdas Imagine 8.6 Reclassification software with a 5 x 5 pixel filter.

C. The annual deforestation rate was then calculated according to the formula:

\[
\%df = \frac{(A_{df} \times 100)}{A_{1989}}
\]

where \(\%df\) is the annual deforestation rate, \(A_{df}\) is the difference in forest area between 1989 and 1989, and \(A_{1989}\) is the forest area in 1989.

A Land Use Change Matrix was also created, essentially comparing the areas of each mapping unit in 1989 and 2002. This process reveals small
inconsistencies in the digitised map, notably in the transitions from one unit to another. Where these were identified, the boundaries of the units were adjusted accordingly to optimise consistency.

D. Carbon stocks were then estimated for each unit, in the following carbon pools: above-ground living biomass, below-ground living biomass (i.e. roots), necromass (dead wood), humus/leaf-litter and soil (see A-Annexe 2 for details on measurement protocols):

- **Above-ground biomass – modified primary forest:** A forest inventory was carried out in 2001 with the support of the Natural Land Trust, on 230 temporary plots of 2000 m² in modified primary forest and measuring commercial volume of all trees of 10 cm diameter breast height (dbh) and above. This data was then converted to total above-ground biomass using the formula (Brown et al., 1996), valid for size ranges between 5 and 148 cm dbh:

  \[
  \text{Kg Biomass} = e^{2.289 + 2.649 \ln(\text{dbh}) - 0.021 \ln(\text{dbh})^2}
  \]

  where \( \ln \) is the natural logarithm (Equation 1).

  As a cross-check, the following formula employed locally for commercial volume was also used:

  \[
  \text{Kg biomass} = (\text{AB} \times \text{HC} \times 0.775) \times (\delta \text{ wood})
  \]

  where AB is the basal area at breast height, HC is the commercial height and \( \delta \) is the timber density, derived from literature search (Equation 2).

  The biomass estimates are derived from the sum of the volumes of the individual trees and thus exclude palms, bamboos and all trees of under 10 cm dbh. To obtain the missing data, 10 of 230 inventory plots were selected at random (2 from each biomass quintile), relocated on the ground and laid out in a nested design within a 20 × 100 m parcel.

  All trees of dbh 10 cm and greater were identified, dbh re-measured, and the % of hollow stem estimated within the 20 × 100 m parcel. Stem-length of palms was also measured. All trees to 5 cm dbh were measured in the 20 × 25 m sub-parcel and all woody stems taller than 1.3 m in the 4 × 5 m sub-parcels, placed in diametric opposition to reduce bias through patchy ground-cover.

  To obtain the expansion factor for all above-ground biomass, the relationship was calculated between the total biomass as derived from the plot re-measurement and the two biomass estimates from equations 1 and 2, applied
to the 2001 forest inventory data. The two estimates per plot were then averaged and the value per quintile also averaged, then re-applied to all 230 plots in the 2001 inventory.

Carbon stocks were then derived using the default conversion of 0.5 tC = 1t biomass.

- **Above-ground biomass – secondary forest**
  This information was obtained from a 1 ha plot, laid out in a 20 x 500m area subdivided into 25 20 x 20m plots, established in 2003 in 8 year-old secondary growth. The measurements comprised dbh, stem-height, total tree-height and crown position. The same approach applied to the modified primary forest was used, except that only the local biomass formula (Equation 2) was used, with a default timber density of 750 kg/m3. An average annual biomass increment could be derived as the secondary forest was of known age. This increment is assumed to be constant for the first 30 years for the purpose of forward projections.

- **Necromass**
  For this study, necromass refers to dead wood and leaf-litter is ignored. The necromass in the plots is estimated using Equation 1 (as for living trees), taking into account the degree of decomposition using the ‘machete test’ – i.e. placed in three classes of 1 – fresh (wood still hard), 2 – moderately decomposed (machete penetrates several cm) and 3 – decomposed (machete sinks fully into heart). Classes 2 and 3 are considered 60 and 30% of the equivalent living wood biomass (i.e. values are reduced by 40% and 70% to account for degree of decomposition).

- **Below-ground biomass**
  Below-ground biomass (roots) was estimated by applying the standard expansion factor in the IPCC Guide of Good Practice to the above-ground biomass estimate:

  \[
  \text{Below-ground biomass (metric ton/ha)} = e^{[-1.0587+0.8836*ln(above-ground biomass)]}
  \]

- **Soil and humus**
  Soil samples were taken along transects both in high forest and other land cover types (deforested before and after 1989, high grassland, low grassland) using the following array:

  ![Soil sample array diagram]

  4 soil density samples (2 @ 0-10 cm, 1 @ 11-20 cm, 1 @ 21-30 cm).
Within each pit (black in the diagram), samples were taken at 0-10 cm, 11-20 cm and 21-30 cm, with all samples at a given depth mixed to give a single sample for analysis of the carbon fraction using the Walkley Black method. 10 x 10 cm core samples were also taken at the different depths to measure soil density, as was also all the humus in a single 35 x 35 cm sample for wet weight, dry weight and carbon fraction analysis. All analyses were undertaken at the soil laboratory of the Agricultural Sciences Faculty of the National University, Asuncion.

*Leiva, 2009* (A-Annexe 3) is the consultancy report conducted for the present project, re-iterating the 2004 study (Parra et al 2004, A-Annexe 2) to assess changes in carbon stocks over the period 2002-2009.

Differences include the following:
- The 2002 Landsat (ETM) imagery was acquired in 03.02.02 (i.e. the same used by Parra et al, 2004, compared against that of 02.04.09).
- The mapping system was upgraded to Arcview 3.3.
- The deforestation rate was calculated according to the following formula (FAO,1996):

\[
r = 1 - \left( \frac{A_2}{A_1} \right)^{1/t}
\]

Where \( r \) = deforestation rate, \( A_1 \) = forest area in 2002, \( A_2 \) = forest area in 2009, and \( t \) = number of years between area measurements.
- ‘Low’ forest types (secondary and riparian) are conservatively assumed to carry 50% of the biomass of ‘high’ modified primary forest.
- The estimate takes account of growth increment over the period, using the following equation recommended by the IPCC Guide to Best Practice:

\[
C_{\text{TOTAL}} = C_w \times (1 + R)
\]

Where \( C_{\text{TOTAL}} \) = average annual biomass increment (above and below ground) in metric tons/ha/yr, \( C_w \) = average annual biomass (above ground) in metric tons/ha/yr and \( R \) is the proportion of roots to shoots.

Carbon stocks in necromass and soil are assumed to remain unaltered since the earlier study.

Other relevant field-work includes: establishment of a 1 ha permanent plot in logged primary forest (*Leiva & Silva 2008 – A-Annexe 4*), giving growth increment in standing forest and a cross-check on carbon stock/ha; as yet unpublished carbon stock measurements from a network of permanent 1 ha plots established under an FAO-funded project (A-Annexe 5), including a site in San Rafael and giving another cross-check; and unpublished field measurements in forest regeneration parcels (natural regeneration plus enrichment planting with native species), giving growth increment in early secondary stages.

*Trends of land use change and deforestation*

Huang et al, 2009 (A-Annexe 1) document the deforestation in the Eastern Region of Paraguay, still 70% forested in the 1970s but reduced to 41% in the 1990s and 25% in the 2000s. The principal economic driver of land use change in the region is
mechanized soya cultivation – the area put to the crop has increased by 375% over the past 25 years, adding 1.7 million ha of new land to the agricultural domain and making Paraguay one of the largest producers in the world and its fourth largest soya exporter. Ranching is also an important land use. Land grants to small-holder communities have a local impact but it is clearance on large holdings (defined as over 100 ha in the Eastern Region) that drives deforestation on a national scale – the 2008 Agricultural Census figures show that only 3% of total deforestation took place on holdings of less than 500 ha extent.

Forest Law (Law 422/73) requires that 25% of any holding larger than 20 ha (i.e. excluding small-holdings) must remain forested and if forest cover on a holding was below that level then 5% must be re-forested. The legislation evidently failed in its aims – indeed, it was often interpreted in a way that had the perverse affect of encouraging replacement of native forest with a smaller area of plantations (see A-Annexe 11). The rampant habitat loss therefore stimulated other protective measures. One of these was to greatly expand the National Protected Area System in the early 2000s (SEAM et al, 2007), to cover a total of 6 million ha (14.9% of the national territory). This covers a full range of protected area categories but the legal basis for many sites, including San Rafael, is unsound while management is chronically underfunded and widely ineffective. Another initiative was the ‘Zero-deforestation’ Law 2524/04, applying only to the Eastern Region but imposing no clearance whatsoever for two years. This legislation, when combined with careful monitoring and good enforcement, was effective in reducing deforestation in the Eastern Region by 94% in its first 18 months, resulting in an extension for a further 5 years from 2006 (MAG/DGP 2006).

The area around San Rafael has been subject to the same deforestation pressures acting on the Eastern Region as a whole, with clearance levels actually well above average in Itapua during the period from 1994-2004 (Map 1). Furthermore, these pressures have been exerted right to the forest edge (Table 2).

<table>
<thead>
<tr>
<th>Department</th>
<th>Total forest area (km²)</th>
<th>1990s</th>
<th>2000s</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itapua</td>
<td>16,389</td>
<td>4192</td>
<td>2579</td>
<td>54.5</td>
</tr>
<tr>
<td>Caazapa</td>
<td>9,539</td>
<td>3,217</td>
<td>1933</td>
<td>39.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Distance from San Rafael boundary</th>
<th>10-15 km</th>
<th>5-10 km</th>
<th>0-5 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>%loss 1990s-2000s</td>
<td>38.9</td>
<td>31.8</td>
<td>35.2</td>
</tr>
</tbody>
</table>

Table 2: Deforestation rates in the area adjacent to San Rafael (derived from Huang et al, 2009 – A-Annexe 1).

Agricultural expansion, primarily for soya, has been the main deforestation driver on the eastern (‘red soil’) side of San Rafael. Small-holder settlement is more extensive on the southern and western flank, where the red soils become thin and rocky or give way to the sandy ‘white soils’ (Map 2).

Trends in the main San Rafael forest bloc (i.e. within the project zone) have also been analysed, both for 1994-2004 (Huang et al, 2009, A-Annexe 1) and 2002-2009 (Leiva 2009, A-Annexe 3). The 1994-2004 analysis (Table 3) shows that loss over the period
was only 10% compared to 39% in the eastern Region as a whole, indicating that moves towards protected area status slowed deforestation within San Rafael prior to the wider zero-deforestation legislation.

<table>
<thead>
<tr>
<th>San Rafael Forest area</th>
<th>Total (km²)</th>
<th>1990s</th>
<th>2000s</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>777</td>
<td>621</td>
<td>556</td>
<td>10.2%</td>
</tr>
</tbody>
</table>

*Table 3: Deforestation within San Rafael, 1994-2004 (derived from Huang et al, 2009,A-Annexe 1).*

Leiva 2009 (A-Annexe 3) shows the following changes in cover within San Rafael (Table 4, Maps 6A-C)

<table>
<thead>
<tr>
<th>Cover type</th>
<th>Area (ha)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002</td>
<td>2009</td>
</tr>
<tr>
<td><em>Modified primary (high) forest</em></td>
<td>40,025</td>
<td>35,270</td>
</tr>
<tr>
<td><em>Low forest</em></td>
<td>2,965</td>
<td>1,500</td>
</tr>
<tr>
<td><em>Secondary forest</em></td>
<td>10,125</td>
<td>12,570</td>
</tr>
<tr>
<td><em>Regeneration</em></td>
<td>463</td>
<td>525</td>
</tr>
<tr>
<td><em>Agriculture</em></td>
<td>5,613</td>
<td>6,256</td>
</tr>
<tr>
<td><em>Grassland</em></td>
<td>9,610</td>
<td>12,682</td>
</tr>
<tr>
<td><em>Water</em></td>
<td>459</td>
<td>500</td>
</tr>
<tr>
<td><em>Unclassified</em></td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>69,304</td>
<td>69,304</td>
</tr>
</tbody>
</table>

*Table 4: Land cover change in San Rafael, 2002-2009 (from Leiva 2009, A-Annexe 3)*
Map 6A – San Rafael land cover 2002.

Map 6B – San Rafael land cover 2009.
The results show a net reduction in total forest cover (i.e. all three forest types combined) of 11.7%, giving an annual average of 1.5% (889 ha/yr). The most important shifts, however, are in decreased modified primary forest area and increased secondary forest, agriculture and grassland pasture, indicating disturbed conditions and a dynamic of clearance and re-growth. The disturbance is compounded by the extensive illicit selective logging in the modified primary forest. The rate of full transformation from a forest to non-forest land cover category is thus significant but overall the greater threat to ecological integrity within San Rafael has been forest degradation rather than deforestation.

Neither Parra 2005 (A-Annexe 2) nor Leiva 2009 (A-Annexe 3) included La Amistad (the project area itself) in their analyses as the community lands had already been excised from the main forest block. Changes were therefore analysed separately as part of project development, using the Guyra Paraguay GIS facility to compare Landsat imagery dating to 1997 (establishment of the settlement), 2003 and 2009 (Maps 7A-C, Table 5).

<table>
<thead>
<tr>
<th>Cover Type</th>
<th>Area (Ha)</th>
<th>1997</th>
<th>2003</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified forest</td>
<td></td>
<td>661</td>
<td>408</td>
<td>299</td>
</tr>
<tr>
<td>Low forest</td>
<td></td>
<td>65</td>
<td>54</td>
<td>50</td>
</tr>
<tr>
<td>Grassland</td>
<td></td>
<td>457</td>
<td>457</td>
<td>490</td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
<td>0</td>
<td>264</td>
<td>344</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1183</td>
<td>1183</td>
<td>1183</td>
</tr>
</tbody>
</table>

**Table 5:** Land cover change in La Amistad, 1997 – 2009 (derived from GIS spatial analysis).

**Map 7A –** La Amistad land cover 1997.
Map 7B – La Amistad land cover 2003.

Map 7C – La Amistad land cover 2009.
The main change at La Amistad is in conversion of 329 ha of the modified primary (high) forest to agriculture. Individual colonists have worked at different rates with some undertaking the minimum permissible and others completely transforming their parcels but, overall, forest cover has been reduced by 52% over the 12 years, equivalent to 4.3% p.a. The area now shows the typical fish-bone pattern of recent planned small-holder settlement in tropical forest, created by progressive clearance back from the road-frontage along the northern edge.

By contrast, low forest along the streamlines has been little altered with only 15 ha converted to agriculture. La Amistad also includes a tract of natural grassland, treated as communal land. This has remained essentially unaltered excepting an additional 33 ha created at the expense of a primary forest patch.

**Carbon stocks and emissions**
Leiva 2009 (A-Annexe 3) gives the following estimate of carbon stocks within San Rafael forest types (Table 6).

<table>
<thead>
<tr>
<th>Category</th>
<th>Carbon Pool</th>
<th>Carbon Stock (tC/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002</td>
<td>2009</td>
</tr>
<tr>
<td>High Forest</td>
<td>Above-ground biomass</td>
<td>141.275</td>
</tr>
<tr>
<td></td>
<td>Below-ground biomass</td>
<td>28.219</td>
</tr>
<tr>
<td></td>
<td>Necromass</td>
<td>44.167</td>
</tr>
<tr>
<td></td>
<td>Litter and soil</td>
<td>38.938</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>tC/ha</td>
<td>252.599</td>
</tr>
<tr>
<td></td>
<td>tCO2e/ha</td>
<td>926.764</td>
</tr>
<tr>
<td>Low Forest</td>
<td>Estimated 50% of prim. forest</td>
<td>126.299</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>tC/ha</td>
<td>126.299</td>
</tr>
<tr>
<td></td>
<td>tCO2e/ha</td>
<td>463.382</td>
</tr>
<tr>
<td>Secondary Forest</td>
<td>Estimated 50% of prim. forest</td>
<td>126.299</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>tC/ha</td>
<td>126.299</td>
</tr>
<tr>
<td></td>
<td>tCO2e/ha</td>
<td>463.382</td>
</tr>
</tbody>
</table>

*Table 6: Carbon stocks per ha in San Rafael forest types (Leiva 2009).*

The 2002 carbon stocks are derived from Parra et al, 2004. The original spreadsheets for the calculations are now unavailable, leaving only the results quoted in the body of the report. The commercial timber inventory data, however, have been relocated, allowing reanalysis for above- and below-ground biomass (A-Annexe 2B) and giving identical results to the nearest tC/ha. The original data-sheets for necromass and soils+litter remain unavailable – the results quoted by Parra et al, 2004 for these pools (and the carbon stocks in grass- and agricultural land) cannot therefore be cross-checked until the base-line for the monitoring programme has been performed (see CL3). The result of the cross-check for high forest nonetheless gives confidence in the accuracy of the whole study, for the purposes of initial estimates of climate benefits attributable to the project.

In Leiva 2009, the following assumptions have been used to update the 2002 stocks to 2009:
- High forest sequesters 0.62 tC/ha/yr (from 1 ha permanent plot on-site measurements);
- Regenerating forest stores 3.52 tC/ha/yr through growth increment (on-site regeneration plot field data);
- Carbon stocks in the necromass, litter and soil pools in forested areas remains unaltered.

Parra, 2004 (A-Annexe 2) found considerable variation in carbon stocks in the plots in modified primary forest, at least in part attributable to variations in levels of timber extraction. The 141 tC/ha represents an average for above-ground biomass and compares with estimates from single 1 ha permanent plots of 117 tC/ha (Leiva & Silva, 2008, A-Annexe 4) and 126 tC/ha (Unpublished FAO report).

Applying the carbon stocking to the land-change information indicates emissions within San Rafael of 3,850,712 tCO₂e between 2002 and 2009, attributable to transformation of high and low forest to other land-cover types. There has also been sequestration of 1,351,653 tCO₂e through woody growth increment. Net emissions over the period are therefore reckoned at 2,499,059 tCO₂e (i.e. 357,008 tCO₂e p.a.), a conservative figure taking no account of degradation.

La Amistad shares the same land cover characteristics as the rest of San Rafael and is assumed to carry the same carbon stocks/ha in its land cover types. These are applied to land use change to estimate emissions attributable to the settlement between its establishment (1997) and 2009 (Table 7). The same basic assumptions are made as for San Rafael as a whole. In addition no account has been made for growth increment on the assumption it has been removed by continued off-take of fuel-wood and timber on the settled land. The result is an estimated net emission of 286,000 tCO₂e over the 12 years (i.e. 23,800 tCO₂e p.a.).

<table>
<thead>
<tr>
<th>Land Cover</th>
<th>High Forest</th>
<th>Low Forest</th>
<th>Grassland</th>
<th>Agriculture</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon stock C/ha</td>
<td>252.6</td>
<td>126.3</td>
<td>30</td>
<td>41.7</td>
<td></td>
</tr>
<tr>
<td>Area 1997 ha</td>
<td>661</td>
<td>65</td>
<td>457</td>
<td>0</td>
<td>1183 ha</td>
</tr>
<tr>
<td>Carbon stock tC</td>
<td>166969</td>
<td>8209</td>
<td>13710</td>
<td>0</td>
<td>188,888 tC</td>
</tr>
<tr>
<td>Area 2009 ha</td>
<td>299</td>
<td>50</td>
<td>490</td>
<td>344</td>
<td>1183 ha</td>
</tr>
<tr>
<td>Carbon stock tC</td>
<td>75527</td>
<td>6315</td>
<td>14700</td>
<td>14345</td>
<td>110,887 tC</td>
</tr>
<tr>
<td>Net Change tC</td>
<td>-</td>
<td>-78,001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net emission tCO₂e</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>286,030 tCO₂e</td>
</tr>
</tbody>
</table>

*Table 7: Net emissions attributable to land use change within La Amistad, 1997-2009.*
G1.5. Community Characteristics

Three key stake-holder groups are identified in the project zone: owners of large land holdings, small-holders and the indigenous Mbya Guarani communities.

**Individual land-holders:** The great majority of the land parcels in San Rafael are held by private land-owners. Three broad categories can be identified in this grouping, all with a limited presence on the ground (and in some cases with none):

- **Conservation managers.** Guyra Paraguay is pre-eminent here, holding title to over 6000 ha of land run as a private reserve (Guyra Reta) with habitat protection, monitoring and research as management aims. It also has a field station with permanent staff on the Kanguery property. Guyra Paraguay operates within the San Rafael Conservation Alliance consisting of Guyra Paraguay, the Natural Land Trust (NATURAL – concentrating on sustainable forest use), the Asociación Pro Cordillera San Rafael (PRO COSARA – concentrating on resource protection), the Instituto de Derecha y Economia Ambiental (IDEA – environmental law) and Fundación Enlace (a networking facilitator). There is considerable collaboration between the Alliance, SEAM and the Municipal authorities, at least of Alto Vera, in enforcing compliance of the protective measures in place.
- **Private land-owners.** These are generally characterised by low-intensity use (e.g. extensive cattle ranching) or a ‘benign neglect’ approach.
- **Agro-businesses.** A number of land-owners are agro-businesses. Patchy, localised clearance has occurred over recent years in holdings within this group.

**Small-holders: The La Amistad community, corresponding to the project site, is the only formal campesino community in the forest bloc and originated in an initiative mounted by the Comisión Vecinale Puente Cué (San Pedro de Paraná) and OLT (Organización Lucha por la Terra). A campesino incursion occurred in the east of the area at the expense of the indigenous community but the occupiers have since withdrawn – the effects on the land cover can be seen on the Arroyo Claro parcel (Map 2).

The original settlement of 1998 created 82 land parcels ranging from 6-9 ha in size. There were 67 households in 2003, rising (according to the Village Council or Comision Vecinal) to 80 in 2009 plus a further 27 occupying land in the western commons area. At the same time there has been some turnover of occupancy (c. 18%) where new settlers have taken over from the first holder. Following the guidelines of the time, the settlers have built their houses close to the road frontage (Map 7A-C) and cleared back from there (Image 1). A social characterisation of the area was carried out in June 2003 as part of the CIDA project, using The Nature Conservancy (TNC) ‘Diagnóstico Rural Participativo’ methodology for conservation area planning (A-Annexe 6). This information is supplemented by community consultations and surveys for this feasibility study (A-Annexes 7, 8, 9b+c).
Image 1 - La Amistad, overview of western extremity of settlement.

The surveys show a relatively disadvantaged small-holder community, primarily occupied in subsistence agriculture supplemented by one to three ha of commercial crop (cotton, sesame and/or soyabean). The prices received for the cash-crops are low due to the long and poor access. Most land parcels still have some forest remaining (averaging c. 3.5 ha by their own estimates), used to meet domestic construction and fuel-wood needs. About 30% of the people also admit to using the main forest area from time to time, primarily to gain access to water (for themselves and for livestock), to wash clothes and gather firewood. A small sawmill is also said to have operated in the community but is now shut down.

Services, though improved since 2003, are still deficient. Access has actually worsened since 2003 by loss of the bridge across the Tebicuary river, leaving a small ferry for foot passengers and forcing road traffic to use the alternative exit involving a much longer route through the GP properties surrounding the settlement. On the other hand the settlement has been served by electricity since 2007, but some families lack the financial resources to connect to the system. There is a water tower but water distribution is limited (only three families appear to be served in 2009) and c. half the population use wells that may have to sunk to 40 m depth. The other half use surface streams. There are two schools, teaching to primary 6th grade on an am-pm shift system – a few children can complete primary education (to 9th grade) by boarding in Lima. There is, however, no health post, seen by the community as a priority need. The settlement has a well-organised village council (Comisión Vecinal) and community solidarity is good.

Relationships between La Amistad community members and its main neighbour, Guyra Paraguay, are mixed and sometimes strained. In effect some community members use the forest for hunting (mentioned in the 2003 but not the more recent surveys) and engage in illicit logging, which brings them into conflict with efforts by the San Rafael Conservation Alliance to protect forest resources. On the other hand Guyra Paraguay engages community members in its conservation programmes, notably its reforestation work. In both surveys (2003 and 2009), c. 20% of the
community members did not participate, undoubtedly at least partly due to reticence regarding conflicts of interest. The consensus of the remainder in consultations was that they would be willing to collaborate with Guyra Paraguay if it resulted in concrete benefits.

Mbyá Guarani: The Mbyá Guarani are indigenous to the San Rafael area, knowing it as Tekoha Guasu. The Atlas of Indigenous Communities in Paraguay (DGEEC 2002) lists thirteen communities within San Rafael with a total population approaching 1000 though some actually constitute groups of smaller settlements (Map 8).

As analysed in the Atlas of Indigenous Communities, the Mbyá follow a traditional life-style, primarily of subsistence agriculture supplemented by hunting. The agriculture uses a shifting system on a long rotation including a period of tree-fallow, showing up in the land-cover analyses in the dynamic between cleared land, secondary and high forest.

AVC 5 y 6: Áreas forestales fundamentales para satisfacer necesidades básicas y para la identidad cultural de comunidades locales.

Map 8: Communities resident within San Rafael
Many basic material needs are certainly met by the forest but the key issue is a deep concern in its future, both as part of traditional territory and its role in Mbyá culture. The Mbyá are well-organised, pursuing their interests through the ‘Asociación de Comunidades Indígenas de Itapúa’ (ACIDI), the ‘Federación de Asociaciones Indígenas Guaraníes de la Región Oriental del Paraguay’ and the ‘Coordinadora por la Autodeterminación de los Pueblos Indígenas de Paraguay’ (CAPI). These bodies are all very active both nationally and, through networking, internationally. The resulting actions and policy positions with regard to land and use are discussed further in the following section.

G1.6. Land Tenure and Land Use

San Rafael consists of some 70 private and community land-parcels (Map 4). The three main stakeholder groups have distinct land tenure systems and land use patterns.

Private land-holdings: Land tenure and use of the parcels under private ownership are conditioned by the measures introduced to protect the extreme importance of San Rafael for biodiversity conservation. Unfortunately these measures are confused and establishing the true status is central to assessing additionality for any carbon sequestration activity. A legal opinion was therefore commissioned as part of the project feasibility study (A-Annexe 12a and 12b). As the area is often referred to as some form of protected area, it is worth outlining the course of events.

San Rafael was originally established as a reserve by Decree 13.680 of 29th May 1992, in which boundaries were not defined but estimated at c. 78,000 ha. This was in advance of legislation establishing the different categories of protected area in the country (Law 352/94, Resolution 200/01). There is provision to designate protected areas on private land but in the case of San Rafael the text specifies that the area was destined to become national protected forest, and ultimately a national park. As a national park can only be established on national land, the state needed to acquire the area with due indemnification to its owners. This step in the process was never undertaken and the national park thus never established. Indeed, the only national acquisitions that have taken place were to transfer parcels to the La Amistad community and indigenous communities.

The anomaly of a prospective national park part in private and part in community ownership, and supporting various forms of land use legally incompatible with National Park status, was addressed by Decree 16.610/02, designating San Rafael as a Managed Resource Reserve with an area of 70,130 ha. It was, however, then noted by the Controller General (Resolution CGR 114/04) that the Law 352/94 could only be modified by another law, not a decree. Issuing yet a further decree (Decree 5638/05) thus failed to rectify matters. In summary, therefore, the 1992 decree is the only effective legislation and in law the area remains only reserved for a future San Rafael National Park, as provided for by Law 352/94.

This does not mean the area is entirely without protection. In order to conserve its qualities until the process of national park designation was completed, Law 352/94 stated that land-owners, following notification, were unable to undertake any act that jeopardises the natural qualities of the land. The land-owners were not notified by the
stipulated date so, strictly speaking, the limitation on use does not apply to them. On the other hand, as the limitation is stated in the law, the restriction does apply to any land acquired after Law 352/94 came into force. Meanwhile, the ‘zero deforestation’ law applies and the Secretariat del Ambiente (SEAM) will not issue licenses allowing large land-holders to clear forest. The Guyra Paraguay policy of acquisition of important land parcels should be seen in the overall legal context, cutting through its ambiguities by attaching restrictions on use to the land titles and so securing lands that may form the core of the future protected area.

It should also be noted that the 1992 decree applied to 19 areas of which only one ever became a true national park with the remainder (excepting San Rafael) now badly degraded or cleared. In San Rafael, on the other hand, clearance by large-scale landowners has actually been at small-scale, on the periphery and dating back to the 1990s. This stands more as a testament to the efforts of the San Rafael Conservation Alliance, working alongside SEAM and the municipal authorities and supported by the international conservation community, than to effective protected area legislation.

*La Amistad*: Originally, the area of La Amistad was a single holding used for logging. It was then acquired by INDERT and excised from San Rafael and subdivided into its 82 parcels, essentially running counter to the ongoing conservation effort. The combination of excision and parcel size effectively removes any legal restriction on the small-holder in the use of the land he occupies.

By law, beneficiaries of land reform must pay for their land at a price set at the fiscal value (i.e. the value for property tax purposes) at the time of settlement and thus artificially low (only 2% of market value according to World Bank, 2007). Land title is only given when the payments are made, which may be on an installment schedule. Until that time, the settler has occupancy but the title rests with INDERT. Other requirements are that the registered settler must occupy his land for 10 years before title can be transferred, and that the clearance must follow a plan developed by INDERT. In the case of La Amistad, the eastern (primarily grassland) section is common land, while the individual parcels are to be brought under small-holder agriculture.

In practice INDERT is undemanding in applying the regulations and different landholders are both clearing and paying at different rates. The survey actually shows that after 12 years only 5% have completed the payment schedule and are due, though apparently yet to receive, full title. Another 5% have made part-payments while the remainder has yet to make any payment at all. Furthermore another 15% have ‘bought’ their land from the original settler, technically in breach of the law. In addition the 27 families living in the eastern common area are unregistered and thus technically squatters, though the La Amistad community itself considers them members.

The upshot is that tenure is that INDERT remains the legal land-owner and that 15% of the occupants of the land parcels (and a further 27 families on the common land) are in an irregular legal position. It should be noted that similar situations are common in such settlements across Paraguay and is in no way peculiar to La Amistad (A-Annexe 9b). The community members occupy the land legitimately and substantial investments relative to income are made – e.g. in dwellings, in the deep wells and
indeed in clearing the ground. Some 55% of the original forest cover has now been cut back, with 6% of the parcels completely cleared.

*Mbyá Guaraní:* Five land parcels in San Rafael have been assigned by INDI to the Mbyá (Map 4, Map 8), again demonstrating the underlying incoherence in the measures enacted for forest protection, in that the same lands were reserved for national park status. Once transferred to an indigenous community, the land is inalienable and there is no restriction on the way the community may use it. The Paraguayan constitution also gives indigenous people the right to maintain traditional land use practices on any land. Some smaller communities use lands in private ownership for traditional agriculture, which is generally tolerated.

The Mbyá Guarani now seek broader recognition of their interests and rights in their traditional territories, one result being an agreement, signed in February 2009, for inter-institutional cooperation between SEAM, ACIDI and the Asociación Tekoha (A-Annexe 13). The agreement, valid for three years and renewable, recognises that San Rafael, as Tekoha Guasu and stipulated as the area ‘reserved for a national park’, is the traditional territory of the Mbyá. It sets a framework for collaboration between the parties in developing projects for sustainable use of natural resources and environmental protection, and also requires full participation, based on informed consent and respect for the rights of the Mbyá, in any other initiative developed within the area.

The principles stated in the SEAM-ACIDI-Tekoha accord are fully compatible with the aims of this project and the direction being taken by Guyra Paraguay for the future. There are, however, two complicating factors. First, there is a strong feeling that the Mbyá not only hold interests in but should also hold title to the land within Tekoha Guasu. They therefore oppose on principle any land transaction of the kind central to the Guyra Paraguay land acquisition programme without their involvement. Secondly, CAPI (with which ACIDI is associated) has adopted a position on REDD, stated in New York in May 2009 (A-Annexe 14). The statement mirrors the aims of this project, which, given due preparation, should therefore be fully compatible. In practice, however, the Mbyá seek a full process of consultation and understanding of the concepts involved prior to any engagement, which does not fit the decision-making schedule the project must adhere to. A similar situation has also delayed implementation of UN REDD-readiness initiatives.

The consensus is that the future of San Rafael is of common concern but that the processes leading to durable collaboration would take time. Guyra Paraguay and representatives of the Mbyá Guarani have therefore continued discussions and consultations on several occasions through the development of this project with a view, *inter alia*, to joint participation if options for project expansion present themselves.

**G1.7. Biodiversity Characteristics**

The biodiversity of San Rafael is relatively well-known, with extensive survey and monitoring programmes in place. The data is voluminous – information in digital format is therefore given in A-Annexes 15, 16 and 17 while other important non-digital references include Cartes J.L 2006 and Yanosky 2008.
As the area lies in the transition between the two ecosystems, the biota falls into two groups: those characteristic of the Upper Paraná Atlantic Forest and those of the grasslands. Diversity is high in both cases and the forest also displays a high level of endemism. The Rapid Ecological Assessment (A-Annexe 15) notes diversity of ecosystems and biodiversity (by group) plus threats, leading to management recommendations. It follows the standard conservation area planning methodology developed by The Nature Conservancy.

The assessment identifies four main vegetation types and a total of seven formations (three high forest types, two grassland formations, one non-grassland herbaceous formation and the aquatic vegetation. In terms of diversity, the inventories give:

- 322 plant species, representing 7.2% of the known flora of the Eastern Region.
- 52 fish species, with the Characiidae, Loricariidae and Pimelodidae best represented (with over 50% of the total species).
- 32 amphibian and 27 reptile species recorded within San Rafael and its surrounding area.
- 329 bird species, representing 48% of the national list. Some 79% of the Atlantic Forest endemic species occurring in the country are recorded from San Rafael. The moist forests of western San Rafael (i.e. the type included in the project area) show the highest diversity.
- 61 mammal species, of which 33% are bats. Again, the moist forest formation shows the highest diversity.

The invertebrate surveys suggest, through extrapolation, a probable occurrence of c. 35,000 species. A comparison with Mbaracaju (the other main Atlantic Forest area in Paraguay) indicates that San Rafael is somewhat more humid, carrying a higher proportion of Paraná Atlantic Forest endemics and rare taxa in general. The grassland invertebrates are also noteworthy and probably represent (as with their flora) a relict of more widespread Pleistocene communities.

It should be noted that subsequent surveys may have added to these lists.

The threat analysis is based on identification of a set of conservation targets that capture key elements of the broader biodiversity of the area. Those identified for San Rafael comprise the moist forest, the wetlands, the springs feeding the Tebicuary river, the tree fern *Cyathea atrovirens*, the saffron-cowled blackbird *Xanthopsar flavus*, the common potoo *Nyctibius griseus*, the underlying aquifer and the spider community, represented by *Josa sp* (new to science) and *Bromelina sp* (a rare species). Threats to these targets (and thus threats to the broader qualities they represent) are analysed and scored, both in terms of their effects on the conservation target (e.g. habitat fragmentation) and the source of threat (e.g. agricultural expansion). Evidently, the same threats and sources of threat may compound each other and also impact on more than one target.

- Very high threat scores were given to habitat fragmentation and loss, and for reduction in species diversity and population levels of forest species. The sources of threat with very high impact include: habitat disturbance due to human activity; poor land use practices by small- and medium-sized producers; unplanned settlement; illicit resource extraction; insecurity of basic requirements (e.g. health, food).
• High threat levels were identified for the alteration of the hydrological system and reduction in water quality. High impacts are also attributed to: the lack of a well-planned road system servicing needs while taking account of environmental considerations; inadequate support for and organisation of small-scale agricultural enterprise; deforestation; low levels of environmental awareness; introduced species.
• Medium levels of impact are attributed to selective logging; ranching, hunting, inappropriate tourism development and poor communication.

Guyra Paraguay (2008) simply identifies the threats as illicit resource extraction and use (e.g. timber extraction, agriculture, hunting). It also identifies the threat represented by occupation by landless campesinos and the establishment (and deficiencies in planning) of the La Amistad settlement itself. In effect, the project site of La Amistad shares the biodiversity characteristics of the larger forest of which it is part and, as a settlement inserted into that forest, plays an important role in contributing to the pressures on it.

**G1.8. High Conservation Values**

The high conservation values of San Rafael have been assessed by a range of formal techniques, all including threat analysis as a basis for a scientific conservation management regime. In addition to the Rapid Ecological Assessment, the importance of San Rafael (and thus its status as a conservation priority) has been assessed in the context of the entire Upper Paraná Atlantic Forest (A-Annexe 16) and a formal assessment has also been conducted using WWF criteria for High Conservation Values (A-Annexe 17).

In addition, the standard methodology developed by Birdlife International to identify Important Birds Areas (IBAs) has been applied to the site (Guyra Paraguay 2008). It was in fact the first IBA to be identified in Paraguay and the indeed the second in Latin America as a whole. As an IBA, the area also qualifies as a Key Biodiversity Area (KBA).

The following points (described more fully in A-Annexe 17) contribute to the exceptionally high conservation values of the area.

• The intention of establishing protected area status has been expressed since 1992, prevented only by deficiencies in the legislation (see G1.6.). The recognition of international importance is however demonstrated by: identification as an IBA (the first in Paraguay, indeed the second in Latin America) and thus also a Key Biodiversity Area (KBA); a ‘Debt-for-Nature’ swap with the US government to release funds for management on protected area principles; the sustained support of the international conservation community to the Guyra Paraguay programme of acquiring key areas within the forest, managed as private protected areas as a holding action.
• The area scores high values as a refuge for threatened species (i.e. classed endangered or vulnerable under the IUCN international RED List criteria, or on the national list of species of conservation concern.) It also shows high values on endemicity criteria. The species are listed in detail in A-Annexe 15 but in summary include:
Plants – 15 spp classed in the Red Data Book as vulnerable, 3 as rare and 15 with ‘indeterminate’ status because poorly known. Overall, some 71 species considered of conservation concern occur.

Amphibia and reptiles – 4 spp are of conservation concern (i.e. inclusive of CITES lists). A new species of snake, *Atractus kangueryensis*, has also been found, described in 2007.

Birds – the area harbours two endangered, 11 vulnerable and a further 13 ‘near-threatened’ species in the Red Data lists. It is the most important site (of 75 surveyed) for threatened and endemic Atlantic Forest birds.

Mammals – 27 spp occurring in the area are of conservation concern.

- High values are scored yet again for seasonal use by migratory species. Both the forest and grassland habitats are used by a wide range of migratory birds (some 45% of the national list) and internationally significant concentrations of the migratory Saffron-cowled blackbird, listed as vulnerable, occur. Fish migration is also noted on the Tebicuary.
- The area scores high by virtue of its landscape scale, with continuous forest areas both larger than 10,000 ha (actually > 30,000 ha) supplemented by smaller, but still significant (> 100 ha and > 1000 ha) forest patches.
- A range of localised habitats are identified as threatened or rare ecosystems within the larger vegetation types. The most notable consists of the associations of tree ferns (of conservation concern on the national lists and CITES schedules) and epiphytes developing around springs.
- Forests providing critical ecosystem services scoring high values include those protecting watersheds in the vicinity of the springs (totalling 3,400 ha around some 126 water sources), on steep erodible slopes, and fire-prone areas.
- Forest resources are of high importance for meeting basic needs (in foodstuffs, materials, drinking water) for the indigenous communities. While used, they appear to be of lower importance to the campesino community (i.e. La Amistad) for basic provision of necessities.
- Similarly, the forest is of high cultural significance to the indigenous communities. This is further emphasised by the efforts devoted to securing formal recognition of that significance, underpinned by the accord with SEAM.

**G2. Baseline Projections**

**G2.1. ‘Without Project’ Land-Use Scenarios**

The economic drivers and rates of land use change on which this section is based are analysed in A-Annexes 1, 3, 9a and 9b.

**Project Zone – San Rafael**

San Rafael is now subject to a complex set of pressures from different interests, in a classic end-game to the deforestation process. A spectrum of possible scenarios is used, from optimistic to pessimistic.

- *The uneasy status quo continues.* This represents a deadlocked situation with conflicting interests – for conservation, for access to forest resources (notably...
timber) and for land to settle and cultivate - counter-balancing each other and preventing concerted action. Under such circumstances the recent-historic degradation process continues by default. This is the most conservative scenario but, as pressures mount, it appears unlikely that the present unstable situation can continue for long and certainly not for 20 years.

- **The area comes under effective protected area management.** This is the desirable (and optimistic) outcome, in which San Rafael becomes a managed resource area with full collaboration and participation by the key stake-holders – SEAM, the San Rafael Conservation Alliance including Guyra Paraguay, and the Mbyá Guarani. Some partial gains can certainly be expected – Guyra Paraguay should be able to conserve the areas it holds and the Mbyá Guarani may, as they intend under the 2009 accord, attract support to improve management elsewhere in the forest bloc, while the efforts of both will certainly be enhanced by working together. To fully achieve effective conservation management would, however, require overcoming barriers that have so far, and despite very substantial international support, proved resistant for a full seventeen years. The root cause is lack of regular long-term funding adequate for, and directed at, site management, applying as much to the Mbyá as the San Rafael Conservation Alliance and undermining concerted action. Above all, there is the lack of sufficient finance to compensate private landowners for transfer of their holdings into a conservation management regime, thus blocking the establishment of a formal protected area. If these underlying issues are not addressed, the likely outcome is a somewhat more durable but still fragile variant of the ‘status quo’ scenario.

- **The status quo breaks down.** Here San Rafael, though somewhat delayed, finally follows the same land use trajectory as other areas reserved for national parks under the 1992 legislation. The most likely trigger is campesino land invasion, already a real risk (with one known case and the threat of others averted) and heightened by: i) a situation where raised expectations of land redistribution are proving politically unrealistic, hence a probable return to more radical strategies; ii) being a proven tool to catalyse political action for the land-needy; and iii) underlying population growth and thus constant increase in demand for land. Evidently, an ineffectively managed forest area becomes an inviting target under such circumstances. To be conservative, the scenario should assume that Guyra Paraguay retains control over its lands, the Mbyá Guarani achieve their aims on the lands they hold, and that the two stakeholders develop sound collaboration. Elsewhere, the process of degradation intensifies and shifts to one of widespread and largely unplanned mosaic deforestation.

Of the three, the third option is both the most pessimistic and also the most likely ‘no-project’ scenario over the full project life, and is the underlying assumption behind previous threat analyses. Indeed, the scenario is playing itself out: since this section was drafted there has been yet another land invasion that is still in process of resolution while there are reports of negotiations to excise a further section of the forest (A-Annexe 18).
Project Area – La Amistad

The establishment of La Amistad is a precursor of the ‘no project’ scenario described for San Rafael as a whole, excising part of the forest for settlement. The striking characteristic at this time, however, is that it is essentially a closed system, unable to expand beyond its present boundaries because of the interests of other stakeholders (conservation community, indigenous communities) in the surrounding area. Within those boundaries the pattern of land change since 1997 follows the classic deforestation trajectory of planned small-holder settlement on new forested land. Three ‘without-project’ land-use scenarios have been examined for the continuing evolution of land use over the twenty-year project life.

- **The on-going deforestation process halts.** This implies that the colony becomes moribund, overcome by the barriers to development (poor soils, poor services, poor access and distance to markets, lack of opportunities, lack of organisation to effect change). This is unlikely – though such difficulties have resulted in the departure of some of the original colonists, they have been replaced. Population growth and shortage of alternative land available to INDERT indicates that there will be a steady demand for occupancy even in the unlikely circumstance that severe difficulties persist through the next twenty years. Furthermore the present occupants are investing their resources, however limited, in the area.

- **The on-going deforestation process continues at its historic rate.** The example of the community of Lima (A-Annexe 9b) illustrates the process on c. 2,500 ha of land immediately west of La Amistad across the Tebicuary river. Here, clearance of the original forest cover began in c. 1985, with 45% converted to farmland by 1994. This concentrated on ‘high’ forest with much less impact (c. 10% of the total clearance) on ‘low’ riparian forest. The pattern closely mirrors that of La Amistad over a similar period. By 2009 – i.e. 15 years further on - the high forest is reduced to 9% of original cover and still exposed to clearance. The area of ‘low’ riparian forest, however, has remained constant even though it is relatively extensive (c. 32% of the total forest area) in Lima. While Paraguayan regulations protect riparian buffers, the more important conserving factor appears to be unsuitability for cultivation.

Translating the Lima scenario to La Amistad assumes that the community simply continues its present activities, accompanied by gradual modest improvements in living conditions. Under this dynamic the remaining high forest is cleared over time with the residue progressively degraded by under-grazing and opportunistic extraction of timber and firewood. The rate of transformation is likely to slow down as the remaining high forest area is diminished but the process, as planned by INDERT and required by law, will be completed within twenty years. Land occupiers do, however, use the high forest and a degraded relict (c. 5% as a working estimate) can be expected to be retained. The riparian forest, however, will probably be spared. Given that this is the established pattern in the area, it is the most likely ‘no project’ scenario.
A conservation management regime is re-established on the area. Here it is assumed that the excision from the rest of San Rafael is reversed, the land is secured for forest protection by the competent government authority and/or Guyra Paraguay, and the colony is compensated and resettled in a more promising area outside the forest. This is unlikely in the immediate future. Many colonists have not completed their payment schedule and INDERT remains the land-owner. Furthermore, even if they have full title they are legally obliged not to dispose of it for a further ten years. The number of parcels available for purchase would therefore not become significant over the next 20 years. Re-establishing the colony elsewhere would also be a lengthy and complicated process both administratively and practically, especially when it is well into the process of consolidation. Finally, land is a politically charged issue and liable to become more so as pressures mount: the presumption must be against giving up any land once it has entered into campesino occupancy. This is indeed enshrined in the law, by which the land is inalienable from its purpose, once acquired and re-distributed under the agrarian reform programme. It is still conceivable that, with consent of the occupiers and INDERT, some parcels may become available at some stage for reintegration with the rest of San Rafael but it is not the most likely scenario for the community lands as a whole.

G2.2. Forest Protection in Absence of Project.

Project Zone – San Rafael

The most likely scenario for San Rafael is extremely volatile and it is difficult to assess what would occur in the absence of the project. The high biodiversity importance of the forest attracts international support and it can be assumed that some level of protective management will be achieved within the forest. The legal measures are, however, not sufficient to prevent state acquisition of private lands for social purposes – both INDERT and INDI (Institutito Paraguayo del Indígena) have secured and redistributed land to smallholder and Mbyá Guarani communities at the same time SEAM was attempting to secure National Park status. Furthermore, enforcement capability is inadequate and timber theft is a continuing issue despite the efforts of the authorities (A-Annexe 10) – any action that has a long-term effect to reduce its incidence is thus additional.

The titles under which Guyra Paraguay holds its properties stipulate that the areas will be conserved, further strengthening the ‘zero-deforestation’ legislation for private landowners and the restrictions applying to areas purchased after the enactment of Law 352/94. Guyra Paraguay suffers chronic underfunding for management and the degree of protection it can offer is imperfect. Nonetheless, it is reasonable to assume that protection of existing Guyra Paraguay lands (‘Guyra Reta’) would occur in the absence of the project and improvements, however desirable, would be non-additional. But Guyra Paraguay conservation objectives in San Rafael include the acquisition and protection of further key properties under private ownership. This programme is now halted through the combination of financial barriers and opposition from indigenous communities. Improved forest protection is also an objective and this too is constrained by the need to concentrate financial resources on Guyra Reta. The degree to which a project overcame these barriers and extended protection in the wider forest would be additional.
Similarly, the indigenous communities intend, as stated in the agreement with SEAM, to conserve the environmental qualities of San Rafael. The approach emphasises the cultural aspect of the forest and sustainable use of its natural resources, but the achievement of these objectives will lead to forest conservation. The indigenous communities seek to extend the area of land titled to them and may well be successful – this should not be considered additional in itself - but again the constraints on good management are financial (the purpose of the SEAM agreement being to facilitate funding for effective actions) and potentially in institutional capacity. Any benefits accruing from actions that overcome the barriers to good management and produce higher levels of stocked carbon should, however, be considered additional. Evidently, effective collaboration between Guyra Paraguay and the indigenous communities to achieve their common aims would be even more effective.

The greater impact under the ‘most likely’ scenario is small-holder settlement, both unplanned (i.e. land invasion) and planned under the Agrarian Reform programme, or a combination of both as unplanned occupation is subsequently regularised. The deforestation laws do not apply to small-holders: they are indeed expected to cultivate their lands and the analyses of both La Amistad and Lima show that they do. Any action that conserves forest on lands occupied by small-holder communities is therefore clearly additional.

In summary, some degree of forest conservation is to be expected in San Rafael but how much depends on management effectiveness, in turn dependent on overcoming a range of financial and institutional barriers in a complex social context. Monitoring will track the actual pattern but the underlying causes leading to benefits must also be analysed and are likely to be attributable to a combination of additional and non-additional factors. Those shown to be additional should be attributed to the project, but should not be claimed until demonstrated to have occurred and thus not included in estimates of future project benefit.

Project Area – La Amistad
The area is excised from San Rafael and the pattern of deforestation is clearly demonstrated. Any action that conserves forest in the face of this trend is clearly additional and projected benefits can be estimated.

G2.3. Carbon Stocks under the ‘No-Project’ Scenario

Project Zone – San Rafael
Given the uncertainty over the future of San Rafael, the most conservative approach in setting a baseline is simply to project recent rates of change forward over the project period. Net emissions attributable to changes in land cover have averaged 357,000 tCO₂ p.a. over the past seven years (c.f. G1.4.). Projecting a continuation over the next twenty years indicates emissions of the order of 7.1 million tCO₂e.

This is conservative. Impacts of continuing illicit timber off-take on high forest are not accounted for and the most likely scenario is not maintenance of the status quo but accelerated forest degradation and deforestation.
**Project Area – La Amistad**

For the purpose of estimating emissions at La Amistad, it is assumed that clearance continues as planned, leaving 5% of present high forest as a degraded relict in 20 years. Indeed, at current rates of clearance this point would be reached in 10 years. It also assumes that clearance involves total conversion to agriculture though a low proportion is likely to be converted to pasture, with lower carbon stocks. Clearance in low riparian forest is assumed to cease, following the Lima example.

Under this scenario, estimated emissions from land use change (essentially conversion of high forest to agriculture) in the La Amistad community over 20 years is estimated at 226,740 tCO₂ (PA-Annexe 1). The carbon pools involved comprise above- and below-ground biomass, necromass and litter and soil, as given in Parra 2004. Non-CO₂ emissions (CH₄, N₂O) are not included – the REDD methodological component developed by Avoided Deforestation Partners (A-Annexes 25a, 25b) notes that N₂O emissions are insignificant in AFOLU-REDD activities. Methane is also considered insignificant as livestock, the main potential methane source, is not a factor at La Amistad. These assessments will be kept under review and calculations adjusted as necessary, should the methodologies be altered under the VCSA double approval process.

Pending on-site measurement, this estimate assumes that the present forest is in good condition and indeed the forest does appear so from remote imagery. Nonetheless it is known that at least some trees have been removed and that firewood collection takes place, indicating it is already degraded to some degree and thus carries lower carbon stocks than average. This may lead to slight over-estimate.

**G2.4. Community Impacts under the ‘No-Project’ Scenario**

**Project Zone – San Rafael**

The foreseeable impact of maintaining the status quo in San Rafael is a continuation of the steady erosion of forest resources and environmental services noted in the analysis of threats to High Conservation Values (A-Annexe 17). Disturbance to the forests protecting the slopes on the upper watersheds (Map 9) is of particular concern, affecting water quality through increased sedimentation.

The more likely scenario, under which the status quo breaks down leading to small-holder occupation, would certainly have the effect of relieving pressure for land but at the cost of heightened social conflict and without addressing deeper-seated issues. It essentially involves a move from planned to unplanned land-use leaving the issues associated with living on that land – uncertain tenure, poor services, security, economic prospects – unaltered or exacerbated. Heightened tension with the larger land-holding, conservation and indigenous interests is also inevitable as the occupation would directly affect their interests. In the case of the indigenous people, the prospects of gaining control, or even securing a satisfactory level of participation in management, over ancestral territory would be greatly diminished. Indeed it is likely to affect the land they already hold – both recent land invasions have been primarily at the expense of indigenous communities. Under these circumstances, material resources and cultural values of fundamental importance to the indigenous communities would be seriously compromised.
Project Area – La Amistad
In the long-term, La Amistad will experience impacts in reduction of supplementary forest resources and reduced water quality as the condition of the surrounding forest deteriorates and these effects would be accentuated if the rate of deterioration accelerates. It is, however, highly unlikely that incursion in San Rafael would directly affect the already-settled area of La Amistad, and small-holder communities are successful in deforested landscapes. The most likely result of the ‘no-project’ scenario would therefore be to leave La Amistad in its present condition – i.e. no deterioration but also no improvement in socio-economic conditions or prospects.

AVC.4.2: Bosques criticos para control de erosión

Map 9: Slopes at risk of erosion under reduced forest cover.
G2.5. Biodiversity Impacts under the ‘No-Project’ Scenario

**Project Zone – San Rafael**
The threats to biodiversity from habitat degradation, fragmentation and loss are ranked very high. These are all linked to the continuation of illicit logging, clearance for agriculture and other forms of disturbance that are assumed to intensify under the base-line scenario. The erosion of High Biodiversity Conservation Values of the area remains the greatest foreseeable loss from the ‘business-as-usual’ scenario.

**Project Area – La Amistad**
Biodiversity values are already believed to be compromised on the residual forest on the community lands and their greatest importance is to buffer, at least partially, against pressure on the main forest block immediately behind them. Once gone, community requirements for timber, firewood, materials and game will act directly into the adjacent forest, contributing to the general pressure on San Rafael as a whole.

G3. Project Design and Goals

G3.1. Project Objectives

The objective of this project is to produce Voluntary Carbon Units to contribute to the overall target of 800,000 tCO₂e by reducing emissions from deforestation and forest degradation on land held by the La Amistad community.

In achieving this primary objective, the project must deliver demonstrable social, biodiversity conservation and other environmental benefits, both to demonstrate the broad value of REDD and to ensure sustainability of the climate mitigation benefits attributable to the project. This will be demonstrated by independent validation and verification under CCBA procedures.

In particular, the project must contribute to the long-term conservation of San Rafael as a site of global importance for biodiversity. Meanwhile Guyra Paraguay will also maintain regular contacts with the representatives of the Mbyá Guarani, to facilitate potential future cooperation in the wider San Rafael area.

G3.2. Project Activities

*Establish a ‘Payment for Environmental Services’ (PES) system to the La Amistad community to conserve remaining forest on its land.*

Approximately half of the total area of La Amistad remains forested at this time. The approach is to pay community members to retain and improve the quality of forest on their land in preference to clearance. The scheme will be voluntary, with individual community members contributing parts of their parcels. The areas involved are at the discretion of individual land-occupiers, grouped in a Cooperative Association of Ecological Producers (A-Annexe 19).
The land to remain forested will be set aside as a community forest reserve, intended to be permanent and allowing continued sustainable use by community members. However, given the experimental nature of the approach, in the first instance an individual must allocate the land to the reserve for a five year period only, renewable thereafter (on the same terms) for a further 15 years. Arrangements beyond that period will then be made based on community circumstances and community benefits seen to derive from the reserve.

Payment is annual, on the area of forest set aside (down to the nearest 0.2 ha), and set at US$170/ha. This price is designed to compete with the income to be expected if the land were cleared for agricultural production (using cotton prices as the standard on this soil type), discounted to take account of the reduced work in avoiding clearance and cultivation.

It is proposed, subject to consultation with community members, that the funds be allocated as follows:

- 75% (US$ 127.50/ha) to individual occupiers, according to their contribution to the community forest reserve.
- 25% (US$ 42.50/ha) to actions benefitting the community as a whole.

The scheme applies to standing forest, disfavouring community members who have already cleared a large proportion of the land they occupy. It is therefore extended to allow for reforestation through natural regeneration and/or tree planting, but carrying a lower payment of US$ 65/ha/yr. Planted species may be native or non-native but the scheme only allows for forestation of former forest areas and does not include transformation of natural non-forest habitat (notably native grassland). This activity is technically reforestation (ARR) rather than REDD and does not qualify for emissions reductions as the land has been recently cleared and the commitment period (20 years) is too short. It is instead seen as a leakage mitigation activity, spreading benefits more widely in the community and reducing need to met basic needs from the wider forest.

The aim of the community reserve is to maintain high quality forest and the scheme is based on conserving its sequestered carbon. Any degradation in quality, as demonstrated by the monitoring programme, will therefore be reflected in the per hectare payment. Loss of biomass from forest degradation (e.g. from illicit logging, fire-wood collection, fire damage, unauthorised clearance) in the Guara Paraguay properties adjacent to La Amistad constitutes project leakage. It will therefore also be deducted from the emissions benefits and thus from the total payments made to the La Amistad community. Further deductions will apply to illicit timber removals elsewhere within San Rafael, where there is established collusion by community members. Free access must be allowed for the purposes of monitoring and research, in order to assess and monitor carbon sequestration, community, biodiversity and other environmental benefits.

**Community revenue streams**

It is important to promote a communal sense of ownership, involvement and benefit in the PES scheme generally. It is therefore proposed that (subject to consultation with community members) the 25% of revenue stream directed towards purposes benefitting the community at large should be allocated as follows:
• 5% (US$ 8.50/ha) to an annual payment for each household in the community. This payment is given regardless of contribution to the communal forest reserve and is additional where a contribution has been made. The purpose is to promote cohesion and individual interest in protecting forest resources in general.

• 10% (US$ 17/ha) to the village council for works or activities of benefit to the community as a whole, allocated at its discretion and according to its own priorities. Examples could include (but is not limited to) support for schools, improved access and/or communications, access to health services.

• 10% (US$ 17/ha) to a community fund for small-scale capital investments (e.g. capital costs for micro-enterprises) to enhance and diversify income generation.

Evidently, the potential for deductions from the PES-derived revenue flow to the community could sow discord. It is therefore crucial that community members be involved in measuring and monitoring carbon benefits and in resource protection in the communal forest leakage area, both to allow them to protect their interests and to ensure transparency and understanding of how deductions are arrived at. This involvement represents paid work, covered by the project ‘monitoring and verification’ budget line and thus an additional income stream to community members. The project budget also provides for a Project Extension Officer, to be recruited by Guyra Paraguay and preferably based in the community, to organise training and, in liaison with the community, general on-ground project administration and management.

**Extension Services**

Setting aside a communal forest management area implies that the area must allow a degree of extraction (for timber and/or firewood) alongside improvement in forest quality and biomass – i.e. a sustainable small-scale forest management regime, operating within a set annual allowable cut based on annual growth increment. Furthermore, retaining forest reduces the area available for cultivation or pasturage by community members, which must be compensated by enhanced productivity and/or profitability on the smaller area that remains, facilitated by the community funds.

These are technical areas in which the community requires additional support services. The project budget therefore allows for provision of expert advice in:

• Enhancing income and productivity from small-holder agriculture and other enterprises appropriate for La Amistad.

• Sustainable community forest management planning, management and operations.

It is envisaged that this input will be provided through local consultancies in coordination with the government extension services, organised through the Project Extension Officer responsible for day-to-day on-ground project activities.

**Long-term Management Fund**

The financing strategy involves the establishment of a long-term management fund to maintain project actions throughout the project life (c.f. G3.11.). This is, however, more than a project-specific expedient: the establishment of a Trust Fund structure has
been a long-term aim to underpin and consolidate conservation action in San Rafael and has been a project design aim since the outset.

Originally, the San Rafael project component was conceived as providing the matching funds to meet a pledge by the Global Conservation Fund (GCF) for the establishment of a Trust Fund to support conservation throughout San Rafael. The project would thus be instrumental in improving the conservation status of the entire forest. The GCF support is no longer likely to be coupled to the matching funds but may be both delayed and focused on management of the Guyra Paraguay lands. The role of the carbon sequestration project is now (in consultation with the GCF) to establish the Trust Fund structure which can, in due course and as clearly identifiable component sub-funds, also be used for funding from facilitate receipt of GCF and other funds to underpin the long-term conservation of the area, including potential REDD+ project extensions. Such potential activity extending the project zone beyond its present boundary will be undertaken in collaboration with the Mbyá Guarani in its conception, development and implementation phases, given their recognised interests in the management of the forest.

The organisation and management of the communal PES fund for La Amistad must be finalised in consultation with the community but, for the sake of simplicity and transparency, and to reinforce the concept that use of these funds is under community control, it is envisaged as being provisioned by but separate from the long-term project management fund.

**Expected climate, community and biodiversity impacts**

In summary, project activities aim to have the following impacts:

- **Climate**: Avoidance of emissions of up to 170,000 tCO₂ through retention on community lands of standing forest that would otherwise be cleared in the project life under the ‘no project’ scenario (c.f. G2.3.).

- **Community**: Additional resources to address issues of concern to community members through:
  
  - Creation of supplementary income streams both to individuals and the general community through payment for forest retention. The scale is dependent on the degree of uptake by community members but, assuming 90% of the existing forest is retained, potential inflow to the community is c. US$ 47,600 p.a.
  
  - Additional opportunities for income from participation in monitoring activity.
  
  - Additional technical support for small-scale enterprise, agricultural productivity and income, and sustainable management for forest products.

- **Biodiversity**: Retention of habitat of species of conservation concern within the matrix of a forest of recognised high conservation value, but most importantly buffering and alleviating pressure (notably unregulated extraction of forest resources) on the main forest area surrounding the community lands. This addresses biodiversity conservation management needs identified independently of the project (see A-Annexes 15-17). The establishment of the long-term management fund, so facilitating further financial support for conservation management in San Rafael, is also considered an important impact in itself.
G3.3. Project Location and Boundaries

These comprise the land distributed to the La Amistad Community by the Paraguayan Government, covering 1182 ha centred on UTM S617166 W7071576 in Alto Vera Municipality, Itapua (cf G1.1, G1.3). The boundaries are as surveyed and lodged with the Land Department (cf Map 4, Map 5).

G3.4. Project Lifetime and Implementation Schedule

The project life (which also corresponds to the accounting period) will be 20 years. All project activities commence in 2010 – i.e. organisation and establishment of the PES scheme and associated payments, monitoring programme and community consultation/communications programmes.

G3.5. Risks and Risk Mitigation

Project risks have been checked against the VCS AFOLU risk guidelines (PA-Annexe 2). Overall, the risk level is low but the following aspects are rated medium or high risk and therefore warrant particular attention.

- **Unclear land title**: The project aims to engage with the land occupant who, according to the terms under which the land is allocated, should be the person on the INDERT registry. It is, however, known that there has been both some turn-over of land occupiers within the community, and some immigration of non-registered households. The status of such people under the INDERT system, and their ability to commit part of the parcel they occupy to the community forest reserve (whether for forest protection or reforestation), is unclear – in effect their occupancy appears technically irregular or even illegal but tolerated by INDERT and accepted by the community. The issue requires resolution in consultation with the community and with INDERT, legally the land-owner excepting the few cases where the payments have been completed. In effect, the community consultation process constitutes the mitigation strategy.

- **Dispute potential**: This is combined with unclear land title in the VCS guidelines but presents itself differently in the case of La Amistad. Two possible sources of dispute are identified.
  - First, disagreement is possible on leakage deductions between Guyra Paraguay (as project implementer) and the community. Participation in monitoring and leakage assessment is therefore a mitigation strategy.
  - Second, part of the La Amistad community is reticent on participation, with some 20% declining to respond during the consultations (cf G1.5). This raises the possibility that a disproportionate part of the leakage is actually attributable to members of this group. Furthermore, the PES system and potential for deductions represents a strategy promoting peer-pressure rather than suppression as the primary means of mitigating leakage, which in turn implies heightened potential for dispute within the community. The policy of ensuring part of the
benefit is directed towards the community as a whole, including a
direct payment to all households regardless of participation, is a
mitigation measure aimed at building a degree of trust and interest in
all community members, including those displaying caution.

The use of PES for forest conservation is innovative in the Paraguayan context and
thus, being untested, carries a risk of management failure through inexperience. PES
schemes are, however, used elsewhere in Latin America. World Land Trust, Guyra
Paraguay’s international collaborator, has an extensive partnership network in the
continent, including NGOs actively involved in PES schemes. This represents a
resource that will be drawn upon as appropriate. Nonetheless, the scheme is voluntary
to avoid risk to community members, allowing community members to commit at a
safe level and to add additional areas as confidence rises. Furthermore the initial
commitment is 5 years, allowing the benefits to be demonstrated before a longer-term
commitment is made.

Opportunity costs of engaging in the PES scheme as against agriculture also present a
risk (A-Annexe 26). Cotton, with a return of US$ 60/ha, is the traditional cash-crop
but small-holders are moving to alternatives, including sesame with a return of up to
US$ 225 per ha. Conditions in La Amistad are not ideal, however, with an average
return of US$ 110 per ha. Furthermore, a small-holder can only work 2 ha sufficiently
well to obtain optimum returns. The project offers US$ 127.50 per ha for retained
forest, which is attractive to an individual compared to present annual returns, but the
agricultural extension support and community funds given through the project may
help overcome barriers to achieving optimal revenues, giving social benefits at the
expense of VCU delivery. Furthermore, the opportunity costs may rise over time (it is
suggested in A-Annexe 26 that US$150-180 is a more suitable negotiated price over
the long-term) posing a risk to permanence of benefits. The dynamics must therefore
be closely monitored but the risk mitigation lies in using the project to deliver
concrete benefits – both in enhanced income streams, food security and access to
forest resources – that are directly linked to maintaining forest quality, which is thus
seen as worth engaging in alongside improved agriculture.

In addition, the project requires a high uptake by community members to achieve
significant carbon sequestration levels. The financial projections assume 75% of
existing standing high forest in La Amistad will be covered by the scheme, and carries
relatively high costs. The prime justification is to maintain project activity in the San
Rafael area, which offers important potential for future expansion in collaboration
with the Mbyá, while offering biodiversity and social benefits. Even so, participation
is expected to be low initially but to build up over time. The issues noted above could
jeopardise that growth, presenting a risk to the project itself. The grouped project
structure is a risk mitigation strategy here – in effect, the La Amistad component
carries relatively high costs for relatively low VCU delivery (< 20%) within the full
programme envisaged, meaning that the component remains feasible within an
acceptable average price and does not constitute a risk for the programme as a whole.

Finally, potential for population growth is also identified as a project risk particularly
as one means of optimizing income is to hire in labour. Further immigration is
limited by the available land and PES payments are made by the household, not its
size. The risk lies in lower and thus less interesting per capita payments but this argument would apply to any form of land use where space is a limiting factor.

**G3.6. Maintenance of High Conservation Values**

The High Conservation Values (A-Annexe 17) reside in maintaining quality and extent of natural habitat, notably high forest. The project contributes both directly and, by alleviating unregulated forest resource extraction, indirectly to that aim.

**G3.7. Permanence of Project Benefits**

The strategy is to use the 20-year project life to consolidate the conservation management regime in San Rafael, with full participation of all stakeholders. A robust system is the best guarantee of post-project sustainability, conferring the capacity to address issues in a practical and effective way as and when they arise.

Delivering concrete benefits to the La Amistad community (income streams, improved social conditions, improved agricultural by more effective use of land, a steady supply of forest materials through sustainable forestry, capacity building) sets the scene for maintaining the community forest reserve and for positive engagement in the conservation management of San Rafael. Maintaining dialogue with the Mbyá Guarani facilitates similar collaboration in the future.

The role of the project in establishing the Trust Fund structure is a key aspect in this strategy, ensuring that the management system and its participants are backed by reliable funding beyond the project life.

**G3.8. Stakeholder Participation**

The original project concept was based on the purchase of the ‘Ocampos’ property, an area critical to the Guyra Paraguay strategy of creating a protected core zone within San Rafael. This, however, is within the area claimed by the Mbyá Guarani and the policy pursued by Guyra Paraguay, though legally sound, is no longer appropriate at least in its present form. The view expressed at a meeting with Mbyá Guarani representatives in June 2009 and in subsequent correspondence was the need for a longer period of dialogue and more extensive prior consultation. In recognition of this stakeholder view the strategy was therefore modified, shifting focus in the short-term to La Amistad (outside the area of concern to the Mbyá) but leaving the way open to revisit the concept in the future after further discussion. Overall, project structure will remain sufficiently flexible to allow modification based on input through community participation so long as VCU delivery targets are met.

Issues affecting the La Amistad community were voiced at community meetings held under the CIDA project and again in June 2009 (A-Annexes 6,7) were used so that project design would meet social needs as well as contributing to meeting VCU delivery targets. They were then presented to the community in September 2009 (A-Annexe 8) during which a majority were broadly supportive but with a proportion reticent on a number of grounds. The scheme is therefore designed to be financially
attractive as possible and also voluntary (including a 5 year review), despite costs to VCU delivery.

Continuous consultation will be maintained with both the La Amistad and Mbyá Guarani throughout project implementation (A-Annexe 19). In the case of La Amistad, this is assured by the Project Extension Officer and reinforced by the need for regular contact for participation in monitoring activity. Given the project runs alongside other technical support programmes provided by government and donor agencies, coordination in the consultations (and monitoring programme) is important to avoid duplication of effort. In addition, formal meetings with community representatives will be held at no less than six-monthly intervals. The outcome of such meetings, to be held in Spanish, with translation of the proceedings (both verbal and in any documentation) to other languages as appropriate, will be formally recorded.

G3.9. Communications

The La Amistad community is to be informed (by writing and verbally) of the activities proposed under the project through direct communication with the Village Council, for their comment and endorsement at a public meeting, as an outcome of those held previously. The PDD and a summary (in Spanish) of the proposals will also be distributed in advance of that meeting. Community members will also be informed of the opportunities to express comment both directly to the validators/verifiers during their site visits and under the CCBA public comment period.

All project documentation (PDD, procedures, consultations, progress reports, associated research reports) are regarded as in the public domain and will be available through the WLT and Guyra Paraguay web-sites. In the case of WLT, this will form a section of its ‘Carbon Balanced’ site, dedicated to the project.

G3.10. Conflict Resolution

Grievances and unresolved issues associated with the project may be notified at any time, via the Village Council and the Project Extension Officer representing community members and the project implementers respectively.

In the first instance, resolution will be sought by negotiation at a formal consultation meeting, which may be called within 10 days by either the community representatives or the project implementer and, if requested, mediated by a mutually acceptable and independent third party. The grievance and result of the negotiation, including measures of redress for issues found to have substance, will be included in the records of the meeting. The written record must be disseminated to all interested parties within 20 days (i.e. 30 days of the original notification). Any remedial action must be initiated within 14 days, with results that must be reported (and recorded) in the subsequent consultation meeting.

G3.11. Financial Structure

Project budgets (A-Annexe A3) assume annual expenditure of US$36,600 on project management (staff, local consultants, monitoring, running costs and administration). Estimated costs for PES are US$ 47,600 p.a., assuming community uptake covers 275
ha of standing forest and reforestation of an additional 10 ha. Total annual on-site project expenditure is therefore US$ 84,200 p.a., to be maintained over 20 years.

Under the management agreement with the project proponent, Swire Pacific Offshore Ltd., these costs will be covered directly by the project for the first five years. At the same time, US$ 252,600 p.a. will be set aside in the long-term management fund to make a reserve of US$ 1,680,400, which will then be drawn down to cover annual project costs from years 6-20. All project budgets have been calculated at constant 2009 US$ rates, inflation being offset by the investment income from the reserve.

Project verification costs are financed by an additional investment of US$ 120,000, again including a combination of direct financing and capitalisation of the long-term management fund to cover the remainder of the project life.

**G4. Management Capacity and Best Practices**

**G4.1. Project Participants**

The project proponent is Swire Pacific Offshore (Pte) Ltd. It has commissioned the project to meet its corporate social responsibility goals, provides the necessary financing and is the recipient of all VCU\(\text{s}\) delivered through project activity.

*Contact:* Simon Bennett, General Manager – Corporate Social Responsibility  
*Address:* 300 Beach Road, 12-01 The Concourse, Singapore 199555, Republic of Singapore  
*Comms:* tel +65 6309 3632 / fax +65 6294 3211 /e-mail simon.bennett@swire.com.sg

Guyra Paraguay is responsible for project implementation. It has developed the project and is responsible for all project activities leading to delivery of VCU\(\text{s}\) for transfer to Swire Pacific Offshore.

*Contact:* Alberto Yanosky, Executive Director, Guyra Paraguay  
*Address:* Gaetano Martino No 215 es. Tte Ross. CC 1132 Asuncion, Republic of Paraguay  
*Comms:* tel +595 2122 3567 / fax +595 2122 9097/ email yanosky@guyra.org.py

World Land Trust provides technical support to Guyra Paraguay in project design and implementation, and acts as the liaison with Swire Pacific Offshore. It is envisaged that this role becomes redundant after five years.

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email rwilson@worldlandtrust.org

The project governance structure is in the process of finalisation. In outline it is envisaged as a contract chain between SPO and WLT, WLT and GP, and GP with local partners – e.g. the La Amistad community - for specific actions under the project strategy.
G4.2. Key Technical Skills

Key skills for project implementation comprise:

- **Practical protection and conservation land-management skills.** Guyra Paraguay has a long-standing and internationally recognized expertise in this area, including projects involving community engagement covering areas equivalent to that proposed in this initiative.

- **Carbon inventory and monitoring.** Guyra Paraguay already has a fully-developed land-use and biodiversity monitoring system, both used to inform national policy. These will be maintained in the service of the project. Specialist expertise has been recruited locally in carbon inventory and social, legal and economic issues for project development and remain available for the implementation phase. It also has an established system of collaboration with SEAM (and its Climate Change Office), the University of Asuncion Forestry School and other partners (including UNDP).

- **Specialist skills.** While GP has conservation management skills of lands exceeding those envisaged here, it does not have prior experience in managing REDD projects. This is the principle function of WLT, which has a portfolio of REDD projects for voluntary carbon offsetting, individually small-scale but comparable to this project in total and staff experienced in other REDD-based projects of comparable or greater size. It also has access to additional expertise in REDD, climate change and the voluntary carbon market – the Climate Change team of PricewaterhouseCoopers have, for instance, provided specialist advice in developing this PDD. Again, these resources are available as required during project implementation. The management of a PES-based project is also a specialist area that may require specialist expertise, available within the WLT partner network of which Guyra Paraguay is also a member (cf section G3.5).

G4.3. Orientation and Training

The participation of La Amistad community members is integral to the project strategy and the project budget includes provision for the necessary technical training expertise, coordinated through the Project Extension Officer. Orientation in the REDD concept is part of the training, which falls into three categories:

- Carbon monitoring: this is a priority area and must be conducted in the first six months of project implementation, to establish the site carbon monitoring plan.

- Sustainable agricultural systems: this is an important area, showing willingness to assist the community in areas that meet community needs and are not immediately linked to forest conservation: The programme will be developed in the first six months of project implementation, by the project consultants in consultation with community members and other project and state support services.

- Sustainable forest management: This programme will be developed in the last quarter of the first year, for full implementation in year 2. The timing avoids placing too much load on community members and also allows time for contributions to the community forest area.
An initial training plan is given in A-Annexe 19. La Amistad is still a relatively small community – training is therefore open to all members willing to participate. The training is on-going and, in the case of carbon monitoring, each measuring period is always preceded by an orientation/induction period. The process thus allows for training of new participants.

G4.4. Employment Policy

The need for community participation is further reinforced by preferential opportunity for employment on project-related activities for local community members wherever skills and aptitudes are appropriate.

For more specialised, skilled and/or administrative tasks, absolute priority is given to the involvement of the available pool of in-country expertise. Recruitment follows Guyra Paraguay employment norms and is open to all. Outside expertise is only called on where there is a demonstrable need, or where deemed desirable by Guyra Paraguay to enrich in-country resources through skills transfer or knowledge exchange.

G4.5. Worker’s Rights and Safety

All Guyra Paraguay employees are fully covered by the legal requirements for employment and workers rights. As all project employees are recruited by Guyra Paraguay, these conditions automatically extend to project personnel. At the outset of project implementation a hand-book will be produced setting out employee’s rights and employment conditions, for distribution to staff engaged on the project (and indeed more widely, as appropriate).

G4.6. Safety

Project actions do not involve outstanding risks but forestry operations in particular do require training in safe practice and use of equipment – this forms a standard part of improved forest management training, which will be based on FSC guidelines.

G4.7. Financial Soundness

The project budget (PA-Annexe 3) indicates that project activities can be covered within the overall funding limits set by Swire Pacific Offshore. Swire Pacific Offshore itself is an extremely well-established international company, with reported 2008 annual turnover of HK$ 4000 million. It is therefore fully capable of maintaining its financial commitments for project implementation, which is only one aspect of a wide-ranging Corporate Social Responsibility programme (PA-Annexe 4).

G5. Legal Status and Property Rights

G5.1. Relevant Law

The legal issues relating to the project have been analysed (A-Annexes 11-12a and b) with cited laws listed (PA-Annexe 6) - collaboration with the La Amistad community
in its land use practice does not infringe the regulations on which that land is held. All projects require an environmental impact statement – in effect the analyses undertaken to meet CCBA and VCSA requirements within the PDD fulfill that function.

G5.2. Approvals

The project has been endorsed at the level of central government (A-Annexe 20). The La Amistad scheme is voluntary but requires a formal endorsement from the community, which will also be sought prior to project initiation.

G5.3. Consent

The project does not encroach uninvited on private, community or government property. At La Amistad actions are based on voluntary participation on individual properties within the land granted to the community by INDERT, preceded by consultations. Consent is implicit in participation and no involuntary actions are involved.

G5.4. Involuntary Relocation

The project does not involve relocation of any form.

G5.5. Impacts of Illegal Activity on Project Benefits

The occurrence of illicit timber extraction in San Rafael (i.e. the project zone) is well-documented. It is also considered an important contributor to the threat on the high conservation values of the area, both directly and as a consequence of the lack of effective control over land use. Project benefits arise from conservation of forest within La Amistad community lands, where clearance is legal, and not the wider forest. On the other hand, impacts on the forest attributed to the community are deducted from project benefits. The threat alleviation strategy is to engender a direct interest on the part of the community in the protection of the wider forest, through its impact on revenue streams via the PES scheme.

G5.6. Carbon Rights

Legal advice (A-Annexe 11) demonstrates that under Paraguayan civil law the carbon integral to a tree on private property belongs to the land-owner, as is any carbon credit it represents. Here, the carbon is therefore initially in the hands of the La Amistad Community. Transfer to SPO of carbon credits arising from the project is recognised in the SEAM endorsement and will be specifically included in the contractual agreements between the various parties governing project activities, PES transactions and financing.
Climate Section

CL1. Net Positive Climate Impacts

CL1.1. Net Change in Carbon Stocks under the ‘With-Project’ Scenario

The ‘with-project’ scenario applies the same method (based on IPCC AFOLU guidelines) used for historic emissions and the base-line scenario (sections G1, G2). The following assumptions are used for preliminary estimates of climate impacts:

- There is a 75% take-up rate of the PES scheme in La Amistad, leading to the protection of 224 of the remaining 299 ha of high forest in the community area.
- The sustainable forestry management regime prevents further degradation with continued off-take within the annual allowable cut based on growth increment – i.e. the present biomass is maintained. Although the regime will aim for improved forest quality and biomass, this is not accounted for until demonstrated through the monitoring programme.
- The low forest has lower agricultural potential and so historically a lower transformation rate – indeed, the pattern at Lima (A-Annexe 9b) indicates it is liable to halt entirely. Contributing low forest to the community reserve would therefore be a ‘no-regrets’ option for the land-holder to contribute to the community reserve but conservation of this forest type is not additional and thus offers no climate benefit. In practice, however, the area involved is limited and it is simpler to make no difference in terms of payments made.
- Some land-occupiers will opt for reforestation but this is assumed to be limited i) by lower PES returns and ii) by need for land already cleared for agriculture. A reforestation area of only 10 ha is therefore assumed to be reforested. Furthermore, reforestation (whether by planting or regeneration) fails to meet permanence criteria and is therefore not included in the emission reductions estimate.

CL1.2. Net Change in Emissions of Non-CO₂ GHGs

Non-CO₂ GHG emissions are considered insignificant in this activity (cf A.G2.3). This will, however, be kept under review as the relevant REDD methodologies are finalized.

CL1.3. Other GHG Emissions from Project Activities

The entire approach is aimed at maintaining the status quo, and even the component for agricultural improvement operates on a limited scale. Other likely sources of GHG emissions associated with the project (e.g. transportation) are included in the list deemed insignificant (A-Annexe 25). Again, this will be kept under review as the relevant REDD methodologies are finalized.
CL1.4. Positive Net Climate Impact

With these assumptions the carbon stock in La Amistad at the end of the 20 year project life is 350,018 tCO₂e (PA-Annexe 1), representing a net gain over the baseline scenario of 169,928 tCO₂e. Gains from reforestation (estimated at 2580 tCO₂e) do not qualify and must therefore be deducted. Overall risk is assessed as ‘low’ (PA-Annexe 2) but given the higher risk issues identified in G3.5, a 20% risk deduction is also applied, as is a 10% reserve against leakage (see CL2). The net benefit (i.e. positive climate impact) under the ‘with project scenario’ is therefore estimated at 120,490 tCO₂e, comprising avoided emissions from conversion of high forest to agriculture net of 10% for leakage and the 20% risk buffer.

CL1.5. Avoidance of Double Counting

No emissions cap is applied to Paraguay but we expect a procedure for REDD-generated emissions reductions, with appropriate provisions for voluntary credits, to develop as the international discussions continue. Meanwhile, all emissions reductions attributable to the project will be lodged with an independent third-party registry. An account has already been opened in anticipation of the project with TZ1, allied to the New Zealand Stock Exchange. This is done to demonstrate their quality as tradable credits – the primary objective is to transfer them to SPO for retirement against emissions attributable to their international operations, so meeting corporate social responsibility commitments. The scope of the project is indeed designed to match that self-imposed emissions reduction target.

CL2. Offsite Climate Impacts (‘Leakage’)

CL2.1. Determination of Leakage Type and Extent

Forested land in La Amistad has been used for materials for local use – notably firewood and some extraction of timber. The small community sawmill is no longer working (this is mentioned as an update in the revised PDD) so timber extraction is now historical. That leaves displacement of firewood collection from the community area to the neighbouring properties in the main San Rafael forest bloc (all owned by Guyra Paraguay) as the most likely form of leakage. Leakage monitoring will cover the entire western area of San Rafael but close attention will be given to the zone on the La Amistad periphery.

CL2.2. Leakage Mitigation Measures

The establishment of a sustainably managed community reserve in preference to a strictly protective regime represents a leakage mitigation action, allowing continued off-take (hence no need to encroach on neighbouring forest) but substituting a controlled for an uncontrolled system of resource use. ‘Sustainable’ here means that continued removal of biomass lies within the capacity of the forest for replacement through annual growth increment, estimated at a minimum of 1.24 t/ha/yr (cf Table 6). Refining these estimates through on-site measurement and monitoring and then applying them, with the community, to the management of the forest is the task of the forestry extension officer provided for under the project.
**CL2.3. Carbon Benefit Deductions for Leakage**

The potential for offsite GHG emissions increases representing project leakage is very low – it is assumed that the forest within the project zone continues to supply materials for domestic use, with an extension service to ensure sustainable production. In effect there is no reason to seek material outside the project zone. Annual increment in stored carbon in the recovering forest is therefore not counted in estimated emissions reductions, being consumed instead. With these measures applied the leakage potential can be considered negligible. However, in order to be conservative, a 10% deduction (implying low risk) is nonetheless applied. This deduction is made from the estimated carbon benefit in PA-Annexe 1, prior to the 20% risk buffer.

The intended effect of the San Rafael Trust Fund, catalysed by the project, is to enhance protective management in the main San Rafael forest bloc, with the aim of reducing illegal harvest levels. It is therefore possible that monitoring will show an additional benefit in carbon stocks. If this is demonstrated, there is a moderate to high risk of leakage by displacing illicit activity to forests of broadly similar carbon density elsewhere in the region. Using the VCSA AFOLU guidelines, any additional carbon benefits from reduced logging in the main San Rafael forest bloc must carry a 40% leakage discount and also necessitates extension of leakage monitoring to the Atlantic Forests of the Eastern Region of Paraguay as a whole.

It is worth noting that the regularisation of logging under a sustainable management system in at least part of San Rafael (with a zero-low leakage risk) may confer greater climate benefits than a total ban (with a medium-high leakage risk from displacement to other areas). It could also give higher social benefits while, if limited to areas of lower biodiversity importance, without serious compromise to biodiversity values. This approach underlay the attempt to convert San Rafael into a managed resource area rather than a national park and, though not relevant to the project at this stage, does give a pointer for potential future approaches to conservation management in the area as a whole.

**CL2.4. Leakage Deductions for Non-CO₂ Gases**

Non-CO₂ emissions are considered insignificant and no deduction is made. This will, however, be kept under review.

**CL3. Climate Impact Monitoring**

**CL3.1. Monitoring Plan**

The aim is to use a VCSA-approved monitoring methodology but none have yet completed the process. As an interim measure the monitoring plan envisages reiterations of the carbon stock estimates originating from the CIDA project and using IPCC methodology based on Tier 2 and Tier 3 data (A-Annexes 2-3), including a refined assessment of the expansion factor converting forest inventory data to biomass (A-Annexe 20). This approach is sufficient for ex ante estimation but will be revised as necessary when VCSA-approved methods become available.
CL3.2. Development of Full Monitoring Plan

The monitoring methodology and plan will therefore be developed through the first six months of the project, aiming for completion by December 2010. It will then be maintained for 20 years (i.e. the project life) – as the ‘without-project’ scenario indicates the deforestation process in La Amistad could be complete in 10 years, the 20 period will capture residual leakage after project actions have taken effect.

The monitoring plan will include:

- Annual assessments of land use change, separating the project area (La Amistad), the leakage area (western San Rafael) and the reference area (the San Rafael forest bloc). It will also be extended to tracking of trends in the Atlantic Forests of the Eastern Paraguay as a whole. The system is already in place using the Guyra Paraguay GIS capability, and will be maintained.
- Measurement of carbon stocks using a permanent plot array, with initial measurements to be completed by June 2010 and re-measurements at 5 year intervals. The carbon pools to be measured are those established in the CIDA project: i.e above- and below-ground biomass; necromass (dead wood); litter; soil.
- The plot array will cover high forest, low forest, agriculture and grassland within La Amistad. The plot array will also cover high, low and secondary forest in western San Rafael (the leakage zone), concentrating on the land parcels owned by Guyra Paraguay and thus with clear access.
- In addition, monitoring on the Guyra Paraguay reforestation plots will be maintained, with new permanent sample plots on reforestation areas La Amistad. While not applicable in terms of delivery of climate benefits, the information is useful additional data.

Estimates of carbon stocks will be annual, applying the measured rates of land use change to the most recent carbon measurements. Assessments of actual delivery and projected benefits will be adjusted every five years on the basis of the field measurements. Members of the La Amistad community will participate in the field measurements, ensuring full awareness and engagement in the process. Results will also be posted regularly on the Guyra Paraguay and WLT web-sites. A budget of US$ 8000 p.a. has been allocated for the monitoring programme at La Amistad, maintained after the fifth year by the long-term management fund.

Community Section

CM1. Net Positive Community Impacts

CM1.1. Community Impact Estimates
The consultations identify issues considered important by the La Amistad community. In summary these include: poor road access; lack of health facilities; inadequate education facilities; inadequate water supply; concern for food security.

The project has been designed to address these issues, but indirectly. In effect it:
• Gives an additional long-term revenue stream to individual community members, so acting directly on the ability of individual households to meet basic needs. The inclusion of the reforestation element aims to open participation to community members regardless of the area of land under natural forest cover on their parcels – this does not deliver additional VCUs and is thus justified purely on social grounds.

• Is structured to ensure a reasonable part of the benefits go to the whole community. Expenditure of these funds is under community control in order that they reflect community priorities but their use in supplementing public services (i.e. the main specific issues of concern) is both intended and encouraged. While the sums are relatively small (up to US$ 11,900 p.a.) they are significant at the level of a single community.

• Supplements the support services available to the community to improve land management practices (agricultural and forestry) on its lands, so addressing security of food (and other) resources.

• Ensures maintenance of clean water supply (the main San Rafael HCV directly affecting the community) by enhancing protection of the forested headwaters. The establishment of a sustainably managed forest reserve also ensures access to a reliable supply of fuel and materials for which there are as yet no readily available alternatives.

The key feature throughout is that this community support is sustained and reliable throughout the 20 year project life, so allowing gains to be consolidated.

The main negative impact is that land is set aside from other use – this is, however, mitigated by the PES payments and the voluntary nature of the scheme, allowing participants to withdraw if the promised benefits are not realised. Again, these measures do not work to the advantage of the project in terms of immediate VCU delivery – they are social safeguards to inspire confidence in the early stages of the project, the project gain being achieved in facilitating potential expansion to actions in the main forest bloc.

The positive and negative impacts are described in more detail in A-Annexe 19. Overall, net community impacts under the project scenario are positive in relation to the ‘no-project’ scenario – indeed, as a voluntary scheme the potential negative impacts are better seen as project risks. This, however, is a qualitative assessment and benefits must be quantified – this is covered in section A.CM.3.

**CM1.2. Impact on HCVs**

The main direct impact on High Conservation Values for the La Amistad community is to maintain ready access to forest products for domestic use from the community lands, without recourse to encroachment on neighbouring properties protected as private nature reserves.
CM2. Offsite Stakeholder Impacts

CM2.1. Negative Offsite Stakeholder Impacts
The location of La Amistad as a near-enclave within the San Rafael forest bloc and the nature of the projects activities make the likelihood of negative offsite stakeholders remote. Indeed, no project impacts have been identified involving decreased social and economic well-being outside the project zone.

CM2.2. Offsite Stakeholder Impacts Mitigation Strategy
While no offsite impacts associated with the project have been identified, there is potential for positive impacts by acting as a model that may be applicable to other small-holder communities. This aspect is important for possible project replication and expansion, but may also raise expectations that cannot be fulfilled in communities on the periphery of the forest. This issue needs to tracked carefully.

A.CM2.3. Net Negative Impacts on Other Stakeholder Groups
Under the circumstances outlined above, the project meets the ‘no-harm’ criterion.

CM3. Community Impact Monitoring

CM3.1. Community Monitoring Plan
A preliminary template for community impact monitoring is given in A-Annexe 19. The monitoring system will:

- Establish a baseline in the first six months of the project, using quantifiable measurements of set socio-economic indicators under an appropriate methodology;
- Re-measure annually, to demonstrate and quantify benefits;
- Be fully reviewed at 5 year intervals (i.e. alongside the carbon monitoring programme).

Community members will participate fully in the monitoring process, including assessment of the net benefits claimed by the project. Updated results will be posted on the WLT and Guyra Paraguay internet sites.

Key elements to be monitored are:

- Degree of participation of community members in project-related activity;
- The level of project-related revenue streams into the community, their distribution and their proportion relative to other income sources;
- Use of project-generated revenues for general community benefit, ‘quality of life’ indicator scores and the role of project-generated revenues in reaching those scores.

CM3.2. Monitoring Plan for HCVs
The key issue is to track the degree to which community needs in forest products are met by the community forest reserve. This will be integrated into the monitoring plan.
CM3.3. Development of Full Monitoring Plan

The preliminary template for community impact monitoring, given in A-Annexe 19, will be refined, with the inclusion of HCV monitoring, for implementation in the second half of 2010: i.e. within six months of the project start date, allowed for under CCBA guidelines.

Biodiversity Section

B1. Net Positive Biodiversity Impacts

B1.1. Biodiversity Impact Estimates

Positive biodiversity impacts will accrue from two sources, both attributable to the project:

- Maintenance of the La Amistad community forest as a buffer against degradation in the immediate hinterland. As these are all Guyra Paraguay properties, selected for high HCVs as a core area for the putative San Rafael National Park, positive biodiversity impacts may be expected. Although a minor gain compared with the buffering role, improving quality of the remaining forest within La Amistad extends available habitat for forest- and forest-edge specialists.

- Improved conservation management of San Rafael as a whole, through establishment of the San Rafael Trust Fund. This was designed as the chief instrument for underpinning activities to maintain the High Conservation Values of the area (A-Annexes 15-17). A substantial net positive biodiversity impact can therefore be expected through its establishment.

The objective here is to maintain biodiversity conservation values that are already exceptionally high but threatened. The means of assessing strategy effectiveness is set out in section A.B3.

B1.2. Impact on HCVs

The project has been specifically designed to contribute to alleviation of pressures on biodiversity HCVs. No negative impacts have been identified.

B1.3. Tree Species to be used in Project Activities

The project is primarily REDD-based, thus by definition targeting use of native species. Reforestation by assisted regeneration (already practiced on the Guyra Paraguay lands within San Rafael) is also based on native species. While retaining a preference for native species, non-native species may also be used for reforestation work at La Amistad. Typically this is appropriate where materials (e.g. firewood) are more effectively produced under plantations, in turn alleviating pressure on the natural forest. Species known to be potentially invasive will not be used.
B1.4. Impacts of Non-Native Species

Justification for use of non-native tree species will be set out in the community forest management plan, if non-native species form part of the management strategy. The most pernicious non-native invasive species in the area are in fact exotic pasture grasses, which do not figure in any part of project strategy.

B1.5. Statement on GMOs

Genetically-modified organisms are not permissible as any part of project strategy.

B2. Offsite Biodiversity Impacts

B2.1. Negative Offsite Biodiversity Impacts

Negative offsite biodiversity impacts directly attributable to the project are extremely unlikely and none have been identified. The possibility remains that the indirect effect of improved protection in San Rafael could displace illicit activity to other forest areas in the region, but any such effect should be detected by the monitoring programme.

B2.2. Offsite Biodiversity Impacts Mitigation Strategy

The project has been designed to be expandable and replicable. In the event that significant displacement of illicit activity affecting other important forest areas is detected by the monitoring programme, the strategy would be to extend the approach to cover the areas concerned.

B2.3. Unmitigated Negative Offsite Biodiversity Impacts

As noted above, the main potential impact is to displace pressure away from San Rafael, in which case it is shifted from a site of higher to others of (relatively) lower HCV. Given that the HCV and IBA analyses give the highest ratings in the region to San Rafael, the result is a net gain.

B3. Biodiversity Impact Monitoring

B3.1. Biodiversity Monitoring Plan

Guyra Paraguay maintains a biodiversity data-base for San Rafael, regularly updated and using the standard Important Bird Area (IBA) monitoring methodology. This acts as the on-going monitoring system, using species of special conservation concern as indicators.

In effect, the formal assessments of biodiversity values and threat levels included in the HCV, IBA and Rapid Ecological Assessment methodologies give both a base-line and an objective, measurable system for monitoring both temporally at a given site and spatially between sites. They were specifically developed for that purpose and meet the CCBA criteria (which are indeed designed to meet the HCV methodology).
The monitoring system will therefore comprise reiterations of the three analyses (A-Annexes 15, 17, Yanosky 2008) at 5 year intervals - i.e. running alongside the carbon and community monitoring - to allowing direct comparison of performance in terms of threat alleviation spanning the pre- and post-implementation periods. This will be maintained through the project life – as the projected deforestation trend in La Amistad would have cleared the area in 10 years, the system will capture delayed effects.

B3.2. Monitoring Plan for HCVs

The plan outlined above specifically includes HCV monitoring following the standard methodology.

B3.3. Development of Full Monitoring Plan

The monitoring plan for biodiversity impact is comprehensive but set out in three separate documents. It is therefore proposed that the different approaches be brought together as a single monitoring protocol, and updated to 2010 to give a project baseline. This will be undertaken through the second half of 2010, i.e. within six months of the project start date, allowed for under CCBA guidelines.

Gold Level Section

A.GL1. Climate Change Adaptation Benefits

A.GL1.1 Likely Regional Climate Change Variability

Short-, medium- and long-term projections have been made for shifts in the Paraguayan climate (A-Annexes 22, 23) and their impacts on the natural environment (A-Annexe 24). In the San Rafael area the predicted trend is towards a hotter and more markedly seasonal climate that, over time, is likely to catalyse a shift from moist forest to wooded savannah (cerrado) conditions.

A.GL1.2 Risks and Mitigation Strategy

Marked impacts are possible in the medium- to long-term (i.e. 2050-2100) and there is a low risk they may start to be felt towards the end of the project lifetime, potentially affecting carbon stocks and VCU delivery if there is die-off of mature trees non-adapted to a hotter, more seasonal, climatic regime and/or seasonally drier conditions with increased fire-risk. If so, they will be detected by the monitoring programme and accounted for accordingly. The shift in climatic conditions will also impact on the characteristic Atlantic Forest biota, and upon agricultural activity.

The issues presented by climate change cannot be mitigated on the scale of a single project – a national approach is required but the development of national strategy is hindered by lack of information (cf A-Annex 24). The most appropriate approach, therefore, is to ensure that the information gathered by Guyra Paraguay in project monitoring contributes to national strategy development.
A.GL1.3 Climate Change Impacts on Communities and Biodiversity
At this time the information is inadequate for meaningful analyses of the kind set out by the CCBA guidelines. The issue will, however, be explored alongside the project and, as probable likelihood of impacts becomes clearer, appropriate action will be incorporated as part of adaptive project management.

A.GL1.4 Project Adaptation Measures
Meanwhile, the most promising adaptation measures under the circumstances are to promote resilience, both ecologically and socially. This is assisted by project actions:

- **Ecological resilience**: The better the management of the area, the more healthy (and thus more resilient) the system is likely to be, capable of retaining elements of its HCVs under changing conditions. Such refugia may be small-scale but nonetheless important for landscape connectivity. Furthermore the cerrado is also an ecosystem with its own set of HCVs. The system may change but still has its value. Post-project, protected cerrado may still be expected to have higher carbon stocks than an equivalent cleared area.

- **Social resilience**: Climate change may be expected to exert changes on water supply and agricultural potential. Protection of the headwaters under natural vegetation cover is likely to become of even greater importance in a more extreme environment. In terms of agricultural potential, the capacity-building envisaged under the project for improved agriculture is liable to confer a degree of flexibility of response, perhaps the best approach to adaptation to an uncertain future.

GL2. Exceptional Community Benefits

GL2.1 Project Activities in Low Human Developed Country
The World Bank classes Paraguay as a medium development country, but with marked inequalities of wealth in which the La Amistad community is likely to be towards the bottom end of the scale.

GL2.2. Benefits to Poorest Communities
The project is designed to benefit the entire community, and the relative advantages are expected to be highest for the poorest members. It is possible that tenure issues could exclude some members (i.e. those not registered as land-holders with INDERT), hence the insistence that the PES scheme benefit the land occupier rather than title-holder at the cost of increased project risk. The clarification and regularization of land-holders in collaboration with INDERT as part of the project will, however, greatly benefit those community members who are currently technically illegal occupants.

At this stage, however, these characteristics have not been quantified and no exceptional community benefits are claimed. The revised community benefit monitoring system will include a component concentrating on disadvantaged, poor and more vulnerable households, which may identify impacts that should be optimized where positive and mitigated where negative. These will be assimilated in
project activity as part of adaptive management. These cover sections A.GL2.3. *Negative Affects for Poor and More Vulnerable Households*, A.GL2.4. *Mitigation of Negative Affects* and A.GL2.5. *Community Monitoring of Disadvantaged Groups* in the CCBA.

**GL3. Exceptional Biodiversity Benefits**

**GL3.1 Demonstration of HCV Vulnerability**
San Rafael is an Important Bird Area or IBA (Yanosky 2008) and thus by definition a Key Biodiversity Area (KBA). As the residual forests on La Amistad are integral to the forest as a whole, their conservation meets the Gold Standard criteria for exceptional biodiversity benefits as defined by CCBA. The relationship is confirmed by the results of the San Rafael biodiversity surveys (Map 10) - all surveyed land parcels adjacent to La Amistad harbour IUCN-listed endangered and vulnerable species and their presence on the project site can therefore reasonably be inferred.

**AVC.1.2: Especies amezadas y en peligro.**

**Map 10: Presence of species of conservation concern, San Rafael**