CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM FOR SMALL-SCALE AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-SSC-AR-PDD)
(Version 02)

Version for validation under Climate, Community and Biodiversity Project Standards

CONTENTS

Note

This PDD for the Sierra Gorda Reforestation Project is following the CDM-SSC-AR-PDD Template and the Clean Development Mechanism (CDM) methodology AR-AMS0001 / Version 06. The reason behind this choice is that CDM methodologies are accepted as the highest standard of afforestation / reforestation projects. The use of the template and methodology does not mean that the project will be submitted as a CDM project. CDM methodologies are approved under the Verified Carbon Standard (VCS) and also meet the requirements of the Climate, Community and Biodiversity Project Standards (CCB).

SECTION A. General description of the proposed small-scale A/R CDM project activity:

A.1. Title of the proposed small-scale A/R CDM project activity:

>> Carbon Sequestration in Communities of Extreme Poverty in the Sierra Gorda of Mexico

A.2. Description of the proposed small-scale A/R CDM project activity:

>> In 1987, Grupo Ecológico Sierra Gorda (Grupo Ecológico) began reforesting degraded lands in the Sierra Gorda Queretana in eastern-central Mexico. Between 1997 and 2001, Grupo Ecológico planted 52.6 hectares, in parcels greater than 0.5 hectares, with the intention of using the revenues from the sale of the carbon sequestered to support landholders and the organization's environmental activities.

Following restructuring of Grupo Ecológico in 2001, Bosque Sustentable A.C. has continued as the partner organization of Grupo Ecológico focusing on reforestation and the sale of carbon credits. Since the restructuring, Bosque Sustentable has planted an additional 93.2 hectares through 2009 in parcels greater than 0.5 hectares, with the expressed goal of using the revenues from the sale of the carbon sequestered to support landholders and the organization's activities in forest management and biodiversity protection. Bosque Sustentable has a target to plant an additional 40 hectares per year from 2010 to 2013 for this project activity.

The purpose of the project is to reforest areas that require restoration while providing an alternative productive activity to hundreds of landowners and landholders in conditions of severe poverty while capturing carbon at the same time. The project is primarily designed to overcome the financial barrier to landholder participation. Bosque Sustentable provides the landholders with incentives to follow the forest management plan proposed by Bosque Sustentable.

A.3. Project participants:

>>Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be indicated using the following tabular format.

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as a project participant (Yes/No)
Mexico	• Bosque Sustentable A.C. • Various landowners and landholders	No

A.4. Description of location and boundary of the small-scale A/R CDM project activity:

>>

A.4.1. Location of the proposed small-scale A/R CDM project activity:

>> Please see Annex 3 for a detailed inventory of reforestations established from 1997-2009.

A.4.1.1. Host Party(ies):

>>Mexico

A.4.1.2. Region/State/Province etc.:

>> Querétaro and San Luis Potosí

A.4.1.3. City/Town/Community etc:

>>

Zone 1: Sierra Gorda Biosphere Reserve (SGBR)
Municipalities of Pinal de Amoles, Jalpan de Serra, Landa de Matamoros and Arroyo Seco in the state of Querétaro

Zone 2: San Luis Potosí
Municipalities of Xilitla and Aquismón in the state of San Luis Potosí

A.4.2. Detail of geographical location and project boundary, including information allowing the unique identification(s) of the proposed small-scale A/R CDM project activity:

>> The project boundary includes 138 reforestations totaling 145.7 hectares established from 1997-2009 and is projected to increase by approximately 40 hectares each year from 2010-2013. Please see Annex 3 for a detailed inventory of existing plantings. The locations of the plantings have been mapped (see Figures 4-11, KML file and Assessment of Land Condition/Suitability Sheets).

The project proponent will demonstrate that communities that enter the project after the validation of the PDD have roughly the same social, economic and environmental conditions (i.e. in the same region, with the same social and economic indicators). These lands will not affect the additionality of the project and will have the same baseline as presented in the PDD.

VCS provisions regarding control of project area

The VCS Guidance for AFOLU Projects states that in cases where project validation occurs before verification, as is the case with this project, the project boundary encompasses the area under the control or to become under the control of the project participants as defined in the Project Document. The entire area is to be validated as if it were under control and ready to be implemented. For validations where less than 80% of the total proposed area of the project is under current control, certain requirements must be met.

In this project, 160 of the total hectares have not yet been identified. In addition, as part of the project operator's procedures to reduce financial and plantation survival risks, contracts between the project operator and the reforesters are not signed until the plantation shows adequate survival rates and until a corresponding donation is received from the user of the emissions

offsets. Therefore, because less than 80% of the total proposed area of the project is under current control, the following four requirements must be met.

A. Demonstrate that the differing area (i.e., whether under control now or in the future) does not affect the outcome of the additionality test.

The project proponent has established clear participation requirements that ensure that areas entering the project in the future do not affect the outcome of the additionality test. These include a geographic requirement that ensures the participants in the project will be from communities with similar social, economic and environmental conditions; a requirement that lands are in agriculture or livestock use prior to the establishment of the plantation and thus would not regenerate naturally; and a requirement that any individual who would establish a plantation without the administrative and technical assistance of the project proponent or its key partners is not eligible. Please see Annex 5 for more details on participation requirements.

B. Assure that if the area is eventually smaller than intended, there are provisions that increased emissions attributable to the project activity in the areas that at verification have not come under control of project shall be considered as leakage. This requires the selection of the appropriate methodology beforehand for the eventuality that this may happen.

Under the selected methodology, "project emissions are considered insignificant and therefore neglected."

C. Design a monitoring plan that is flexible enough to deal with changes in the size of the Project.

The monitoring plan includes a leakage survey and calculation methodology that will be applied to all new areas entering the plan and that will operate regardless of any changes in the size of the project.

D. Verify the project within five years of validation.

The project proponent plans to seek verification within five years and has included its cost in the project's financial projections.

Figure 1: Reference map - project region

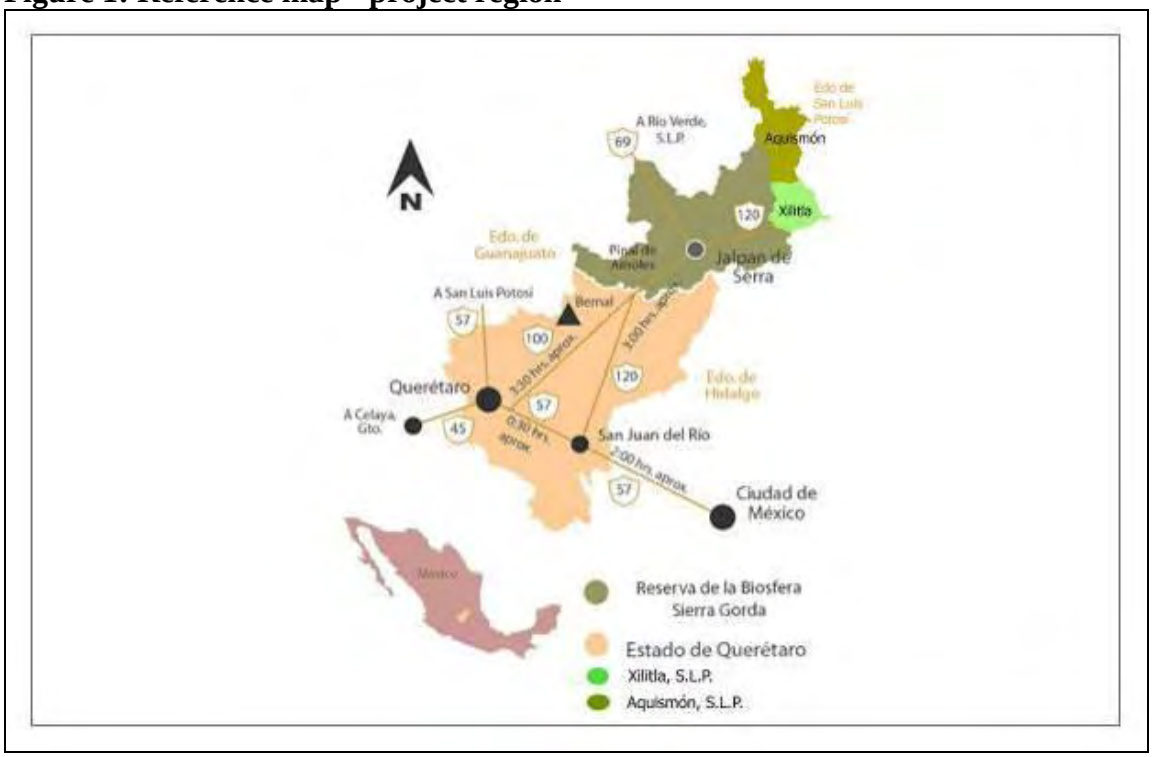


Figure 2: Reference Map for Zone 1, Sierra Gorda Biosphere Reserve in Querétaro

Figure 3: Reference Map for Zone 2, Municipalities of Xilitla and Aquismón in San Luis Potosí

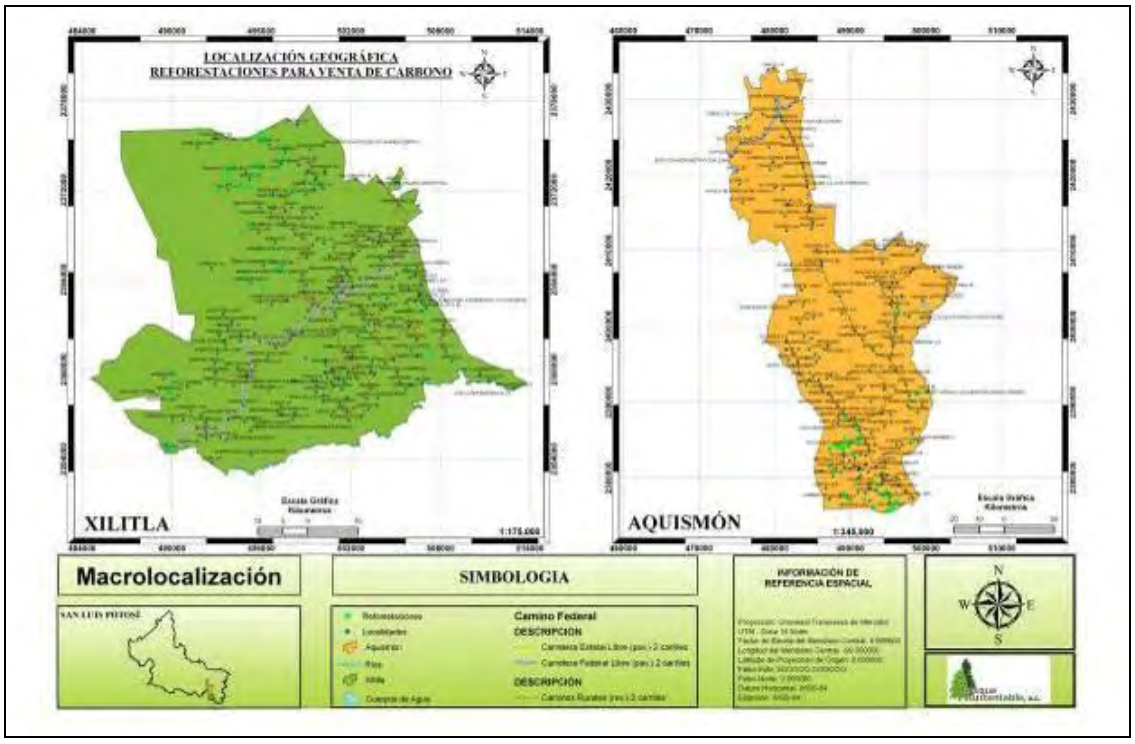


Figure 4: Locations of existing reforestations in the municipalities of Pinal de Amoles and Jalpan de Serra, northern section

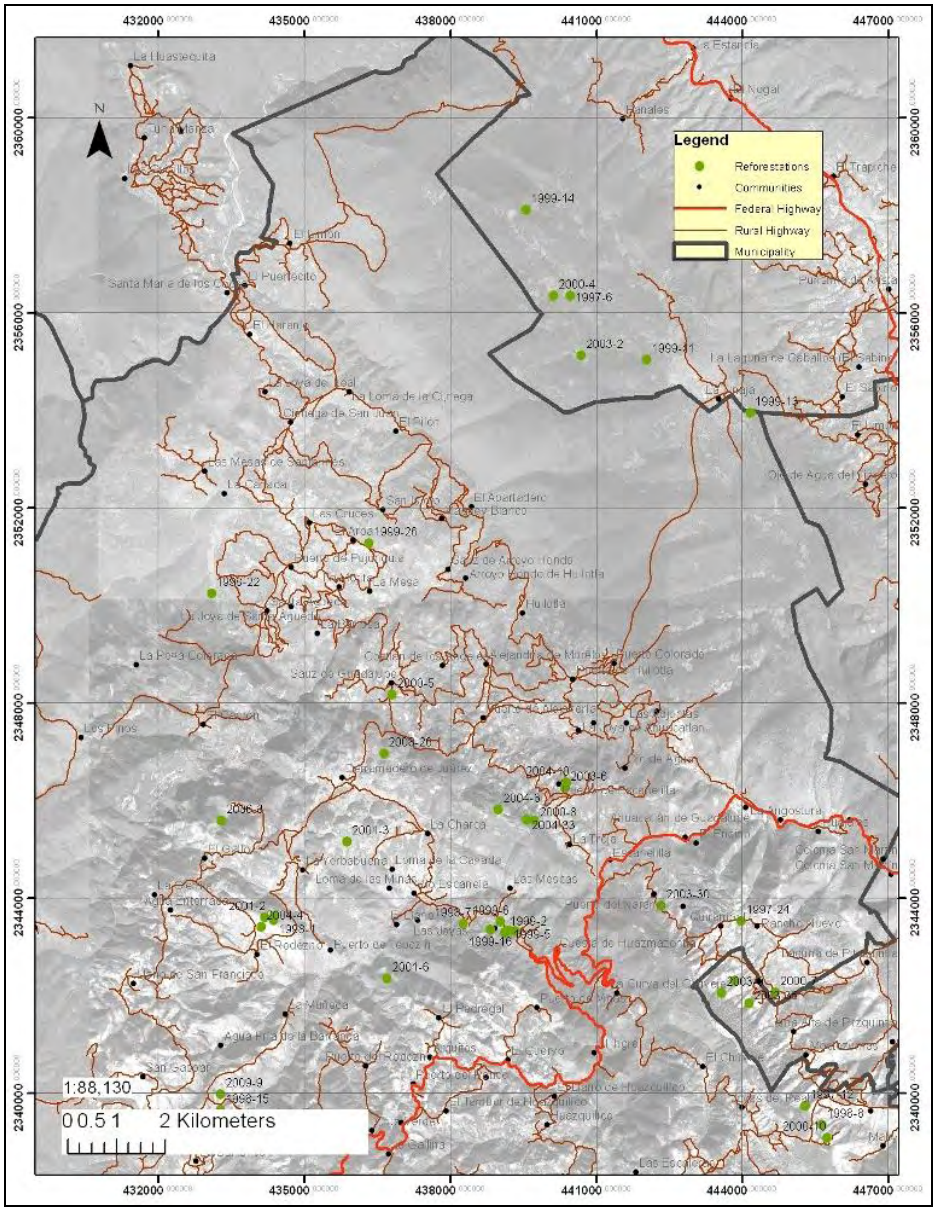


Figure 5: Locations of existing reforestations in the municipalities of Pinal de Amoles and Jalpan de Serra, southern section

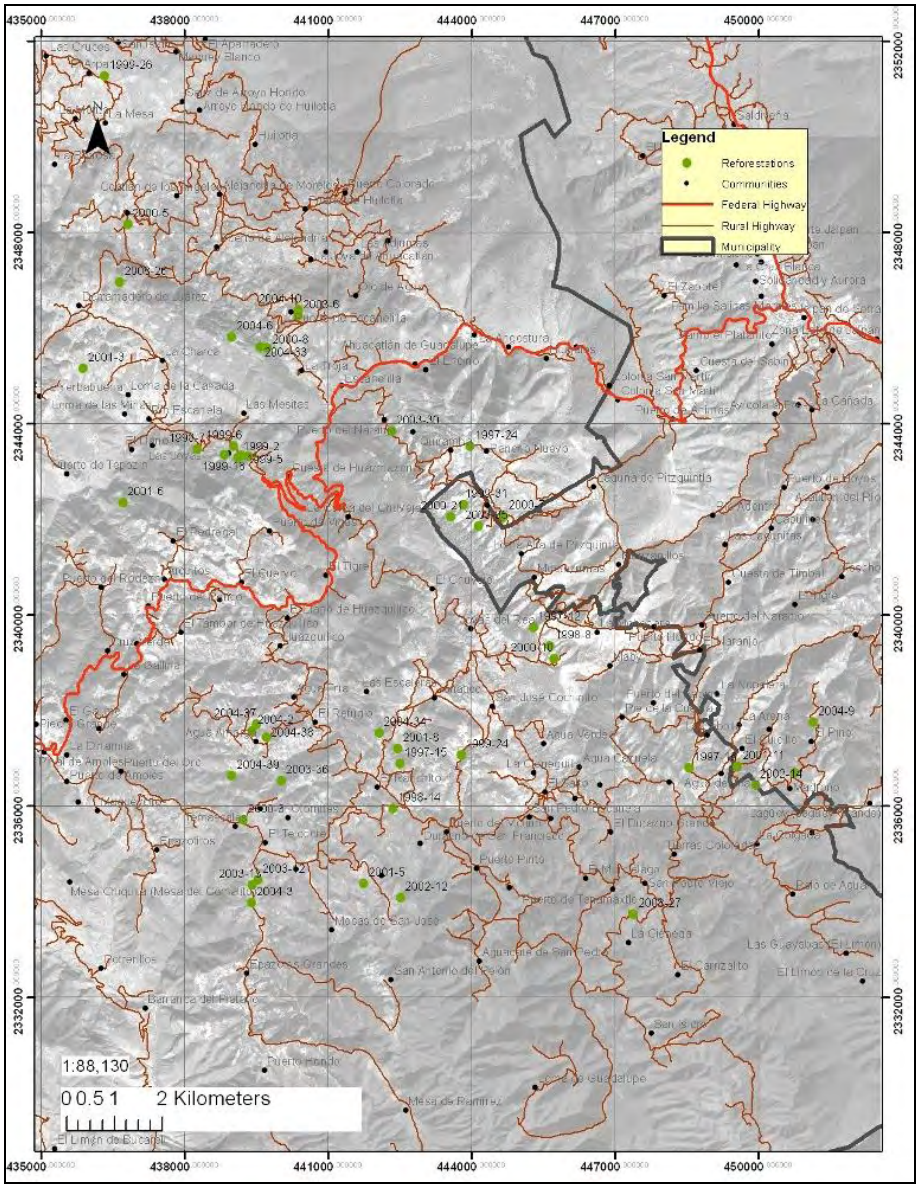


Figure 6: Locations of existing reforestations in the municipality of Landa de Matamoros

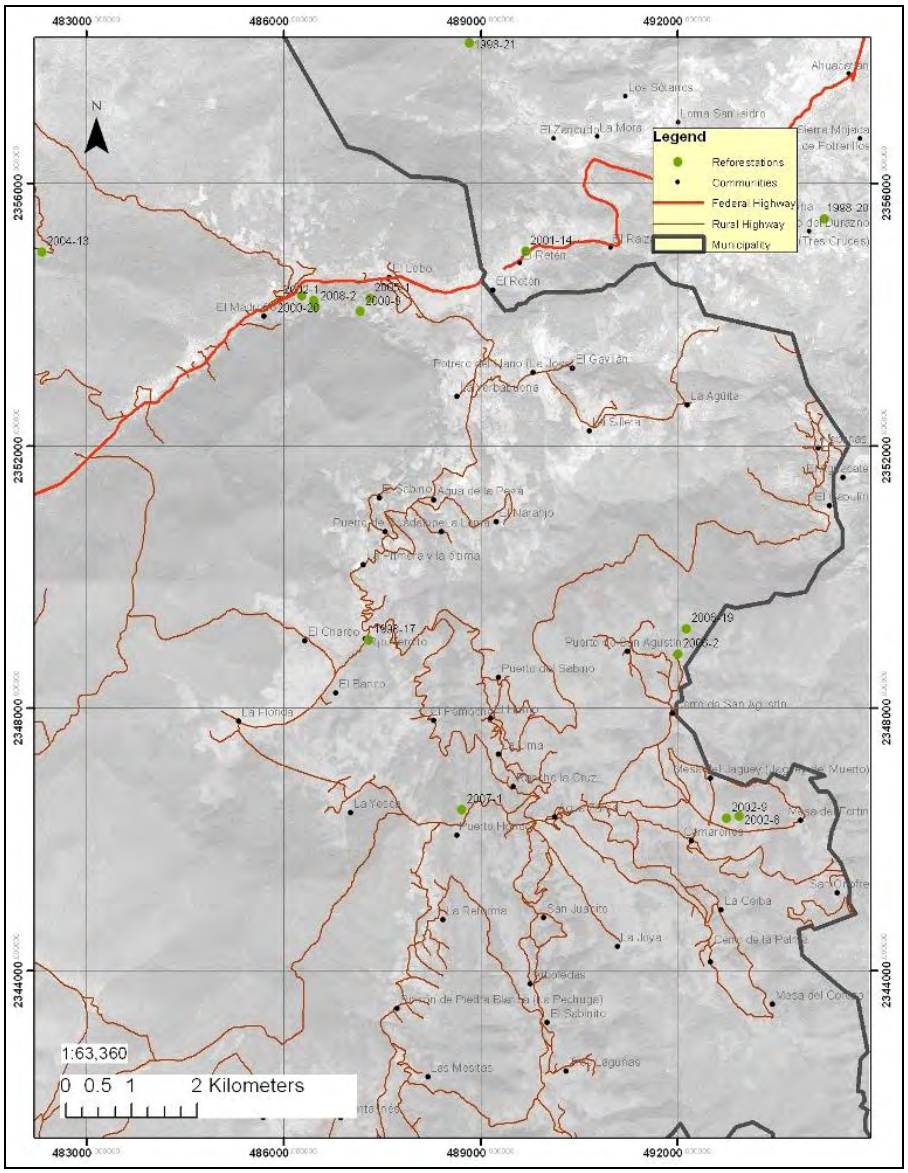


Figure 7: Locations of existing reforestations in the municipality of Arroyo Seco, northern section

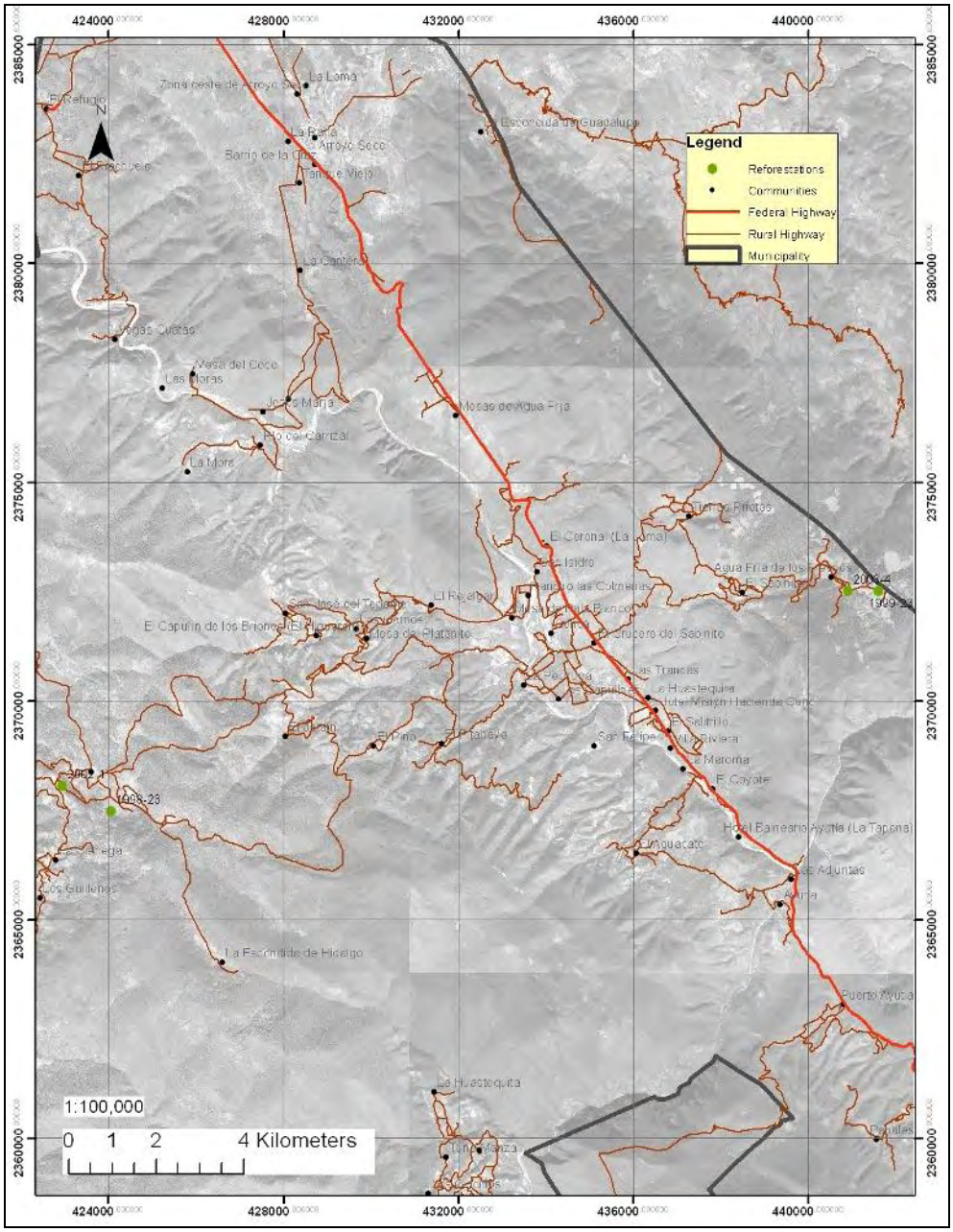


Figure 8: Locations of existing reforestations in the municipality of Arroyo Seco, southern section

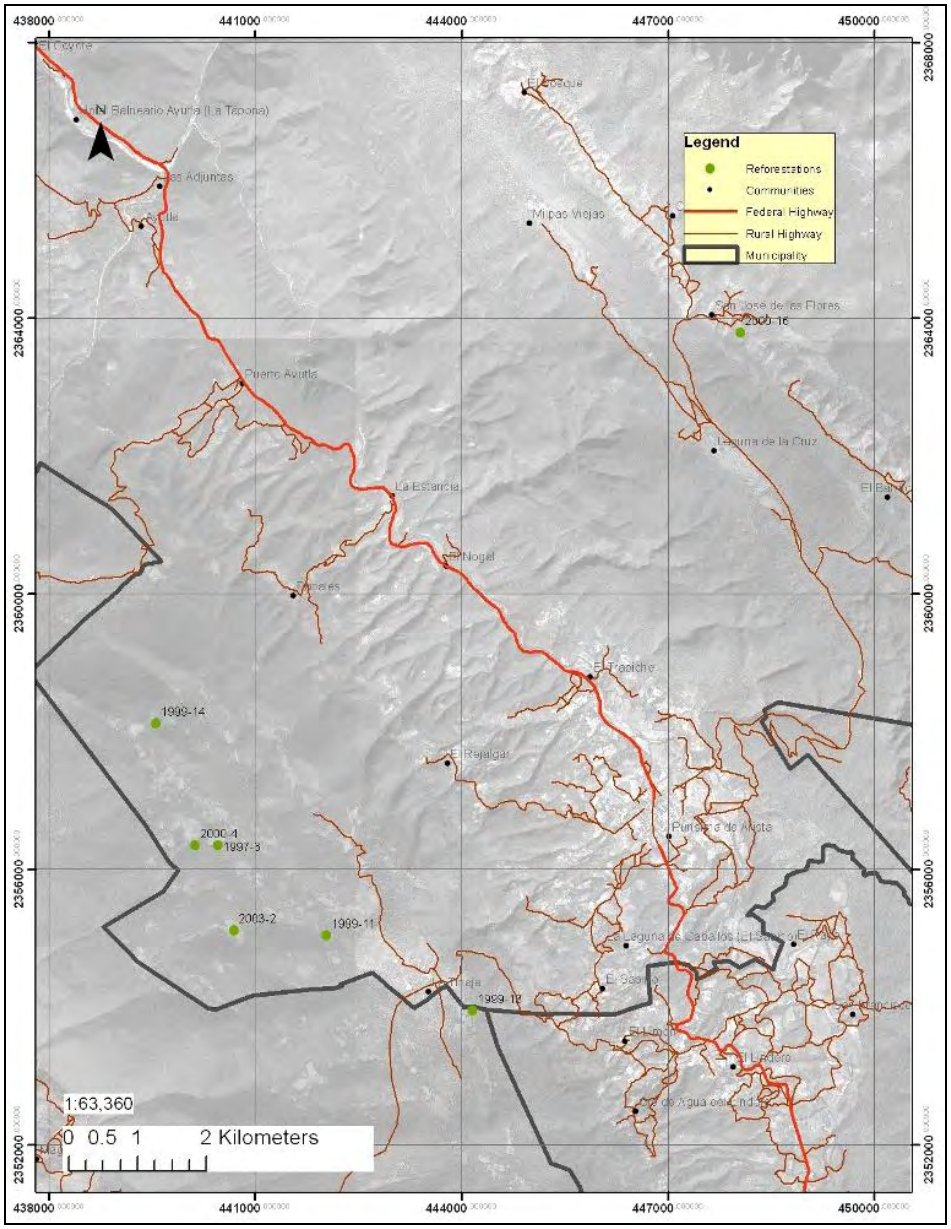


Figure 9: Locations of existing reforestations in the municipality of Xilitla, northern section

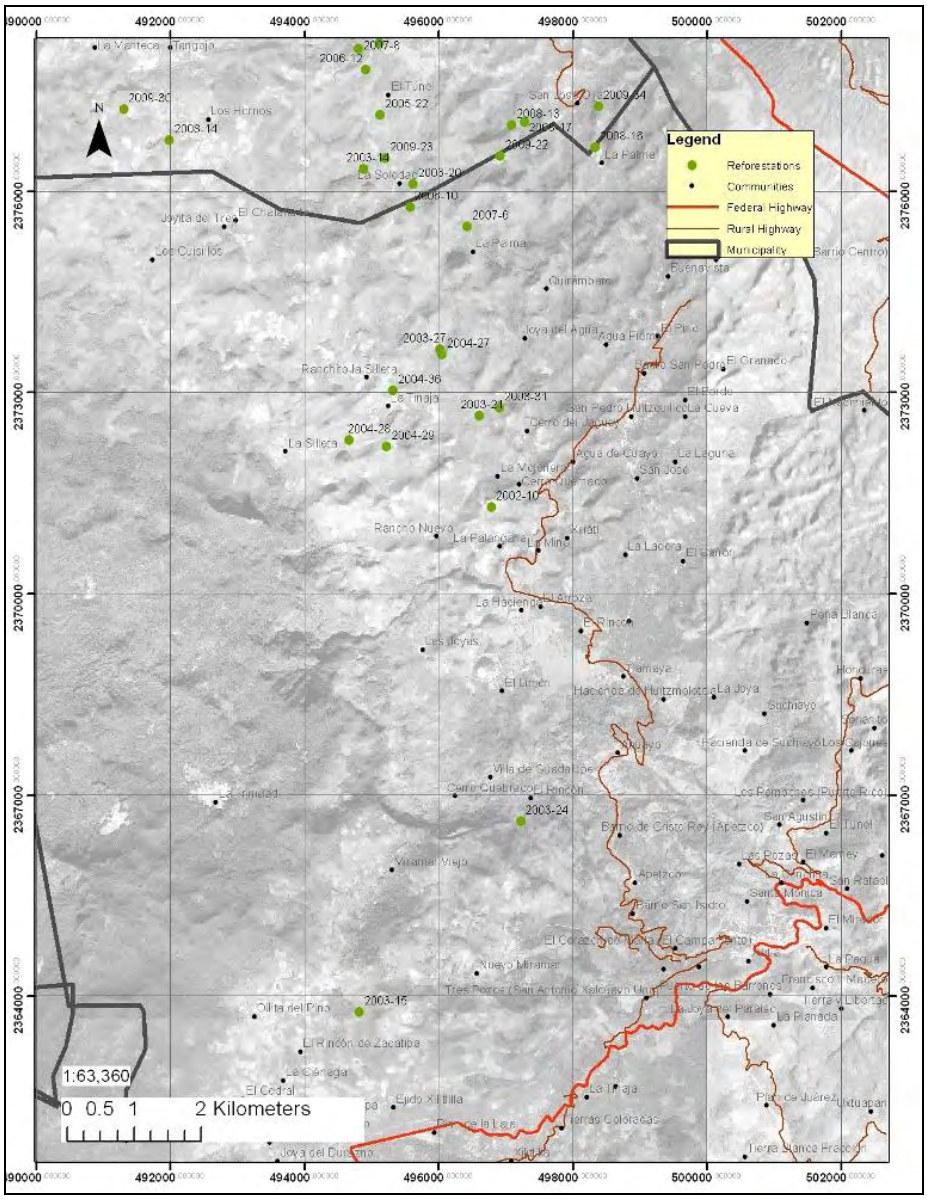


Figure 10: Locations of existing reforestations in the municipality of Xilitla, southern section

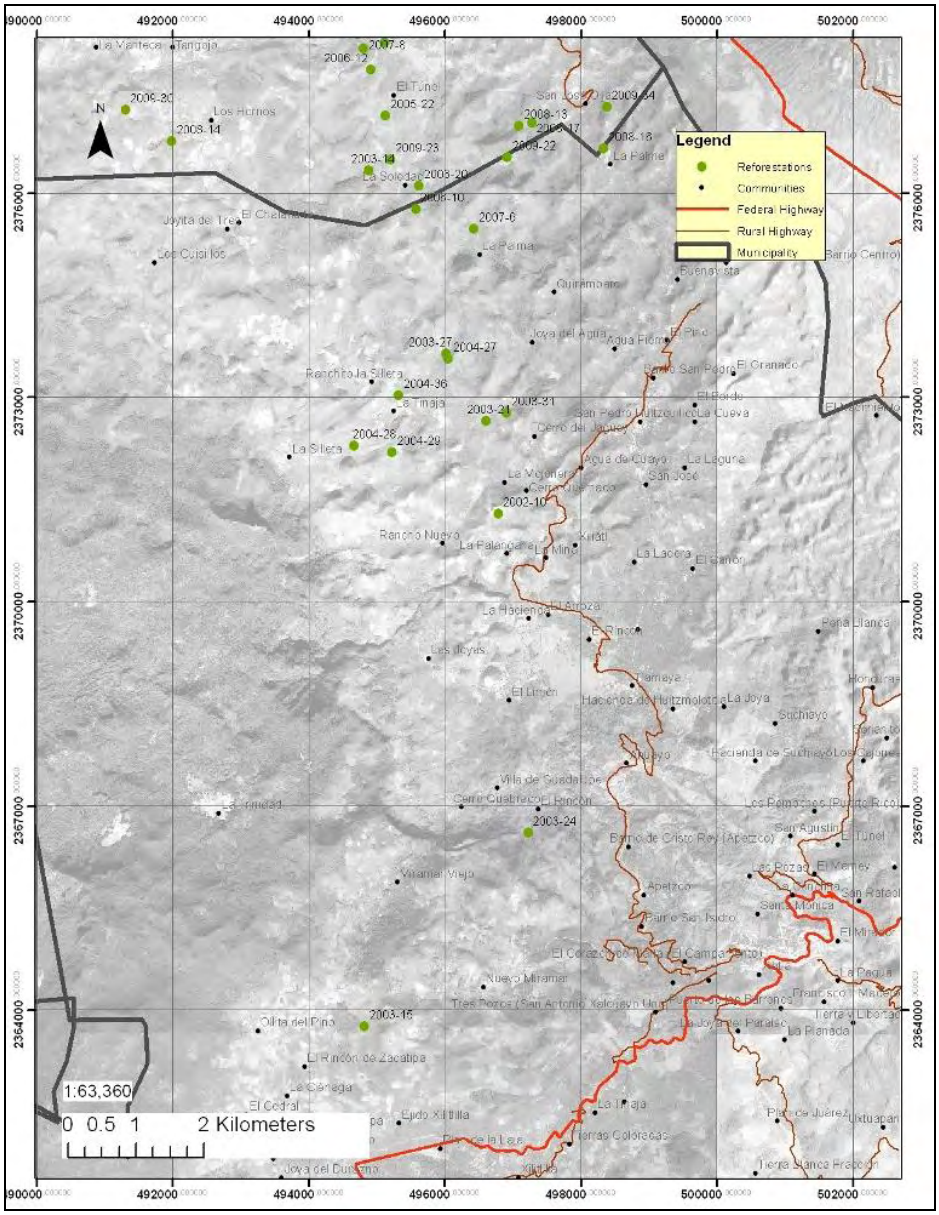
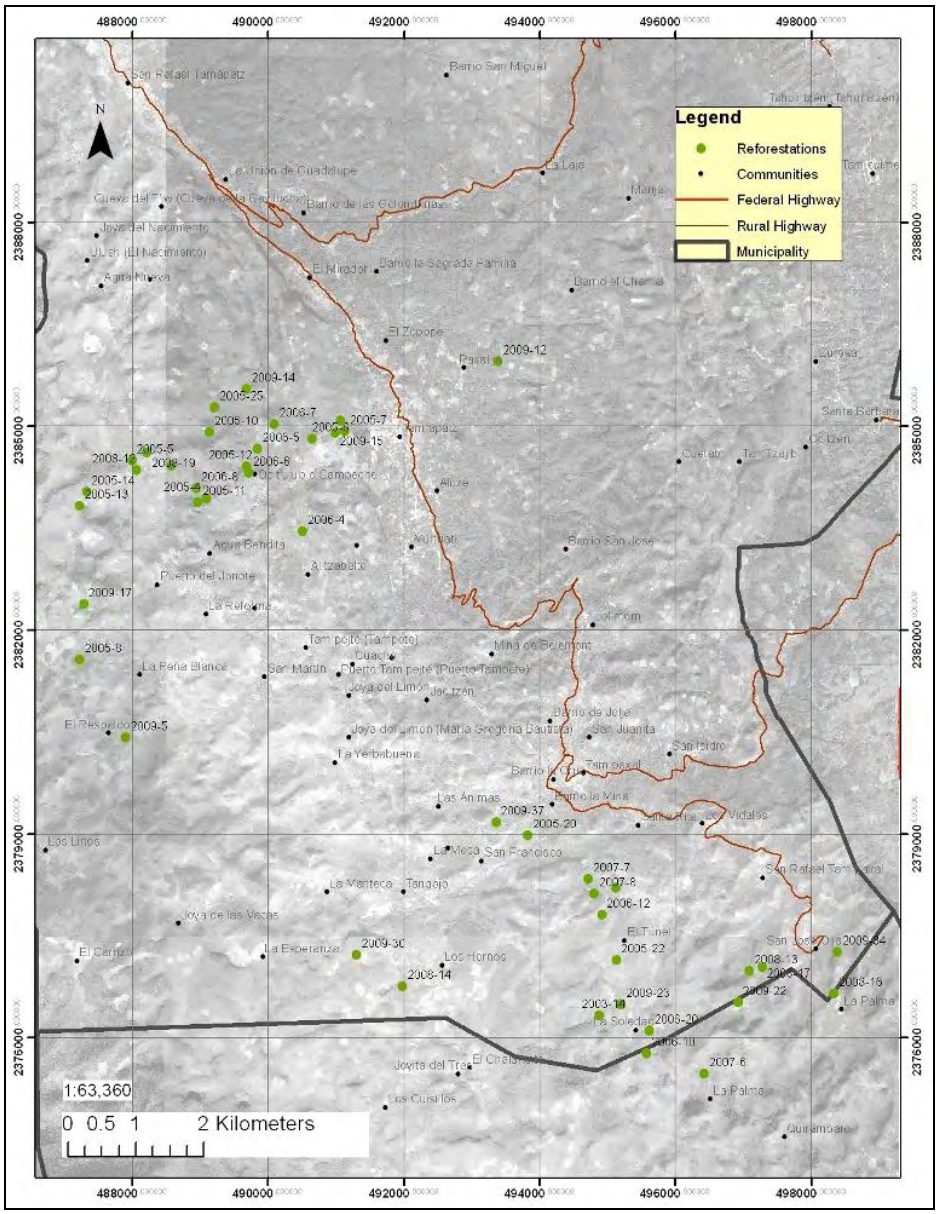


Figure 11: Locations of existing reforestations in the municipality of Aquismón



A.5. Technical description of the small-scale A/R CDM project activity:

A.5.1. Type(s) of small-scale A/R CDM project activity:

>> "Grassland to forested land" and "cropland to forested land"

A.5.2. A concise description of present environmental conditions of the area, which include information on climate, soils, main watershed, ecosystems, and the possible presence of rare or endangered species and their habitats:

>>

Zone 1: Sierra Gorda Biosphere Reserve

The SGBR is an area of immense variability in elevation, climate, soils and ecosystems.

Elevation: Elevations in the region vary from 300 meters above sea level (masl) to 3,100 masl. Most of the plantings are occurring between 1,500 and 2,500 masl.

Climate: Annual rainfall depends dramatically on elevation, aspect and location. In the region, rainfall is from 300 mm to 2,000 mm. In the planting area, the rainfall averages about 1,000 mm per year.

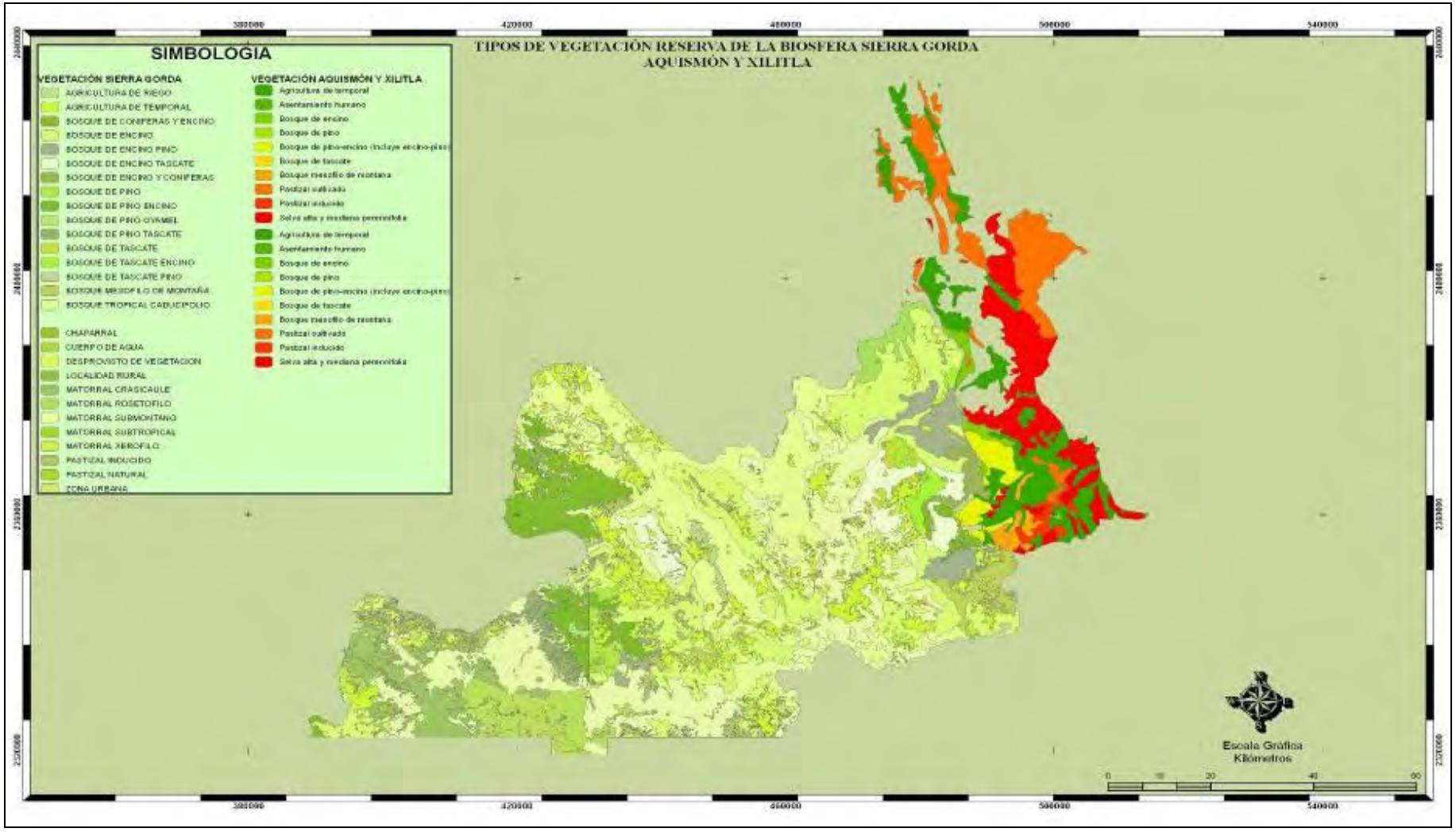
Soils: In Arroyo Seco, Jalpan de Serra and Pinal de Amoles, the soils are predominately cambisols and calcic cambisols. The cambisols support pine and oak forests. The calcic cambisols are reddish brown color to grayish brown of argillaceous texture with high calcium content and moderate levels of potassium and magnesium. These soils support mostly deciduous forests. The soils are formed mainly of fluvial and marine sediments from the carbonate platform and reefs of Jurassic to Cretaceous Ages, igneous Tertiary intrusives and extrusives and Quaternary continental sediments[1].

The soils in Landa de Matamoros are predominately feozems, luvisols, and vertisols. There are soils with a thin cover of humus which lie on limestone sediments. There are also argillaceous soils of red color that include dark, rich brown or reddish organic and nutrient rich layers that are associated with loosely cemented caliches. Finally there are soils which include lumps and accumulations of clay, calcium carbonate or iron[2].

Hydrography: The geologic structure of the Sierra Gorda is uplifted Mesozoic marine sediments. There are areas in which karst is very well developed with little surface water. The municipality of Pinal Amoles is crossed in the south by the Extoraz River and closer to the center by the Escanela River, which flows into the Jalpan River. In the municipality of Jalpan de Serra, the Jalpan River flows through the Jalpan Reservoir, a Ramsar site, before continuing on to the municipality of Arroyo Seco, where it joins the Santa María River. The Santa María flows along much of the northern border of the municipality of Jalpan, where it also forms the border between the state of Querétaro and the state of San Luis Potosí. The principal streams of Arroyo Seco are the Santa María, Ayutla and Jalpan rivers. The principal river of Landa de Matamoros is the Moctezuma, which flows along the eastern side of the municipality forming the boundary with the neighboring state of Hidalgo.

Ecosystems: As with the climate and soils, the ecosystems in the Sierra Gorda are very diverse. At higher, cooler altitudes with higher rainfall, the ecosystems are dominated by pine, pine-oak and oak forests. These are the elevations where the majority of the plantings occur. At lower, hotter and drier elevations the oak forests grade into deciduous and tropical deciduous forests. See Figure 12 for details.

Figure 12: Vegetation Map[3 1]



[1] Field observations indicate that the amount of surviving tropical forests shown here is exaggerated.

Endangered species: The Sierra Gorda is home to numerous species that are endangered or at risk of extinction. The decree that established the SGBR also established "zonas nucleo." These are the core protected areas of the SGBR that include many of these species. All plantings are outside these areas.

Flora at risk of extinction include: Giant Biznaga (*Echinocactus grandis*), Chapote (*Diospyros riojae*), Peyote (*Lophophora diffusa*), Magnolia (*Magnolia dealbata*) and Guatemalan Fir (*Abies guatemalensis*). Flora on the endangered list include: Magnolia (*Magnolia schiedeana*), Mexican Cycad (*Dioon edule*), Yew (*Taxus globosa*), Mexican Cypress (*Cupressus lusitanica*), Red Cedar (*Cedrela dugesii*), Palo Escrito (*Dalbergia paloescrito*) and Douglas Fir (*Pseudotsuga menziesii*)[4].

Fauna at risk of extinction include: Jaguar (*Panthera onca*), Humboldt Butterfly (*Eucheira socialis*), Black Bear (*Ursus americanus*), Military Macaw (*Ara militaris*) and Bearded Wood-Partridge (*Dendrortyx barbatus*). Fauna on the endangered list include: Otter (*Lutra longicaudis*), Porcupine (*Coendu mexicanus*), Emerald Toucanet (*Aulacorynchus prasinus*), Ocelot (*Felis pardalis*) and Kinkaju (*Potos flavus*)

Zone 2: San Luis Potosí

Municipality of Xilitla

Orography: The municipality is located on the slopes of the Eastern Sierra Madre, reaching heights of 2,680 meters above sea level in the western part of the zone; the orographic folding slowly reduces the elevation to the east.

Hydrography: The most important surface stream is the Tancuilín River, located to the southeast, which defines the limit with the neighboring municipalities of Matlapa and Tamazunchale. This river originates in the state of Hidalgo and flows into the municipality of Axtla de Terrazas. The Huichihuayan also flows from Huehuetlan to Axtla de Terrazas in northeastern Xilitla. Aside from these two major streams, the rest of the municipality is drained by intermittent streams that form in the mountains during the rainy season.

Climate: The climate of Xilitla varies from south to north. The southern part of the municipality bordering the state of Querétaro is semi-hot and humid. In the center it is semi-hot and humid with rain throughout the year and to the north, temperate, and humid. Annual precipitation is 2,075.3 millimeters and the mean annual temperature is 22ºC, with a maximum of 39ºC and a minimum of 3ºC.

Principal Ecosystems

Flora: Originally the ecosystems were distributed in the following manner: to the south and east were large sections of tropical rainforest; in the center and to the north tropical sub-deciduous forest predominated; and to the west, gaining altitude with the Sierra, the vegetation types with greatest surface area were temperate forest with oaks and conifers, and cloud forest in the wettest areas. Today, however, as a result of deeply rooted slash-and-burn practices for the

establishment of crops by the Huasteca population of the zone, the forest richness of the area has been decimated, resulting in a mosaic of small remnants of the original vegetation besieged among crops of corn and *mizcahuales* (areas with natural regeneration) that are systematically cleared every two to three years, which prevents the regeneration of the original forests. The growth of the population and the consequent demand for new lands for agriculture constantly increases the pressure on local ecosystems.

Fauna: Although local fauna has suffered from extensive deforestation and habitat loss, there are still species such as Emerald Toucanets *(Aulacorhynchus prasinus),* Green Parakeets *(Aratinga holochlora),* Green Jays *(Cyanocorax yncas),* Elegant and Mountain Trogons *(Trogon elegans* and *T. mexicanus),* Squirrel Cuckoos *(Piaya cayana),* Roadside Hawks *(Buteo magnirostris),* Collared Forest-Falcons *(Micrastur semitorquatus),* euphonias *(Euphonia elegantissima, E. affinis, E. hirundinacea),* woodcreepers *(Lepidocolpates affinis, Sittasomus grisecapillus),* and mammals such as Coatimundis *(Nasua narica),* Raccoons *(Procyon lotor),* Ringtails *(Bassariscus astutus),* Opossums *(Didelphis virginianus),* Brocket and White-tailed deer *(Mazama americana, Odocoileus virginianus),* Margays *(Leopardus wiedii),* Ocelots *(Leopardus pardalis),* Armadillos *(Dasypus novemcinctus),* Squirrels *(Sciurus aureogaster),* Kinkajous *(Potos flavus),* Porcupines *(Coendu mexicanus)* and Pacas *(Agouti paca)* among others.

The municipality has a forest reserve that was designated in 1923 with a surface area of 29,885 ha. Due to an outdated decree, however, the reserve is not actively managed as a protected area and has suffered extensive deforestation.

Soils: Limestone inserted with shales from the early and late Cretaceous period predominate. In the north, there are shales with insertions of sandstone from the Eocene period of the early Tertiary. In the central area, the soils are rendzina and litosol; to the north and west the soils are formed from luvisol and litosol. The soil is appropriate for agriculture, forestry and livestock uses.

Municipality of Aquismón

Orography: The majority of this municipality is within the Eastern Sierra Madre. The mountainous region is in a northeast-southeast direction, including the center and all the western portion of the municipality. The coastal plain zone is located to the north and northeast of the municipal seat.

Hydrography: The Gallina and Santa María rivers are located in the municipality. They form the Tampaón River, which is the most important river of the zone. Another important stream is the Coy River, which originates in the Eastern Sierra Madre. Thanks to its karst topography, the Sierra is an extraordinarily effective zone for the recharge of aquifers, providing water to a large number of communities and enabling productive activities. A good part of this recharge and hydrologic production originates in the neighboring SGBR in the state of Querétaro, as the SGBR includes the high part of the Sierra and still has an extensive forest surface area.

Climate: The average annual temperature is 24.7ºC, with an absolute maximum of 44.0ºC and a minimum of 7.0ºC. Hot temperatures dominate from April through September and the cool period is from October through March. The rainy season is from March to November. The dry season is from January to March, and annual precipitation is 1,975.3 mm.

Principal Ecosystems

Flora: The predominant vegetation is tropical sub-deciduous forest. Other vegetation types include oak and pine forests, cloud forests, tropical rain forests and induced grasslands.

Fauna: Although local fauna has suffered from deforestation and habitat loss, there are still species such as Emerald Toucanets *(Aulacorhynchus prasinus),* Green Parakeets *(Aratinga holochlora),* Green Jays *(Cyanocorax yncas),* Elegant and Mountain Trogons *(Trogon elegans* and *T. mexicanus),* Squirrel Cuckoos *(Piaya cayana),* Roadside Hawks *(Buteo magnirostris),* Collared Forest-Falcons *(Micrastur semitorquatus),* euphonias *(Euphonia elegantissima, E. affinis, E. hirundinacea),* woodcreepers *(Lepidocolpates affinis, Sittasomus grisecapillus),* and mammals as Coatimundis *(Nasua narica),* Raccoons *(Procyon lotor),* Ringtails *(Bassariscus astutus),* Opossums *(Didelphis virginianus),* Brocket and White-Tailed Deer *(Mazama americana, Odocoileus virginianus),* Margays *(Leopardus wiedii),* Ocelots *(Leopardus pardalis),* Armadillos *(Dasypus novemcinctus),* Squirrels *(Sciurus aureogaster),* Kinkajous *(Potos flavus),* Porcupines *(Coendu mexicanus)* and Pacas *(Agouti paca)* among others.

Soils: The type of soils that predominate are of variable thickness and moderately stable permeability, with a high content of red and brown-red clays, rich in quartz and oxides, appropriate for fruit cultivation.

Please see Annex 6 for additional information about the biodiversity resources of the area.

A.5.3. Species and varieties selected:

>>
Pinus patula
Pinus gregii
Cupressus lindleyi

All species selected are indigenous to the zones.

A.5.4. Technology to be employed by the proposed small-scale A/R CDM project activity:

>> The methods of establishing and managing the reforestations are based on the field experience of Bosque Sustentable field staff. The techniques used have been developed through discussion and cooperation with landholders, the necessities of institutional management and field operations.

The local variables that are considered during the selection of species and establishment techniques are based on the geographic location, altitude, topography, use of the ground, type of ground, pH, fertility, etc. As well, biological variables such as the existing dominant vegetation and fauna and likelihood of diseases and pests are considered.

Site preparation
Site preparation depends on the slope of the land and the economic resources of the landholder. The main purpose is to improve the likelihood of survival by improving water retention, and nutrient absorption.

On lands with less than 25% slope, if the soil is compacted it may be loosened by furrowing. On lands with slopes greater than 25% the soil preparation is done by hand. Site preparation is done from June through September so that the seedlings can get full use of the June, July and September rains.

Seedlings are raised at local government-run nurseries (CONAFOR). At planting, the seedlings are transported in individual plastic bags (8 cm x 18 cm). The seedlings are planted in individual holes that are approximately 30 cm wide and 30 cm deep. The spacing of the seedlings is typically 3 m x 3 m (1,100 seedlings per hectare) but may vary. Planting occurs from June through September. Fertilizers are not used.

Reforestation maintenance
Weeding is extremely important during the first three years of reforestation establishment. Weeding is performed by the landholders using grub hoes, machetes or other tools.

The survival of the seedlings is checked after one year and poor or dead seedlings are replanted. The management plan accommodates replanting of up to 200 trees per hectare.

Landholders are instructed on pruning of their reforestations. Generally pruning is done to improve the form of the tree and improve light penetration and air circulation in the reforestation. Pruning of secondary branches occurs up to the fifth year. Thinning of the reforestations will be conducted when possible to reduce competition and improve the growth conditions for the remaining trees. Such thinning will be carried out in accordance with approved management programs. When thinning is utilized, approximately 465 trees per hectare will remain after the final thinning to ensure meeting carbon capture goals. The crown cover of the remaining trees is expected to be 100%.

Management Programs
In Zone 1, a regional forest management program for the reforestations is being developed by Bosque Sustentable in coordination with the Forestry Department of the Querétaro Ministry of Agriculture Development (SEDEA) and will be approved by the federal Ministry of Environment and Natural Resources (SEMARNAT). In Zone 2, forest management programs for the reforestations are being developed for the participating communities by Bosque Sustentable and will also be approved by SEMARNAT. These management programs will include management techniques to improve the growth and development of the reforestations.

A.5.5. Transfer of technology/know-how, if applicable:

>> The participating landholders, who have minimal silvicultural experience, are trained in how to establish and manage reforestations.

A.5.6. Proposed measures to be implemented to minimize potential leakage as applicable:

>> Prior to reforestation establishment, the lands are either under temporary subsistence agriculture or grazing. Measures to minimize leakage include landholder payments, which allow the landholders to replace some subsistence agriculture with bought goods. Also, in most cases, the reforestation is established on only a part of the participant's land, thus maintaining other land to meet subsistence needs. When displacement of cultivation activity occurs, it involves utilizing another cultivated parcel more intensively or utilizing other areas that have recently been used for crop cultivation. Similarly the livestock that may be on the land prior to the reforestation are sometimes sold or slaughtered. When displacement does occur, the cattle may be moved to another nearby pasture or, more commonly, simply excluded from the fenced reforestation area, while continuing to graze on already degraded adjacent areas. In both cases, displacement does not result in deforestation.

A.6. A description of legal title to the land, current land tenure and land use and rights to tCERs / lCERs issued:

>> All lands must have clear legal title or a certificate of legitimate land possession issued by the municipality (documented in Paragraph II.D of contracts) in order to be included in the project. Rights to the emissions offsets are transferred from the landowners and landholders to the project operator via contracts that are signed subsequent to the receipt of corresponding donations from the users of the emissions offsets. (See model contract in Annex 4.)

A.7. Assessment of the eligibility of land:

>> Following "Procedures to Demonstrate the Eligibility of Lands for Afforestation and Reforestation CDM Project Activities (Version 01)"[5]

Step 1(a)

For the purposes of the Kyoto Protocol, Mexico has defined "forest" as an area with:

- 30% canopy cover;
- 4 m potential tree height; and
- 1.0 hectares area

At planting the sites were / are:

i) not covered by young natural stands or reforestations which have the potential to reach — without direct human intervention — the thresholds adopted for definition of forest by the host country;

ii) not temporarily unstocked, for a period consistent with common forest practices in the host country, as a result of either direct human intervention such as harvesting or indirect natural causes such as fire or insect damage.

iii) not expected to exceed—without human intervention— the thresholds adopted by the host country for definition of forest due to environmental conditions, anthropogenic pressures, or lack of available seed sources prevent significant encroachment or regeneration of natural woody vegetation.

Step 1 (b)

To be eligible as a CDM AR activity it must be demonstrated that the lands were not forest on December 31, 1989.

These steps can be demonstrated using:

(a) Remote sensing images (such as LANDSAT);
(b) Land use or land cover maps;
(c) Cadastre records; and/or
(d) Interviews with landowners.

The project proponent has elected to use a combination of remote sensing images and interviews with landholders to confirm the eligibility of the lands in this project activity. The Reforestation Documentation section of B.8 describes this assessment process in more detail. The project proponent has prepared Assessment of Land Condition/Suitability Sheets for each land parcel included within the project area.

Although CDM requires that lands be converted to "forest" as defined by the host country in order to qualify as a reforestation project, this is a program requirement of CDM that is not specifically listed in the selected methodology and therefore is not required under CCB or VCS. The project proponent utilizes a minimum reforestation size of .5 hectare in order to include participants in conditions of extreme poverty.

A.8. Approach for addressing non-permanence:

>> Non-permanence due to unplanned loss is controlled through the use of a buffer. Please see the AFOLU Non-Permanence Risk Analysis and Buffer Determination in Annex 7.

The project utilizes a number of strategies to guard against loss:

1. 20% of the tCO_2e projected to be sequestered from each reforestation is withheld from sale as part of a project self-insurance buffer. This buffer will be used to compensate for any unplanned loss, as well as insufficient carbon capture in any reforestation.
2. The project utilizes reforestations that are seldom contiguous and that are located in different parts of the SGBR and its area of influence. As a result, forest fires, tree diseases and pests and local extreme weather events such as hurricanes are unlikely to affect a significant proportion of the project area.
3. To demonstrate long-term ownership of land, participants must hold title to the land on which the reforestations are located, obtain certificates of legitimate possession issued by the corresponding municipality or, in the case of community-owned lands, obtain official authorization from the community's governing entity.
4. Participants must enter into long-term (30-year) contracts committing to management of their reforestations for carbon sequestration. Payments are scheduled at regular intervals

throughout the 30-year project and are contingent upon participants complying with management activities.

5. Contracts with participants specifically list vigilance of reforestations as one of the required management activities on the part of the participants and include requirements for replanting in the case of unexpected tree loss. The organizations of the Sierra Gorda Consortium operate long-term successful programs of enforcement of environmental laws and regulations as well as environmental education with substantial community involvement that have resulted in a substantial reduction of illegal logging in the area.
6. In order to achieve the goal for carbon capture and ensure its permanence, thinning will only be permitted consistent with management programs developed by Bosque Sustentable and approved by the corresponding authority, for the benefit of the health of the forest and existing biodiversity.

A.9. Duration of the proposed small-scale A/R CDM project activity / Crediting period:

>> From January 1st 1997 to December 31st 2042 - 46 years

A.9.1. Starting date of the proposed small-scale A/R CDM project activity and of the (first) crediting period, including a justification:

>> January 1st 1997

CDM projects are eligible from January 1st 2000 only. This programmatic requirement does not apply to CCB or VCS.

A.9.2. Expected operational lifetime of the proposed small-scale A/R CDM project activity:

>> 46 years

A.9.3. Choice of crediting period and related information:

>> Please select one of the following:

1. Renewable crediting period ☐
2. Fixed Crediting period X

A.9.3.1. Duration of the first crediting period (in years and months), if a renewable crediting period is selected:

>> Not selected

A.9.3.2. Duration of the fixed crediting period (in years and months), if selected:

>> 46 years

A.10. Estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period:

>>

Years	Annual estimation of net anthropogenic GHG removals by sinks in tonnes of CO_2 e
1997	0
1998	7
1999	43
2000	130
2001	275
2002	459
2003	629
2004	794
2005	996
2006	1,241
2007	1,481
2008	1,679
2009	1,837
2010	1,973
2011	2,144
2012	2,457
2013	2,883
2014	3,376
2015	3,842
2016	4,132
2017	4,270
2018	4,307
2019	4,276
2020	4,197
2021	4,085
2022	3,951
2023	3,802
2024	3,644
2025	3,480
2026	3,313
2027	3,147
2028	2,983
2029	2,823
2030	2,667
2031	2,516
2032	2,370
2033	2,231
2034	2,098
2035	1,970
2036	1,850
2037	1,735
2038	1,627
2039	997
2040	723
2041	466
2042	226
Total estimated net anthropogenic GHG removals by sinks (tonnes of CO_2 e)	**100,134**
Total number of crediting years	**46**
Annual average over the crediting period of estimated net anthropogenic GHG removals by sinks (tonnes of CO_2e)	**2,177**

A.11. Public funding of the proposed small-scale A/R CDM project activity:

>>For reforestations from 1997-2013, public funding from Mexican government sources is estimated at U.S. $192,440 for an annual average of U.S. $4,183 over the 46-year lifetime of the project activity.[2] The project activity was a component of the project of "Biodiversity Conservation in the Sierra Gorda Biosphere Reserve," financed by the Global Environment Facility, which financed some activities of design, implementation, promotion and dissemination of the project activity from 2001-2008.

A.12. Confirmation that the small-scale A/R CDM project activity is not a debundled component of a larger project activity:

>> The project activity is not a debundled component of a larger project activity. There are no other small-scale AR/CDM projects in the Sierra Gorda.

Note: Small-scale CDM projects are limited to 16,000 t CO_2e/year. As well, small-scale CDM projects must be 1 km apart, or have different project participants, or be registered 2 or more years apart.

SECTION B. Application of a baseline and monitoring methodology:

B.1. Title and reference of the approved baseline and monitoring methodology applied to the proposed small-scale A/R CDM project activity:

>> Simplified baseline and monitoring methodology for small-scale A/R CDM project activities implemented on grasslands or croplands with limited displacement of pre-project activities AR-AMS0001 / Version 06

B. 2. Justification of the applicability of the baseline and monitoring methodology to the proposed small-scale A/R CDM project activity:

>>For the methodology to be applicable the following conditions are required:

(a) Project activities are implemented on grasslands or croplands;
(b) Project activities are implemented on lands where the area of the cropland within the project boundary displaced due to the project activity is less than 50 per cent of the total project area**, or where it can be shown that loss of crop land will not cause deforestation.**
(c) Project activities are implemented on lands where the number of displaced grazing animals is less than 50 per cent of the average grazing capacity of the project area**, or where it can be shown that loss of grazing will not cause deforestation.**
(d) Project activities are implemented on lands where ≤ 10% of the total surface project area is disturbed as result of soil preparation for planting.

[2] This estimate utilizes 2009 costs. Exchange rates from December 31 of each year are applied for 1997-2010 reforestations; the exchange rate of December 31, 2010 is assumed for reforestations that will be established from 2011-2013.

The highlighted sections of conditions (b) and (c) indicate a modification of those conditions by the project proponent. This methodology deviation does not impact negatively on the conservativeness of the VCS Program approved methodology's criteria and procedures to quantify data leading to GHG emission reductions or removals and is therefore permitted under Section 5.3 of VCS 2007.1.

Eligibility conditions (b) and (c) were confirmed as part of a leakage survey of landowners and landholders that are participating in the project. Through April 2011, landowners and landholders of 75.4 hectares had completed the leakage survey, and all confirmed that the loss of cropland and grazing land did not cause deforestation.

Eligibility condition (d) can be estimated from the planting practices. In hand-dug planting, 1,100 30 cm diameter holes have a surface area of 77.8 m^2. This is approximately 0.8% of the total surface project area. If a plough is used, a 30 cm furrow every 3 m is 10% of the surface area.

B.3. Specification of the greenhouse gases (GHG) whose emissions will be part of the proposed small-scale A/R CDM project activity:

>>CO_2

B.4. Carbon pools selected:

Carbon pools	Selected (answer with yes or no)
Living biomass: Above ground woody	Yes
Living biomass: Above ground non-woody	No. This pool is not considered part of the SSC A/R methodology
Living biomass: Below-ground	Yes
Dead organic matter: Litter	No. This pool is not considered part of the SSC A/R methodology
Dead organic matter: Dead wood	No. This pool is not considered part of the SSC A/R methodology
Dead organic matter: Soil	No. This pool is not considered part of the SSC A/R methodology
Dead organic matter: Wood products	No. This pool is not considered part of the SSC A/R methodology

B.5. Description of strata applied for ex ante estimations:

>>

Ex-ante baseline stratification

Following the methodology, the project area should be stratified for purpose of the baseline calculation into:

(a) Area of cropland with changes in the carbon stocks in the living biomass pool of woody perennials and in below-ground biomass of grasslands expected not to exceed 10% of ex-ante actual net GHG removals by sinks multiplied by share of the area in the entire project area;
(b) Area of grassland with changes in the carbon stocks in the living biomass pool of woody perennials and in below-ground biomass of grasslands expected not to exceed 10% of ex-ante actual net GHG removals by sinks multiplied by share of the area in the entire project area;
(c) Area of cropland with changes in the carbon stocks in the living biomass pool of woody perennials and in below-ground biomass of grasslands expected to exceed 10% of ex-ante actual net GHG removals by sinks multiplied by share of the area in the entire project area;
(d) Area of grassland with changes in the carbon stocks in the living biomass pool of woody perennials and in below-ground biomass of grasslands expected to exceed 10% of ex-ante actual net GHG removals by sinks multiplied by share of the area in the entire project area.

All previous plantings were on lands with little to no woody perennials – and no significant growth or regeneration of woody perennials is likely to occur in future. Future plantings will also be on lands with little to no woody perennials. Therefore, strata (c) and (d) do not occur.

As well, all previous plantings are on lands with above and below-ground biomass in grasses with less than 10% of the ex-ante actual net GHG removals by sinks. Future plantings will also be on similar lands. Therefore, a single stratum for the baseline is assumed.

Ex-ante project stratification

A single stratum with the average expected growth based on measured carbon stocks will be assumed for each planting year from 1997 to 2013. Therefore there will be 17 ex-ante project strata. *Corresponds to paragraphs 15-16 of methodology*

B.6. Application of baseline methodology to the proposed <u>small-scale A/R CDM project activity</u>:

>> All plantings were undertaken and will be undertaken on cropland or grassland with little or no woody perennials.

Insignificance of change in carbon stocks of pre-existing woody vegetation

To determine whether the change in carbon stocks in pre-existing trees and shrubs that would have occurred in the absence of the project may be considered insignificant, the project proponent elected to use "Annex 16 Guidance on Conditions under Which the Change in Carbon Stocks in Existing Live Woody Vegetation Are Insignificant (Version 01)," which is available for use in conjunction with A/R CDM methodologies. This guidance document states that the change in carbon stocks of existing woody vegetation sinks may be accounted as zero for an area of land within the project boundary, if for that area at least one of the conditions (i) to (vi) is met. The project proponent has chosen to demonstrate that both conditions (ii) and (vi) are met.

First, utilizing image analysis, the project proponent prepared Assessment of Land Condition/Suitability Sheets[3] that document whether the change in carbon stocks of existing woody vegetation sinks on the sites may be accounted as zero because the following condition applies:

> *(ii) The average stocking (or crown cover) of existing trees or shrubs within the area is less than 2% or 10%, respectively, of the final stocking (or crown cover) of trees in the forest to be established by the A/R project activity.*

For the purpose of assessing this condition, the final stocking and crown cover of trees in the forests to be established was assumed to be 465 trees and 100% crown cover, which are the stocking and crown cover expected after 30 years.

The image analysis indicated that condition (ii) is met for all reforestation sites in the project area and, therefore, the change in carbon stocks of pre-existing woody vegetation sinks on the reforestation sites may be accounted as zero.

To provide additional evidence of the insignificance of change in carbon stocks of pre-existing woody vegetation for the reforestations, the project proponent also confirmed that the change in carbon stocks of pre-existing woody vegetation sinks may be accounted as zero because the areas within the project boundary meet condition (vi) of the Guidance:

> *(vi) Fire due to natural or anthropogenic causes, including due to slash-and-burn activities, is a common occurrence in the region the project is located in, and has occurred at least once in the area in the 10 years prior to project commencement—and the existing woody vegetation does not comprise a fire-adapted ecosystem.*

According to the Guidance, the following meets the minimum set of evidence required:

> *(f) For condition (vi): if fire due to anthropogenic causes is considered to be a common occurrence—provide documented evidence that demonstrates land clearance or other anthropogenic activities involving fire are:*
>
> *—routinely practiced (at least once every 10 years) in the area*

The Guidance states that this condition may be assessed at the project, parcel, or individual stratum level, as applicable, depending on the extent of the area involved. Due to the dispersed nature of the project area and its division into two zones with different management and cultural characteristics, the project proponent elected to assess this condition at the project level for each of the two zones:

[3] On the Land Condition/Suitability sheets, the statement that the parcel has minimal carbon refers to this condition being met.

Zone 1
In the SGBR, fire due to anthropogenic causes was a common occurrence in the region prior to project commencement, as documented in the SGBR Management Program[6]. Fires in this zone, with very rare exceptions, were and continue to be human-induced and thus artificial and out-of-place. The pre-existing woody vegetation on the reforestation sites, therefore, does not comprise fire-adapted ecosystems.

Documented evidence of the previous routine use of human-induced fire on agricultural and grazing lands in this zone is provided by the SGBR Management Program and also by interviews with long-time residents of the Sierra Gorda, who confirmed more specifically that the areas within the SGBR that include the reforestations were among those that suffered from routine use of fire at least every 10 years[4]. Evidence that this practice would still be occurring on the reforestation sites without the implementation of the project was provided by the photographing of fire being used on land near one of the reforestations during the CCB/VCS validation site visit.

The use of fire to maintain lands clear of unwanted vegetation for cultivation or grazing purposes was a routine practice prior to the implementation of the reforestation project. Although such use of fire has declined significantly in the SGBR since the implementation of the project, this photo, taken on land adjacent to one of the reforestations of Zone 1 during the CCB-VCS validation site visit in March 2011, is evidence that such a practice would still be taking place on reforestation parcels in the absence of the project.

[4] Interview with Roberto Pedraza Muñoz, legal representative of the Grupo Ecológico Sierra Gorda and a native of the municipality of Pinal de Amoles, March 25, 2011. Interview with Martha Isabel Ruiz Corzo, General Director of the Grupo Ecológico Sierra Gorda and resident of the municipality of Pinal de Amoles since 1984, March 25, 2011. Signed statement by C. Agustín Herrera Altamirano, a longtime resident of the municipality who is not part of the project, April 18, 2011.

Zone 2
In this Zone, the use of cyclic slash-and-burn activities is a widespread common practice that continues to date. As in Zone 1, fires in this zone, with very rare exceptions, are human-induced and thus artificial and out-of-place. The pre-existing woody vegetation on the reforestation sites, therefore, does not comprise fire-adapted ecosystems.

The routine use of this practice in this zone is widely documented[5], and the project proponent confirmed that these practices were previously carried out on the reforestation sites[6]. Additional evidence was also provided by interviews with landowners carried out during the site visit of CCB/VCS auditors to this zone.

Cyclic slash-and-burn is commonly used in the municipalities of Xilitla and Aquismón, the location of Zone 2 of the project. This photo is from the municipality of Xilitla, taken in April 2011.

[5] This practice is widely documented. For examples of references to this practice, see www.campopotosino.gob.mx/modulos/tecnologiasdesc.php?idt=108 and www.campopotosino.gob.mx/modulos/tecnologiasdesc.php?idt=109

[6] This confirmation is logged in the file containing the responses to the leakage survey.

In conclusion, the project proponent has exceeded the requirements of the guidance document by demonstrating that two of the conditions are met. There will be an insignificant increase in biomass on pre-existing trees and bushes with respect to the growth of the reforestations and this increase can be ignored, and for these strata the baseline removals are assumed to be zero.

Insignificance of change in carbon stocks of existing grasslands

As well, if the lands were grasslands, following AR-AMS001, the baseline below ground biomass in grasslands is considered insignificant if it is less than 10% of the total removals from the project. A typical reforestation is estimated to remove 369 t CO_2e/ha over 46 years. The net primary production of grasslands in the Sierra Madre Oriental was not available using a literature search. Using default values from IPCC (2003)[7] the standing biomass for tropical grasslands = 6.2 t d.m. /ha. The root-shoot ratio = 1.58. Therefore the below ground biomass in grasslands is estimated at 9.8 t d.m. /ha. The loss of this biomass would release 18.0 t CO_2e/ha. This amount is 4.9% of the total estimated project removals and is considered not significant.

Ensuring that pre-existing trees are not counted during future monitoring

To ensure that in the future, the pre-existing trees are not confused with planted trees, their GPS coordinates will be taken and the trees will be marked on their bark. Finally, the pre-existing trees will be located on the polygon of the corresponding reforestations in order to have a map of their spatial distribution. During monitoring, pre-existing trees encountered within sampling sites will be noted on the field formats but will not be added into the carbon calculations.

New plantings

For new plantings, all selected sites will be evaluated to confirm that they comply with condition (ii) and/or (vi). There will be an insignificant increase in biomass on these trees with respect to the growth of the reforestation and this increase can be ignored. If a future planting were not to comply with condition (ii) and/or (vi), the project proponent must determine whether another condition applies that allows the change in carbon stocks of existing woody vegetation sinks on the sites to be accounted as zero. If none of the permitted conditions apply, then the project proponent will implement the following methodology to quantify baseline carbon stocks.

Steps of methodology
Step 1: The corners of the boundary of the planting or the coordinates for at least one point of reference within the parcel will be recorded using GPS units and plotted in a GIS system.

Step 2: A sample point per hectare for each planting will be selected at random within the boundary of the planting. At minimum one sample point for each planting will be selected. For example if the planting area is less than 1 hectare then one sample will be selected. If the planting area is 2.5 hectares in area, then two sample points will be selected.

Step 3: Proceed to each sample point. The permanent grid node will be marked using a buried metal nail, paint or other reliable marking method that allows the node to be located in subsequent monitoring exercises.

Step 4: Tag, measure and record the diameter at breast height (DBH) and height of all living trees within 20 m of the sample plot center. Record the species of each tree.

Step 5: Calculate the above ground biomass for each tree within the sample plot using allometric equation listed in Appendix C of the AR-AMS001 for broad leaf species in dry climates with annual rainfall of 900 - 1500 mm and DBH of < 40 cm

$$AGB = \exp\left(-1.996 + 2.32 * \ln(DBH)\right)$$

For coniferous trees, the following equation from AR-AMS001[7] is used.

$$AGB = \exp\left(-1.170 + 2.119 * \ln(DBH)\right)$$

Where DBH = diameter at breast height in centimeters.

Step 6: The average above ground biomass per hectare for each planting is calculated by summing the biomass of individual trees dividing the sum by the area sampled. The total biomass for each planting is estimated by multiplying the average above ground biomass per hectare for the planting by the area of the planting. All values are entered in the Table 1.

Table 1: Baseline above-ground biomass survey

Area (ha)	No. of Samples	Average Above-ground Woody Biomass (t/ha)	Total Biomass (t)
Total			

Step 7: Calculate the total baseline removals and emissions from the loss of baseline biomass

Above-ground biomass

Following AR-AMS001, the baseline biomass stocks are given by

$$B_{(t)} = \sum_i \left(B_{A(t),i} + B_{B(t),i}\right) * A_i \qquad (1)$$

Where:
$B_{(t)}$ = carbon stocks in the living biomass within the project boundary at time *t* in the absence of the project activity (t C)
$B_{A(t)\,i}$ = carbon stocks in above-ground biomass at time *t* of stratum *i* in the absence of the project activity (t C/ha)

[7] Non-published local information validates the use of the AR-AMS001 equations.

$B_{B(t)\,i}$ = carbon stocks in below-ground biomass at time *t* of stratum *i* in the absence of the project activity (t C/ha)
A_i = project area of stratum *i* (ha)
i = stratum *i* (*I* = total number of strata)

And

$$B_{A(t),i} = 0.5 * M_{(t),i} \quad (2)$$

Where:
$B_{A(t)}$ = carbon stocks in above-ground biomass at time *t* in the absence of the project activity (t C/ha)
$M_{(t)}$ = above-ground biomass at time *t* that would have occurred in the absence of the project activity (t d.m./ha)
0.5 = carbon fraction of dry matter (t C/t d.m.)

Below-ground biomass

$$B_{B(t=0),i} = 0.5 * (M_{grass,i} * R_{grass,i} + M_{woody\,(t=0),i} * R_{woody}) \quad (6)$$

Where:
$B_{B(t=0),i}$ = carbon stocks in below-ground biomass at time t that would have occurred in the absence of the project activity (t C/ha)
$M_{grass,i}$ = above-ground biomass in grass on grassland at time t that would have occurred in the absence of the project activity (t d.m./ha)
$M_{woody\,(t=0),i}$ = above-ground biomass of woody perennials at t=0 that would have occurred in the absence of the project activity (t d.m./ha)
R_{woody} = root to shoot ratio of woody perennials (t d.m./t d.m.)
R_{grass} = root to shoot ratio for grassland (t d.m./t d.m.)

As discussed previously, the grassland component is considered not significant.

B.7. Description of how the actual net GHG removals by sinks are increased above those that would have occurred in the absence of the registered small-scale A/R CDM project activity:

>> The steps outlined in the A/R Methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" (Version 01), but applying only the barrier analysis as per AR-AMS001, shall be followed to demonstrate that a proposed A/R CDM project activity is additional and not the baseline scenario. The steps to demonstrate the additionality are outlined below.

STEP 0: Preliminary screening based on the starting date of the project activity

1. The activity started in 1997.
2. The lands are eligible for an A/R CDM activity (see section A.7)
3. The proposed activity is the direct planting of indigenous species.

Evidence that the incentive from planned sale of CERs was seriously considered as part of the project activity is based on documents that were made publicly available or presented as part of the activities of Grupo Ecológico. These documents include the following:

a) The SGBR Management Program, published in 1999, which includes carbon capture as an activity.
b) "The Potential of Carbon Sequestering Projects in the Sierra Gorda Biosphere Reserve, East Central Mexico, Draft," D. Neil Bird and Roberto Pedraza Muñoz, December 1997.
c) "Preparación de una Propuesta para Implementación Conjunta de los Estados Unidos de la Reserva de la Biosfera Sierra Gorda", presentado por Woodrising Consulting Inc, Mayo 1997.
d) (Propuesta de) "Estudio para la Determinación de Emisiones de Carbono en la Reserva de la Biosfera Sierra" presentado por Woodrising Consulting Inc, Mayo 1997.

STEP 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity

The following alternatives to the project activity will be evaluated:

1. The land-use prior to the implementation of the project activity, either grasslands or croplands;
2. Natural regeneration;
3. Planting trees for commercial gain by landholders without the incentives from the carbon market (project activity); and
4. Planting trees for forest restoration or commercial gain by some other organization.

Sub-step 1b: Enforcement of applicable laws and regulations

All alternatives are not contrary to applicable laws and regulations

STEP 2: Barrier analysis

Sub-step 2a: Identification of barriers that would prevent the implementation of at least one alternative land use scenarios

AR-AMS001 identifies the following possible barriers

1. Investment barriers;
2. Institutional barriers,
3. Technological barriers;
4. Barriers related to local tradition;
5. Barriers due to prevailing practice;
6. Barriers due to local ecological conditions and
7. Barriers due to social conditions.

Sub-step 2b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed A/R CDM project activity already considered in step 3a).

1. The land-use prior to the implementation of the project activity, either grasslands or croplands has no barriers to implementation.

2. Natural regeneration cannot occur because ecological conditions such as degraded soils and occasional biotic pressure such as temporary subsistence agriculture or grazing cattle do not allow the lands to naturally regenerate. The land has been non-forest since 1990 due to these reasons.

3. Planting trees for commercial gain by landholders without incentives from the carbon market does not occur due to a combination of barriers, including a lack of financial resources and technology for establishing plantations and the lack of a profitable commercial market for wood, given local ecological and social conditions. Slow growth rates, remote difficult-to-access locations and distance from markets have proven timber harvesting from plantations in the project area to be non-feasible for generating commercial income; to date, neither the participating landholders nor the Sierra Gorda organizations have received any funding from commercial sales from the reforestations of this project activity.

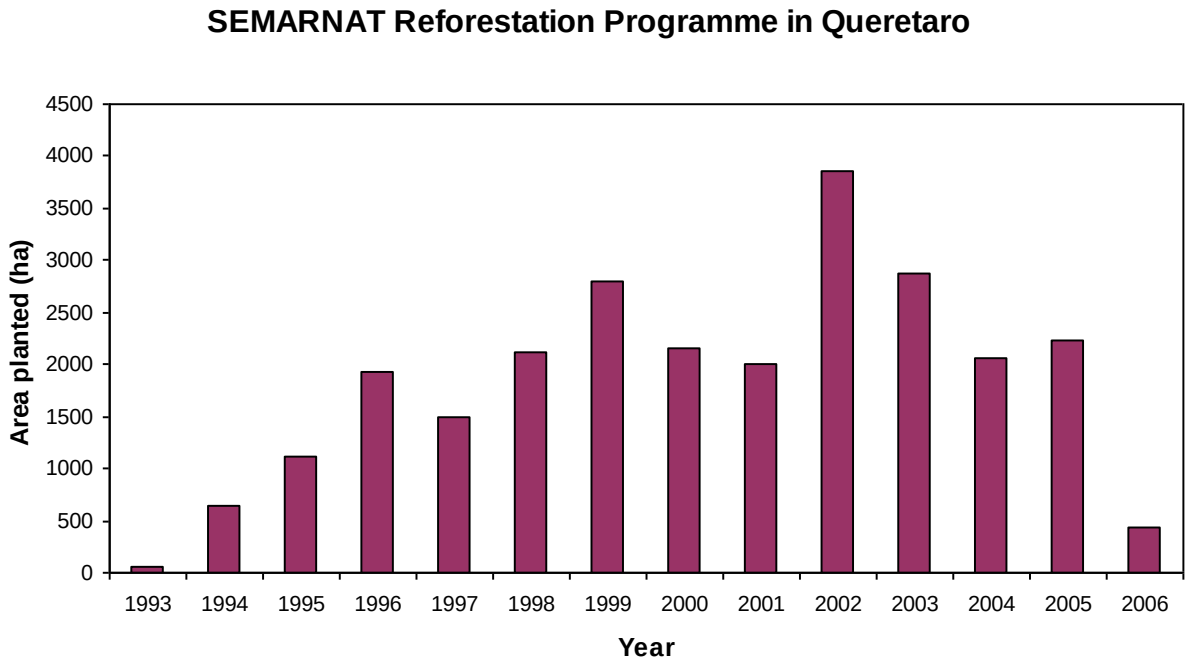
   Although the National Forestry Commission (CONAFOR) of the Ministry of Environment and Natural Resources (SEMARNAT) provides financial incentives for reforestation as part of a national reforestation program (See Figure 13 for its operation in the State of Querétaro.), the project activity by Grupo Ecológico and Bosque Sustentable, has been to support poorer landholders, primarily in remote rural areas with difficult access and limited communications, who would not otherwise establish reforestations. Bosque Sustentable and Grupo Ecológico achieve this by providing the landholders free of charge the technical assistance needed to enrol in the project activity, tree seedlings and fencing materials delivered to remote locations, and the training and technical advising necessary to successfully establish and manage the reforestations. Although the motivations of the landholders for establishing the reforestations are very personalized and varied, and may include the payment received for planting labor, expectation of personal use of small amounts of wood, small sales to neighbors and a personal conservation ethic, as well as the expectation of carbon offset money, without the free services provided by the Sierra Gorda organizations, the reforestations would not have been established.

   Corresponding with the start date of this project activity, the Grupo Ecológico has documentation dating back to 1997 of its intention to enter the carbon market.[8] Although Grupo Ecológico and Bosque Sustentable have obtained contributions from a variety of donors to help fund the project activity in the interim, it has been with the expectation of eventually accessing carbon funding.

[8] According to a May 1997 document presented by Woodrising Consulting, Inc., a project was prepared and presented to the United States Initiative on Joint Implementation in February 1997. In addition, "The Potential of Carbon Sequestering Projects in the Sierra Gorda Biosphere Reserve, East Central Mexico," was drafted in December 1997.

4. Planting trees for forest restoration or commercial gain by some other organization also faces the barriers discussed above.

Figure 13: SEMARNAT Reforestation Programme in Querétaro[8 9]



The barrier analysis is summarized in Table 2.

Table 2: Barrier Analysis Matrix

Alternative	Investment	Institutional	Technological	Local tradition	Prevailing practice	Local ecological conditions	Social conditions
Land-use prior to the implementation of the project activity, either grasslands or croplands							
Natural regeneration					X	X	X
Planting trees for commercial gain by landholders without the incentive from the carbon market (project activity)	X		X			X	X
Planting trees for forest restoration or commercial gain by some other organization	X	X			X		

Sub-step 2c: Elimination of land use scenarios that are prevented by the identified barriers
Alternatives 2, 3, and 4 are prevented by identified barriers and can be eliminated.

Sub-step 2d: Determination of baseline scenario (if allowed by the barrier analysis)
Only one alternative that is not prevented by an identified barrier remains – the land-use prior to the implementation of the project activity, either grasslands or croplands. It is the baseline.

STEP 3. Investment analysis
Not required in AR-AMS0001

STEP 4. Common practice analysis
Not required in AR-AMS0001

B.8. Application of monitoring methodology and monitoring plan to the small-scale A/R CDM project activity:

>>

Reforestation documentation

Description of sites: A detailed description of each planting site will be made. This will include:

- a unique identifier based on the year and a number assigned to each polygon as it is entered into the database;
- a record of land ownership, possession and operator;
- UTMx and UTMy coordinates for at least one point of reference within the parcel;
- the area, in hectares, of the reforestation;
- a description of land use at the time of planting;
- an estimate of land use in 1990 based upon the nearest year of available satellite images or aerial photos with adequate resolution;
- an estimate of land use between 1990 and the planting year based upon a review of satellite images or aerial photos from some other year between 1990 and the planting year;
- a map of the plot location within the GIS database showing roads and communities;
- assessment of whether condition (ii) of "Annex 16 Guidance on Conditions under Which the Change in Carbon Stocks in Existing Live Woody Vegetation Are Insignificant (Version 01)" applies; and
- leakage survey.

Planting information: At the time of planting, a record will be kept of species planted, number of plants, seedling source, year planted, and site preparation techniques.

Management and harvest records: Every management application will be recorded, with the exception of the landowner or operator's annual use of dead wood for personal fire wood.

The numbering of paragraphs and equations used in the following sections corresponds to that used in AR-AMS001.

A. *Ex post* estimation of the baseline net greenhouse gas removals by sinks

36. In accordance with decision 6/CMP.1, Appendix B, paragraph 6, no monitoring of the baseline is requested. Baseline net GHG removals by sinks for the monitoring methodology will be the same as using the simplified baseline methodology in Section II above.

B. *Ex post* estimation of the actual net greenhouse gas removals by sinks

The project involves large numbers of dispersed reforestations, sometimes in remote locations. Because of this, monitoring will take place over five-year periods. In each year, approximately 20% of the total required area will be sampled. The monitoring will follow the processes outlined in Márquez, 2000[10] or Pearson et al, 2005[11].

37-38. A preliminary inventory and previous monitoring results will be used to stratify the project area and create sample designs to estimate the project biomass stocks to a precision level that complies with AR-AMS001, as updated by the CDM.

39. Carbon stocks (expressed in t CO_2-e) shall be estimated through the following equations:

$$P_{(t)} = \sum_i \left(P_{A(t),i} + P_{B(t),i} \right) * A_i * 44/12 \qquad (24)$$

Where:
$P_{(t)}$ = carbon stocks within the project boundary at time *t* achieved by the project activity (t CO_2-e)
$P_{A(t)\ i}$ = carbon stocks in above-ground biomass at time *t* of stratum *i* achieved by the project activity during the monitoring interval (t C/ha)
$P_{B(t)\ i}$ = carbon stocks in below-ground biomass at time *t* of stratum *i* achieved by the project activity during the monitoring interval (t C/ha)
A_i = project activity area of stratum *i* (ha)
i = stratum *i* (*I* = total number of strata)

40. The following calculations shall be performed for each stratum:

Above-ground biomass

41. For above-ground biomass $P_{A(t)}\ i$ will be calculated per stratum *i* as follows:

$$P_{A(t)\ i} = E_{(t)\ i} * 0.5 \qquad (25)$$

Where:
$P_{A(t)\ i}$ = Carbon stocks in above-ground biomass at time t achieved by the project activity during the monitoring interval (t C/ha)
$E_{(t)\ i}$ = Estimate of above-ground biomass at time t achieved by the project activity (t d.m./ha)
0.5 = Carbon fraction of dry matter (t C/t d.m.)

42. Estimate of above-ground biomass at time *t* achieved by the project activity *E(t)* shall be estimated through the following steps:

Step 1: Data in the field will be collected using permanent sample plots. A grid will be placed randomly upon the reforestation area so that the number of nodes corresponds to the required

number of sampling sites. The size of each sampling site will be determined by the sample design. The locations of the permanent plots will be documented in the first monitoring report.

Step 2: The diameter of each tree within the sample plots will be recorded. For reforestations up to three years of age, diameters will be measured at the base, afterwards at breast height. This information will be documented in the monitoring reports.

Step 3: Carbon content will be measured using the default equation from AR-AMS001 or species-specific allometric equations. The choice of allometric equations will be documented along with their sources.

As allometric equations are expected to be used, paragraphs 43 - 44 are not necessary. In case of future need, however, they would be followed as described in the methodology. Similarly, paragraph 46 is used in place of paragraph 45, which in case of future need would be followed as described in the methodology.

Below-ground biomass

46. The carbon stocks in below-ground biomass will be calculated using the formula from AR-AMS001.

If stratification by species is not required,

$$P_{B(t)} = \exp(-1.085 + 0.9256 * \ln(E_t)) * 0.5 \quad (28)$$

And E_t is given on the previous page

47. Project emissions are considered insignificant and therefore:

$$t\ PROJ\ GHG\ , = 0 \quad (28a)$$

Where:
GHGPROJ, t = Project emissions (t CO_2-e/year)

C. *Ex post* estimation of leakage

The project will use the following guidelines and tools available for use in conjunction with A/R CDM methodologies:

- "Guidelines on conditions under which increase in GHG emissions attributable to displacement of pre-project crop cultivation activities in A/R CDM project activity is insignificant" (Version 01)
- "Guidelines on conditions under which increase in GHG emissions related to displacement of pre-project grazing activities in A/R CDM project activity is insignificant" (Version 01)

- "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities" (Version 01)
- A/R Methodological Tool: "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" (Version 01)

The project proponent will conduct a survey of landholders of existing reforestations and future reforestations to ascertain the amount of leakage attributable to the project. The survey will identify the:

(a) Percentage of area and total area within the project boundary subjected to pre-project crop cultivation activities that are displaced due to the project activity;
(b) Percentage of area and total area within the project boundary subjected to pre-project domestic grazing activities that are displaced due to the project activity.

Displacement of crop cultivation activities

Following "Guidelines on conditions under which increase in GHG emissions attributable to displacement of pre-project crop cultivation activities in A/R CDM project activity is insignificant" (Version 01)

4(a) The increase in GHG emissions due to displacement of pre-project crop cultivation activities attributable to the project activity will be considered insignificant if the total area subjected to pre-project crop cultivation activities displaced is less than 5% of the area of the entire project activity, or less than 50 ha.

4(b) If the total area subjected to pre-project crop cultivation activities displaced is more than 5% of the entire project activity and more than 50 ha, the lands to which the crop cultivation activities have been displaced will be considered. The increase in GHG emissions due to displacement of pre-project crop cultivation activities attributable to the project activity will be considered insignificant if the n-a ha (where "n" is the area in ha displaced and "a" is 5% of the total project area or 50 ha) are displaced to:

(i) Areas of land that have been subjected to crop cultivation activities during at least one year within a timeframe of five years before the year of the project start; and/or

(ii) Existing cropland (i.e., area subjected to pre-project crop cultivation activities) managed in an extensive way subjected to an extensive management hence, allowing for increase of production without increasing their area (e.g., via improving crop rotation or change in the length of production/fallow periods).

If the increase in GHG emissions due to displacement of pre-project crop cultivation activities attributable to the project activity cannot be considered insignificant, the A/R Methodological Tool for the "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" (Version 01) will be utilized to quantify leakage.

Displacement of pre-project grazing activities

Following "Guidelines on conditions under which increase in GHG emissions related to displacement of pre-project grazing activities in A/R CDM project activity is insignificant" (Version 01)

4(a) The increase in GHG emissions due to displacement of pre-project grazing activities attributable to the project activity will be considered insignificant if the total area subjected to pre-project grazing activities displaced is less than 5% of the area of the entire project activity, or less than 50 ha.

4(b) If the total area displaced is more than 5% of the entire project activity or more than 50 ha, and the n-a ha (where "n" is the area in ha expected to be displaced and "a" is 5% of the total project area or 50 ha) are displaced to lands located in the reforestation zones identified in the Project Document, then the increase in GHG emissions due to displacement of pre-project grazing activities attributable to the project activity will also be considered insignificant, as these lands have been identified as degraded by an international land classification system.

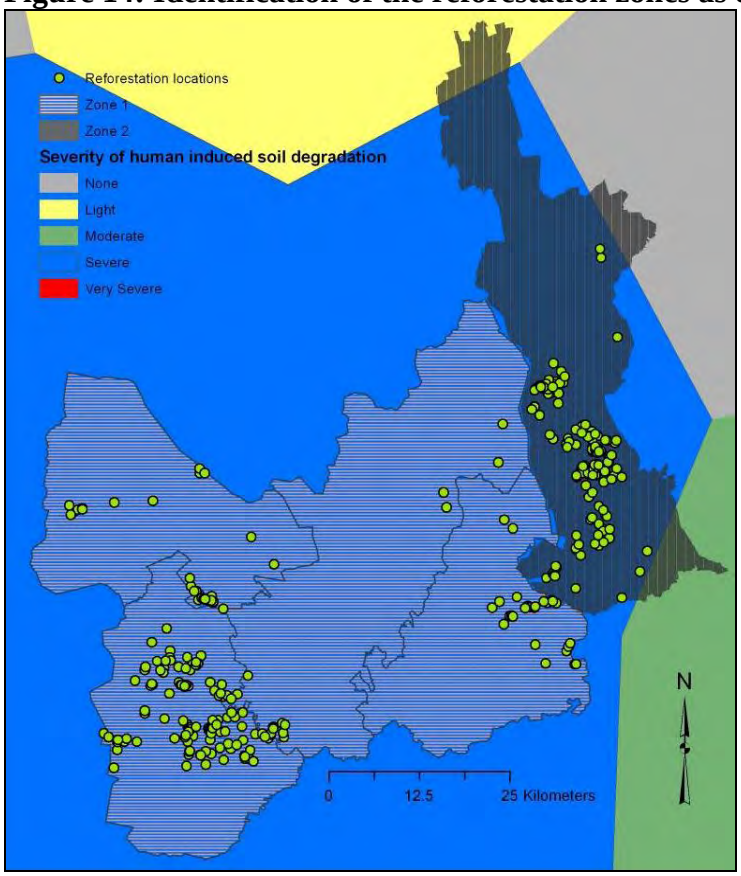
4(b-d) In the unlikely event that grazing activities are displaced to lands outside of the reforestation zones identified in the project document, then the project proponent will determine whether those lands are classified as degraded and if necessary apply other elements of the "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities" (Version 1) and the A/R Methodological Tool for the "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" (Version 01).

Classification of the area as degraded

Following "Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities" (Version 01)

(a) As the reforesters are small landholders, all lands to which grazing activities are displaced are expected to be in the immediate vicinity of the reforestations. All reforestations are in areas classified as degraded by the FAO National Degradation Map for Mexico[12] as shown by Figure 14, in which existing reforestations zones have been overlaid upon this map:

Figure 14: Identification of the reforestation zones as degraded



Although the classification is older than 10 years, the project operator has confirmed with remote imagery and field observations that the drivers and pressures that led to lands becoming degraded in the reforestation zones, such as agricultural activity on steep slopes and extensive cattle grazing, are still present and that without the reforestation program, there are insufficient management interventions to reduce degradation. The 1999 management program of the SGBR and the unpublished draft of a new management program both confirm that land degradation is a continuing problem within the SGBR and its area of influence. In fact, these two reforestation zones were selected specifically because of the urgent need for their restoration.

D. *Ex-post* estimation of the net anthropogenic GHG removals by sinks

50. Net anthropogenic greenhouse gas removals by sinks will be calculated as the actual net greenhouse gas removals by sinks minus the baseline net greenhouse gas removals by sinks minus leakage as appropriate.

B.8.1. Data to be monitored: Monitoring of the actual net GHG removals by sinks and leakage.

>>

B.8.1.1. Actual net GHG removals by sinks data:

>>

B.8.1.1.1. Data to be collected or used in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary resulting from the proposed small-scale A/R CDM project activity, and how this data will be archived:

>>

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	Comment
Parcel Boundary at the project start	*GPS units, maps*	*UTMX/ UTMY*	*m, c and e*	*Prior to project validation*	*All lands*	*Both*	
Ai - Size of the areas where the project activity has been implemented for each type of strata	*Field survey*	*ha*	*m*	*Annually*	*20% of lands*	*Both*	*GPS can be used for field survey*
Location of the permanent sample plots	*Project maps and project design*	*UTMX/ UTMY*	*Defined*	*Annually*	*20% of lands*	*Both*	*Plot location is registered with a GPS and marked on the map*
Tree DBH	*Field measurements*	*cm*	*m*	*Annually*	*20% of lands*	*Both*	
Tree biomass	*Project activity*	*kg/tree*	*c*	*Annually*	*20% of lands*	*Electronic*	
Area sampled	*Field measurements*	m^2	*m*	*Annually*	*20% of lands*	*Both*	
Biomass density	*Project activity*	*t/ha*	*c*	*Annually*	*20% of lands*	*Electronic*	
Above-ground carbon stock density	*Project activity*	*tC/ha*	*c*	*Annually*	*20% of lands*	*Electronic*	
Below-ground carbon stock density	*Project activity*	*tC/ha*	*c*	*Annually*	*20% of lands*	*Electronic*	
Total carbon stocks	*Project activity*	*tC*	*c*	*Annually*	*20% of lands*	*Electronic*	

B.8.1.2. Data for monitoring of leakage (if applicable)

>> Though leakage is not expected, a survey of reforesters' practices will be undertaken.

Existing and future reforestations. Reforesters will be surveyed prior to the signing of contracts with the project operator, at least one year after plantation. The survey will include the following questions:

1. What did you use the land for prior to the reforestation? (cropland, grazing, no use)
2. If grazing then:
    a. How many livestock did you have on these lands?
    b. What did you do with these livestock? (slaughtered, sold to a neighbor, moved to other grasslands, moved to new grasslands or forests)
3. If cropland then:
    a. Did you replace the crop area with other land? (yes, no)
    b. Where did you make the replacement? (on other cultivated area, grassland, forested land).

Leakage due to the use of fertilizers is not significant. Fertilizers are not used during planting.

B.8.1.2.1. If applicable, please describe the data and information that will be collected in order to monitor leakage of the proposed small-scale A/R CDM project activity

>>

Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	Comment
Initial amount of grazing land	*Survey*	*ha*	*e*	*One time after project is established but before the first verification*	*All lands*	*Both*	
Initial amount of cattle	*Survey*	*head*	*e*	*One time after project is established but before the first verification*	*All lands*	*Both*	

Portion of grazing land displaced	*Project activity*	*ha / ha*	*e*	*One time after project is established but before the first verification*	*All lands*	*Electronic*	
Portion of cattle displaced	*Project activity*	*Head / head*	*e*	*One time after project is established but before the first verification*	*All lands*	*Electronic*	
Source of displaced grazing land	*Survey*	*Land use type*	*e*	*One time after project is established but before the first verification*	*All lands*	*Both*	
Initial amount of cropland	*Survey*	*ha*	*e*	*One time after project is established but before the first verification*	*All lands*	*Both*	
Portion of cropland displaced	*Project activity*	*ha / ha*	*e*	*One time after project is established but before the first verification*	*All lands*	*Electronic*	
Source of displaced cropland	*Survey*	*Land use type*	*e*	*One time after project is established but before the first verification*	*All lands*	*Both*	

Leakage	*Project activity*	*t CO2e*	*e*	*One time after project is established but before the first verification*	*All lands*	*Electronic*	

B.8.2. Describe briefly the proposed quality control (QC) and quality assurance (QA) procedures that will be applied to monitor actual GHG removals by sinks:

>> The project will use the following QC and QA procedures. This will include

1. Training all field-team members on the need and method to collect accurate data. Márquez, 2000 and/or Pearson et al, 2005 will serve as training manuals.
2. A standard operating procedure will be developed and adhered to at all times; and
3. Independently re-measuring the tree diameters and number of trees in every 10th sample plot.

Procedures to verify field data collection

To verify that plots have been installed and the measurements taken correctly, it is good practice to re-measure independently every 10 plots and to compare the measurements. The following quality targets should be achieved for the re-measurements, compared to the original measurements:

- Missed or extra trees no error within the plot
- Tree species or groups no error
- D.B.H. < ± 0.5 cm or 3 % whichever is greater
- Height < ± 10/ and -20%
- Circular plot radius/sides of rectangular plot < ± 1% of horizontal (angle-adjusted)

Reliable carbon estimates require proper entry of data into the data analyses spreadsheets. Possible errors in this process can be minimized if the entry of both field data and laboratory data are cross-checked and, where necessary, internal tests incorporated into the spreadsheets to ensure that the data are realistic. Communication between all personnel involved in measuring and analyzing data should be used to resolve any apparent anomalies before the final analysis of the monitoring data is completed. If there are any problems with the monitoring plot data that cannot be resolved, the plot should not be used in the analysis.

B.8.3. Please describe briefly the operational and management structure(s) that the project operator will implement in order to monitor actual GHG removals by sinks by the proposed small-scale A/R CDM project activity:

>> Forestry promoters are responsible for the field work, including the implementation of the monitoring plan. The forestry engineer of Bosque Sustentable is responsible for field supervision of the forestry promoters. The forestry engineer is also responsible for training, the review and processing of the data, the carbon calculations, the preparation of monitoring reports and the overall supervision of the monitoring program.

B.8.4. Records relating to the project.

>> The project utilizes information in electronic as well as physical formats. All documents and records will be stored and maintained in a secure and retrievable manner until at least two years after the end of the project crediting period.

Physical documentation

Information in physical formats is primarily composed of field forms containing information regarding each of the reforestations. Documentation in physical formats will be saved in an area with appropriate conditions of ventilation, humidity and temperature on shelves that are adequate for maintaining the paperwork in good condition. In addition, the paper data produced in a year be scanned, written to a DVD, backed up and archived in an offsite facility. There will be an annual inventory of the stored documentation.

Electronic information

Electronic information will be maintained in a database that is currently under development that will integrate images for the verification of eligibility, the calendar of payments to reforesters, the reforestation inventory and the current monitoring database. This new database will be continually updated and maintained on the internal computer network of Bosque Sustentable. There will be yearly backups and updates of the backups. A complete copy will be maintained offsite in the Querétaro office. In order to avoid out-of-date and incorrect versions, the database will be managed only by authorized personnel. At the end of each year, there will be a general review of the database to ensure that it has been updated correctly.

Organization of the documentation

The paper documents for field samples will be organized numerically by a number that relates them to the tree data entered into the digital database. Other documents, files and contracts will be organized alphabetically. The reforestation polygons in the digital database will be assigned a number that includes the year they were planted and the sequential number within the year.

B.9. Date of completion of the baseline study and the name of person(s)/entity(ies) determining the baseline and the monitoring methodology:

>>

Baseline study completed:	May 2011	
Baseline study performed by:	Avram Primack, Peace Corps Volunteer Bosque Sustentable, A.C. Ave. La Presa S/N Col. Barrio el Panteón Jalpan de Serra, Qro. C.P. 76340 MÉXICO Tel: +52 441 296 0242 Email: primacag@yahoo.com	David Neil Bird Woodrising Consulting Inc. 91 Scott Street Belfountain, Ontario, CANADA Tel: +43 650 634 5273 Email: nbird@woodrising.com

Monitoring study completed:	April 2011	
Monitoring study performed by:	Marco Antonio Miguel Martínez, Forestry Engineer Bosque Sustentable, A.C. Ave. La Presa S/N Col. Barrio el Panteón Jalpan de Serra, Qro. C.P. 76340 MÉXICO Tel: +52 441 296 0242 Email: brefangus@gmail.com	David Neil Bird Woodrising Consulting Inc. 91 Scott Street Belfountain, Ontario, CANADA Tel: +43 650 634 5273 Email: nbird@woodrising.com

SECTION C. Estimation of ex ante net anthropogenic GHG removals by sinks:

C. 1. Estimated baseline net GHG removals by sinks:

>> This section corresponds to first part of paragraph 17 of the methodology.

The baseline net GHG removals by sinks can be calculated by:

$$\Delta C_{BSL,t} = (B_{(t)} - B_{(t-1)})*(44/12) \quad (10)$$

Where:
$\Delta C_{BSL,t}$ = baseline net GHG removals by sinks (t CO_2-e)
$B_{(t)}$ = carbon stocks in the living biomass pools within the project boundary at time *t* in the absence of the project activity (t C)

Based on the baseline estimate, it is assumed that $B_{(t)} = 0$ for all t

C. 2. Estimate of the actual net GHG removals by sinks:

>> This section and accompanying carbon calculations correspond to paragraphs 17-26 of the methodology.

Table 3 lists the expected yields and biomass for the species selected. The growth estimates utilized in the model are based on actual measurements of existing reforestations by Bosque Sustentable. Assumptions utilized include the following:

- It is assumed that reforestations in the project will have planting densities and growth rates that are similar to the reforestations whose measurements were used for the modeling.
- A general allometric equation is used for all the species.
- For purposes of the ex ante estimation, it is assumed that reforestation planting densities will not vary during the project.

Table 3: Yield and biomass tables for conifers

	Average of Existing Plantings				
Year	Stem Volume	T	N_A	N_B	N
		Above-ground biomass	Above-ground biomass	Below-ground biomass	Total biomass
	m3/ha	t/ha	tC/ha	tC/ha	tC/ha
1	0.0	0.0	0.0	0.0	0.0
2	1.1	0.7	0.3	0.1	0.5
3	5.3	3.4	1.7	0.5	2.3
4	12.2	8.0	4.0	1.2	5.1
5	20.9	13.6	6.8	1.9	8.7
6	30.6	19.9	9.9	2.7	12.6
7	40.9	26.6	13.3	3.5	16.8
8	51.5	33.5	16.7	4.4	21.1
9	62.2	40.4	20.2	5.2	25.4
10	72.8	47.3	23.7	6.0	29.7
11	83.3	54.2	27.1	6.8	33.9
12	93.5	60.8	30.4	7.6	38.0
13	103.5	67.2	33.6	8.3	41.9
14	113.0	73.5	36.7	9.0	45.7
15	122.2	79.4	39.7	9.7	49.4
16	130.9	85.1	42.6	10.3	52.9
17	139.3	90.6	45.3	10.9	56.2
18	147.3	95.7	47.9	11.5	59.4
19	154.8	100.6	50.3	12.1	62.4
20	162.0	105.3	52.6	12.6	65.2
21	168.7	109.7	54.8	13.1	67.9
22	175.1	113.8	56.9	13.5	70.4
23	181.2	117.8	58.9	14.0	72.8
24	186.8	121.4	60.7	14.4	75.1
25	192.2	124.9	62.5	14.7	77.2
26	197.2	128.2	64.1	15.1	79.2
27	201.9	131.2	65.6	15.4	81.0
28	206.3	134.1	67.1	15.7	82.8
29	210.5	136.8	68.4	16.0	84.4
30	214.4	139.3	69.7	16.3	86.0
31	218.0	141.7	70.9	16.6	87.4
32	221.4	143.9	72.0	16.8	88.8
33	224.6	146.0	73.0	17.0	90.0
34	227.6	148.0	74.0	17.2	91.2
35	230.4	149.8	74.9	17.4	92.3
36	233.0	151.5	75.7	17.6	93.3
37	235.5	153.1	76.5	17.8	94.3
38	237.7	154.5	77.3	17.9	95.2
39	239.9	155.9	78.0	18.1	96.1
40	241.9	157.2	78.6	18.2	96.8
41	243.7	158.4	79.2	18.4	97.6
42	245.5	159.5	79.8	18.5	98.3
43	247.1	160.6	80.3	18.6	98.9
44	248.6	161.6	80.8	18.7	99.5
45	250.0	162.5	81.2	18.8	100.0
46	251.3	163.3	81.7	18.9	100.6
47	252.5	164.1	82.1	19.0	101.0
48	253.7	164.9	82.4	19.1	101.5
49	254.7	165.6	82.8	19.1	101.9
50	255.7	166.2	83.1	19.2	102.3
	Density	0.5	t/m3		
	BEF	1.3			
	R	Cairns equation			
	CF	0.5			

The yield curves were calculated using the following steps:

1. Actual measured diameters and heights from existing plantations of various ages were converted to biomass using the allometric equation provided in AR-AMS0001.
2. The biomass for all stands of the same age were averaged to produce an average standing biomass at a specific age.
3. A smooth Chapman-Richards Equation[13] was fitted by minimizing the square error (least-squares estimate) between the smooth curve and the average biomass values. There are no existing reforestation plots more than 22 years old. For this reason the maximum biomass, a parameter in the Chapman-Richards equation, is underdetermined. It was set to be 175 t/ha.
4. The below ground biomass was calculated from the above ground biomass using equation 28.

Figure 15: Average yield curve and actual measurements

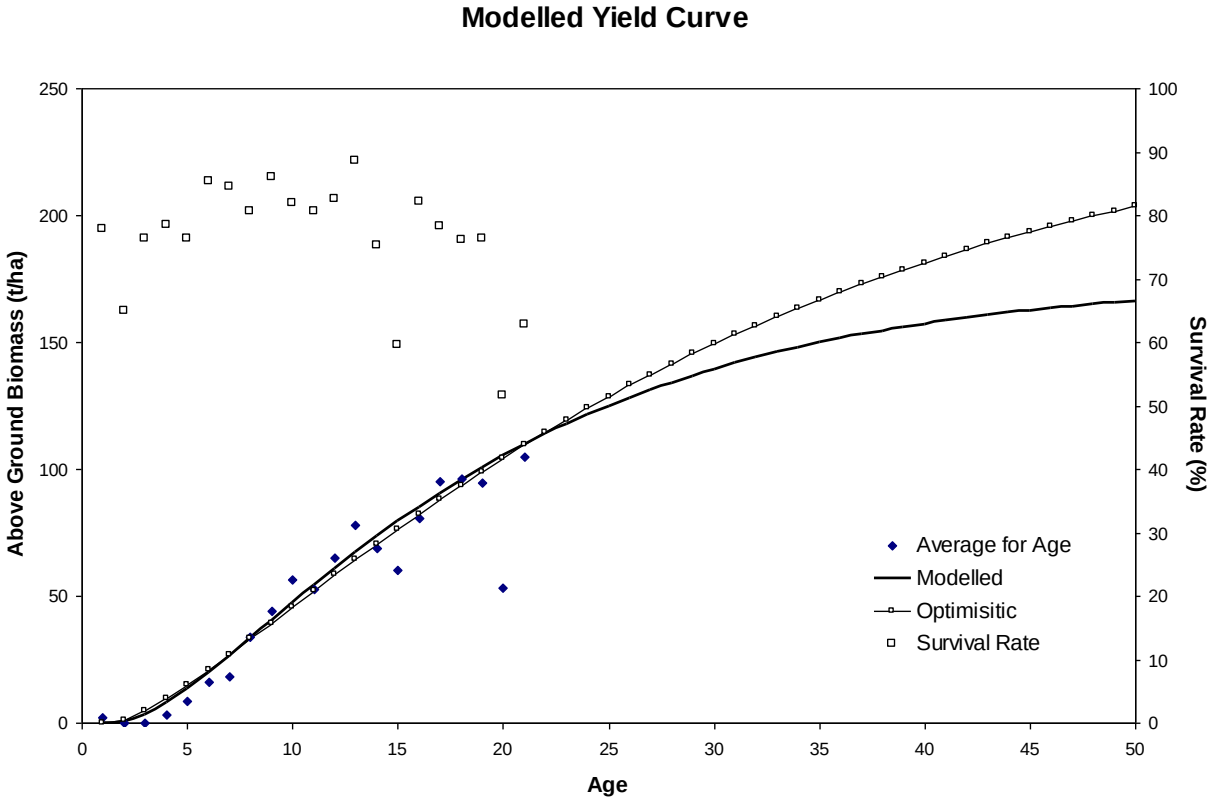


Table 4: Estimate of the actual net GHG removals by sinks by stratum

Stratum No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17			
Year Planted	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	**Total**	**Removals**	
Area Planted (ha)	4.1	9.5	14.0	17.8	7.2	7.1	15.9	21.7	15.9	8.7	6.7	8.7	8.5	40.0	40.0	40.0	40.0	305.7	**Annual**	**Cumula-tive**
Year	**Total Biomass (tC)**																	**Total**	**tCO2-e /year**	**tCO2-e**
1997	0																	0	0	0
1998	2	0																2	7	7
1999	9	4	0															14	43	50
2000	21	21	7	0														49	130	180
2001	35	49	32	8	0													124	275	455
2002	52	83	72	40	3	0												250	459	915
2003	69	120	121	91	16	3	0											421	629	1,544
2004	86	160	177	154	37	16	7	0										638	794	2,338
2005	104	201	235	224	62	36	36	10	0									909	996	3,334
2006	121	242	295	298	91	62	82	49	7	0								1,248	1,241	4,575
2007	139	283	356	375	121	90	138	111	36	4	0							1,652	1,481	6,056
2008	155	323	416	451	152	119	201	189	81	20	3	0						2,110	1,679	7,735
2009	172	362	474	527	183	150	267	274	138	44	15	4	0					2,610	1,837	9,572
2010	187	399	532	602	214	180	335	365	200	75	34	20	4	0				3,149	1,973	11,545
2011	202	436	587	675	244	211	404	458	266	109	58	45	19	19	0			3,733	2,144	13,689
2012	216	470	641	745	274	241	472	552	334	145	84	76	44	90	19	0		4,403	2,457	16,146
2013	230	504	692	813	302	270	539	645	403	183	112	110	74	205	90	19	0	5,190	2,883	19,029
2014	243	535	741	878	330	298	604	737	471	220	140	147	107	347	205	90	19	6,110	3,376	22,405
2015	255	566	787	940	356	325	667	826	537	257	169	184	143	505	347	205	90	7,158	3,842	26,247
2016	267	594	832	999	381	351	728	912	602	293	198	222	179	672	505	347	205	8,285	4,132	30,380
2017	278	621	874	1,055	405	376	786	995	665	329	226	259	216	843	672	505	347	9,450	4,270	34,650
2018	288	647	914	1,108	428	399	842	1,074	725	363	253	295	252	1,016	843	672	505	10,625	4,307	38,957
2019	298	671	951	1,159	450	422	895	1,150	783	396	279	331	288	1,187	1,016	843	672	11,791	4,276	43,233
2020	307	694	987	1,206	470	443	945	1,222	839	428	305	366	323	1,355	1,187	1,016	843	12,935	4,197	47,429
2021	316	715	1,020	1,251	489	463	993	1,291	892	458	329	399	356	1,519	1,355	1,187	1,016	14,050	4,085	51,515
2022	324	735	1,052	1,294	508	482	1,038	1,356	942	487	352	431	389	1,677	1,519	1,355	1,187	15,127	3,951	55,466
2023	332	754	1,081	1,334	525	500	1,080	1,418	989	514	374	461	420	1,830	1,677	1,519	1,355	16,164	3,802	59,269
2024	339	772	1,109	1,371	541	517	1,121	1,477	1,034	540	395	490	449	1,976	1,830	1,677	1,519	17,158	3,644	62,912
2025	346	789	1,135	1,407	556	533	1,159	1,532	1,077	565	415	518	478	2,116	1,976	1,830	1,677	18,107	3,480	66,392
2026	352	804	1,160	1,440	571	548	1,195	1,584	1,117	588	434	544	505	2,249	2,116	1,976	1,830	19,011	3,313	69,705
2027	358	819	1,183	1,471	584	563	1,228	1,633	1,155	610	452	569	530	2,375	2,249	2,116	1,976	19,869	3,147	72,853
2028	363	833	1,204	1,500	597	576	1,260	1,679	1,191	630	469	592	554	2,495	2,375	2,249	2,116	20,683	2,983	75,836
2029	369	845	1,224	1,527	608	588	1,290	1,722	1,224	650	485	614	577	2,609	2,495	2,375	2,249	21,452	2,823	78,659
2030	373	858	1,243	1,553	620	600	1,317	1,762	1,256	668	500	635	599	2,716	2,609	2,495	2,375	22,180	2,667	81,325
2031	378	869	1,261	1,577	630	611	1,344	1,800	1,285	685	514	655	619	2,818	2,716	2,609	2,495	22,866	2,516	83,841
2032	382	879	1,277	1,599	640	621	1,368	1,836	1,313	702	527	673	638	2,913	2,818	2,716	2,609	23,512	2,370	86,211
2033	386	889	1,293	1,620	649	631	1,391	1,870	1,339	717	540	691	656	3,003	2,913	2,818	2,716	24,121	2,231	88,442
2034	390	898	1,307	1,640	657	640	1,412	1,901	1,364	731	551	707	673	3,088	3,003	2,913	2,818	24,693	2,098	90,539
2035	393	907	1,321	1,658	665	648	1,432	1,930	1,386	744	562	722	689	3,167	3,088	3,003	2,913	25,230	1,970	92,510
2036	396	915	1,334	1,675	673	656	1,451	1,958	1,408	757	572	736	703	3,242	3,167	3,088	3,003	25,734	1,850	94,360
2037	399	922	1,345	1,691	680	663	1,469	1,983	1,428	768	582	750	717	3,312	3,242	3,167	3,088	26,208	1,735	96,095
2038	402	929	1,356	1,706	686	670	1,485	2,007	1,447	779	591	762	731	3,378	3,312	3,242	3,167	26,651	1,627	97,721
2039	402	929	1,356	1,706	686	670	1,485	2,007	1,447	779	591	762	731	3,439	3,378	3,312	3,242	26,923	997	98,718
2040	402	929	1,356	1,706	686	670	1,485	2,007	1,447	779	591	762	731	3,439	3,439	3,378	3,312	27,120	723	99,442
2041	402	929	1,356	1,706	686	670	1,485	2,007	1,447	779	591	762	731	3,439	3,439	3,439	3,378	27,248	466	99,908
2042	402	929	1,356	1,706	686	670	1,485	2,007	1,447	779	591	762	731	3,439	3,439	3,439	3,439	27,309	226	100,134

C. 3. Estimated leakage:

>> Leakage surveys were applied to landowners and landholders of 75.4 hectares of reforestations through April 2011. The results show that displacement of pre-project activities has not caused deforestation and, therefore, leakage can be considered zero *(Paragraphs 27-28 of the methodology).* The project proponent also elected to apply other steps of the leakage methodology to provide additional certainty of this *ex ante* conclusion.

Following "Guidelines on conditions under which increase in GHG emissions attributable to displacement of pre-project crop cultivation activities in A/R CDM project activity is insignificant" (Version 01)

For crop cultivation, the results show that 74.6% of the surveyed area within the project boundary subjected to pre-project crop cultivation activities involved some type of displacement due to the project activity, but all of that displacement involved utilizing another existing crop parcel more intensively or utilizing other areas that had been used for crop cultivation within the previous five years.

By 2013, it is projected that the project will include 279.8 hectares with pre-project cultivation activities. Applying the survey result of 74.6% to the 279.8 hectares results in an end-of-project projection of 208.7 hectares displaced. Since this is more than 5% of the entire area of the project activity and more than 50 hectares, the next step of the methodology must be applied. *Paragraph 4(a) of the Guidelines*

The survey confirmed that all displacement of pre-project crop cultivation activities occurred to areas of land that have been subjected to crop cultivation activities during at least one year within a timeframe of five years before the start of the project activity on the corresponding reforestation and, therefore, leakage may be considered insignificant. *Paragraph 4(b)(1) of the Guidelines.*

Following "Guidelines on conditions under which increase in GHG emissions related to displacement of pre-project grazing activities in A/R CDM project activity is insignificant" (Version 01)

For grazing, the results show that 55.0% of the surveyed area within the project boundary subjected to pre-project domestic grazing activities involved some type of displacement due to the project activity. By 2013, it is projected that the project will include 25.9 hectares with pre-project domestic grazing activities. Applying the survey result of 55.0% to the 25.9 hectares results in an end-of-project projection of 14.2 hectares displaced. Since this is less than 5% of the entire area of the project activity and less than 50 hectares, leakage may be considered insignificant. *Paragraph 4(a) of the Guidelines*

C. 4. The sum of C. 2. minus C.1. minus C.3. representing the net anthropogenic GHG removals by sinks of the proposed small-scale A/R CDM project activity:

>> The Net Anthropogenic GHG Removals by Sinks are calculated using equation 21 of AR-AMS001 (Table 5).

C. 5. Table providing values obtained when applying equations from the approved methodology:

>> This section corresponds to paragraph 33 of the methodology but calculates removals for the entire crediting period.

Table 5: Net Anthropogenic GHG Removals by Sinks

Year	Estimation of baseline net GHG removals by sinks (tonnes of CO2 e)	Estimation of actual net GHG removals by sinks (tonnes of CO2 e)	Estimation of leakage (tonnes of CO2 e)	Estimation of net anthropogenic GHG removals by sinks (tonnes of CO2 e)
1997		0	0	0
1998		7	0	7
1999		43	0	43
2000		130	0	130
2001		275	0	275
2002		459	0	459
2003		629	0	629
2004		794	0	794
2005		996	0	996
2006		1,241	0	1,241
2007		1,481	0	1,481
2008		1,679	0	1,679
2009		1,837	0	1,837
2010		1,973	0	1,973
2011		2,144	0	2,144
2012		2,457	0	2,457
2013		2,883	0	2,883
2014		3,376	0	3,376
2015		3,842	0	3,842
2016		4,132	0	4,132
2017		4,270	0	4,270
2018		4,307	0	4,307
2019		4,276	0	4,276
2020		4,197	0	4,197
2021		4,085	0	4,085
2022		3,951	0	3,951
2023		3,802	0	3,802
2024		3,644	0	3,644
2025		3,480	0	3,480
2026		3,313	0	3,313
2027		3,147	0	3,147
2028		2,983	0	2,983
2029		2,823	0	2,823
2030		2,667	0	2,667
2031		2,516	0	2,516
2032		2,370	0	2,370
2033		2,231	0	2,231
2034		2,098	0	2,098
2035		1,970	0	1,970
2036		1,850	0	1,850
2037		1,735	0	1,735
2038		1,627	0	1,627
2039		997	0	997
2040		723	0	723
2041		466	0	466
2042		226	0	226
Total (tonnes of CO_2.e)	**0**	**100,134**	**0**	**100,134**

SECTION D. Environmental impacts of the proposed small-scale A/R CDM project activity:

D.1. Provide analysis of the environmental impacts, including transboundary impacts (if any):

>> Please see Annex 6, Additional information for CCB validation, for an analysis of the environmental impacts of this project activity.

D.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken an environmental impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to support documentation:

>>As the reforestation project is part of the official government approved management program of the SGBR, there are no significant negative impacts.

D.3. Description of planned monitoring and remedial measures to address significant impacts referred to in section D.2. above:

>>Not applicable.

SECTION E. Socio-economic impacts of the proposed small-scale A/R CDM project activity:

E.1. Provide analysis of the socio-economic impacts, including transboundary impacts (if any):

>> Please see Annex 6, Additional information for CCB validation, for an analysis of the socio-economic impacts of this project activity.

E.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken a socio-economic impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to support documentation:

>> There are no negative social impacts foreseen.

E.3. Description of planned monitoring and remedial measures to address significant impacts referred to in section E.2. above:

>>Not applicable.

SECTION F. Stakeholders' comments:

F. 1. Brief description of how comments by local stakeholders have been invited and compiled:

>> This project activity was one of the topics of numerous meetings of consensus held with SGBR communities prior to the establishment of the SGBR in 1997, as well as the publication of the SGBR Management Program in 1999.

More recently, as the activity has advanced with transactions in the voluntary carbon market, comments have been invited through numerous meetings of Bosque Sustentable staff with participants in their own communities, as well as events for project participants held at the Sierra Gorda Earth Center on August 21, 2009, November 6, 2009, February 20, 2010, May 20, 2010,

October 8, 2010 and March 9, 2011. Attendance lists and other information on these events are available upon request. In addition, presentations have been made to the SGBR's advisory council, which includes representatives from communities as well as local, state and national governments and agencies.

Future stakeholder comments will be registered on a technical assistance form of Bosque Sustentable and reviewed by management of the Sierra Gorda Alliance for Conservation.

F. 2. Summary of the comments received:

>>Comments received from participants have been expressions of support for the project activity and questions regarding how the program operates, eligibility, requirements, the amount of payments and whether harvesting is permitted. Basic questions have also been received regarding climate change, carbon dioxide and the role of trees. In general, the comments reflect a willingness to participate in the project and a desire for payments to begin as soon as possible.

Comments from representatives of the three levels of government have focused on many of the same questions, as well as questions about carbon markets and buyers. In general, their comments also show support for the project combined with a wait-and-see attitude about the extent to which carbon markets will contribute to local development.

No opposition to the project has been received.

F. 3. Report on how due account was taken of any comments received:

>>Bosque Sustentable promoters are being trained to provide more and better information to the participants in the program, and the Sierra Gorda Earth Center is imparting courses to different audiences to share its experiences with this project. Informational handouts and presentations have been developed. The decision to invest in external validations is perhaps the primary manner in which the project proponent is responding to the comments of stakeholders, as the goal of seeking validation is to increase the market for the ecosystem services being provided by the Sierra Gorda. Stakeholders express an urgent need for alternative economic options in the Sierra Gorda, to which this project activity seeks to respond.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROPOSED SMALL-SCALE A/R CDM PROJECT ACTIVITY

Organization:	Bosque Sustentable A.C.
Street/P.O.Box:	Av. La Presa s/n Barrio El Panteón
Building:	
City:	Jalpan de Serra
State/Region:	Qro.
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Telephone:	+52 (441) 296 0700
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E-Mail:	gesgiap@prodigy.net.mx
URL:	http://www.sierragorda.net
Represented by:	
Title:	Director
Salutation:	
Last Name:	Domínguez
Middle Name:	
First Name:	Gabriel
Department:	
Mobile:	
Direct FAX:	
Direct tel:	+52 (441) 296 0700
Personal E-Mail:	gabdoca@hotmail.com

Annex 2

DECLARATION ON LOW-INCOME COMMUNITIES

Please provide a written declaration that the proposed small-scale afforestation or reforestation project activity under the CDM is developed or implemented by low-income communities and individuals as determined by the host Party.

The project is implemented by low-income communities and individuals, as defined by official criteria of the Mexican government. The project proponent presents the following socioeconomic information regarding the involved municipalities.

A. Poverty levels in the municipalities of the project area

State	Municipality	Total population	% Income poverty	
			Food poverty	Asset poverty
Querétaro	Pinal de Amoles	25,325	50	77
Querétaro	Arroyo Seco	12,493	33	62
Querétaro	Jalpan de Serra	22,025	30	57
Querétaro	Landa de Matamoros	18,905	26	56
San Luis Potosí	Aquismón	45,074	70	89
San Luis Potosí	Xilitla	50,064	54	81
TOTAL		**173.886**	**50**	**75**

Source: Indicators, index and degree of lack of social development, estimations of CONEVAL based on 2005 Population and Housing Census II.

Food-based poverty line is identified as a monthly income considered insufficient to obtain minimum food requirements even if the entire income were spent for this purpose. Asset-based poverty is identified as a monthly income inadequate for basic requirements of food, health, education, clothing, shoes, housing and public transportation, even if the entire income were dedicated exclusively to these purposes.[9]

[9] Consejo Nacional de Evaluación de la Política de Desarrollo Social, "Reporta CONEVAL cifras de pobreza por ingresos 2008", Comunicado de prensa No. 006/09, Distrito Federal a 18 de julio de 2009.

B. Additional socioeconomic indicators

Zone 1: Sierra Gorda Biosphere Reserve

Name of the municipality	Total population	% Illiteracy among population >= 15 years	% Without primary school completed among population >= 15 years	% Homes without drainage or toilet	% Homes without electricity	% Homes without piped water in the vicinity of the house	% Homes with some level of overcrowding	% Homes with dirt floors	% Economically active population that earns <= 2 minimum wages[10]	Degree of marginalization
Pinal de Amoles	25325	21.10	44.40	30.21	24.48	50.65	61.78	40.69	63.81	Very High
Arroyo Seco	12493	18.89	43.90	9.42	6.26	18.45	45.43	29.83	70.71	High
Jalpan de Serra	22025	16.03	39.28	12.57	10.28	27.11	50.48	23.15	54.76	High
Landa de Matamoros	18905	22.82	48.52	13.68	7.18	38.43	51.51	21.84	68.39	High

Zone 2: San Luis Potosí

Name of the municipality	Total population	% Illiteracy among population >= 15 years	% Without primary school completed among population >= 15 years	% Homes without drainage or toilet	% Homes without electricity	% Homes without piped water in the vicinity of the house	% Homes with some level of overcrowding	% Homes with dirt floors	% Economically active population that earns <= 2 minimum wages11	Degree of marginalization
Aquismón	45074	27.08	52.05	5.35	29.59	43.50	67.43	73.66	83.12	Very High
Xilitla	50064	13.82	37.16	2.78	17.71	47.13	62.67	50.88	78.32	High

Source: Estimations of the National Commission on Population (CONAPO) based on Census II of Population and Housing 2005, and National Survey of Occupation and Employment (ENOE) 2005, Trimester IV.

[10] In 2005, two general daily minimum wages were equivalent to approximately U.S. $8.29.
[11] Ibid.

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Carbon Sequestration in Communities of Extreme Poverty in the Sierra Gorda of Mexico

Compliance with Climate, Community & Biodiversity Project Standards

May 2011

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Cover photo of Military Macaws *(Ara militaris)* by Roberto Pedraza Ruiz

Project Summary

I. Introduction

Located in the northeast of the state of Querétaro, the Sierra Gorda Biosphere Reserve (SGBR) is the most ecosystem-diverse natural protected area in Mexico with 15 different types and subtypes of vegetation in its 383,567 hectares. In terms of species biodiversity, it ranks second in the country among federally protected areas.

The SGBR represents a pioneering effort in the management of natural protected areas, as more than 90,000 inhabitants of 638 localities live within this protected area of such extraordinary natural diversity. Since 1987, Grupo Ecológico Sierra Gorda, (Grupo Ecológico) a Mexican nonprofit civil-society organization, has developed initiatives in the SGBR to conserve its natural resources and promote sustainable development through the united efforts of citizens and institutions.

Thanks to the efforts of Grupo Ecológico, the SGBR was decreed by the Mexican federal government in 1997. It is the first example of the establishment of a Mexican natural protected area as a direct result of the efforts of the local civil society. Since then, the activities of conservation and sustainable development have grown to such an extent that they are now carried out by the Sierra Gorda Alliance for Conservation, including Grupo Ecológico, Bosque Sustentable, A.C., SGBR, Joya del Hielo, A.C., Sierra Gorda Products and Services, S.A. de C.V. and Viva Sierra Gorda. Each organization plays a key role in the united effort to conserve the natural resources of the area and promote sustainable development.

The Alliance's programs of environmental education, community sanitation, conservation, restoration, alternative productive activities, fund-raising, communications, public relations and scientific investigation are implemented utilizing a co-management model for the protection of the natural protected area, with responsibilities shared between the local civil society organizations and the government. It is a model that has been recognized nationally and internationally, garnering numerous awards and the collaboration of many national and international, private and public organizations and businesses.

The conservation and sustainable management of the natural ecosystems of the SGBR provide benefits that go well beyond the limits of the natural protected area, including:

- Conservation of emblematic species of Mexican flora and fauna and an extraordinary biodiversity of incalculable value to humanity;
- Mitigation of climate change, storing carbon in the living tissues of its forests instead of liberating it as CO_2 into the atmosphere;
- Stabilization of the regional climate;
- Maintenance of water quality and quantity that benefit the entire region;
- Conservation of the productivity of soils for the benefit of this and future generations; and
- Serving as a means of sustenance for the 90,000 inhabitants of the SGBR.

These regional and global benefits, many of which are economic, are frequently not perceived or valued by the population of the SGBR, who live in high and very high levels of poverty. To close the circle between the regional and worldwide value of the ecosystems and their value for the local people,

the Sierra Gorda Alliance for Conservation has been pioneering in entering the "environmental services market." Beginning with its first carbon offset transactions with the United Nations Foundation, the Alliance, led by Bosque Sustentable, has now retired carbon offsets on behalf of more than a dozen organizations and businesses and is paying more than 60 small landowners, landholders, *ejidatarios* and *comuneros* for activities of reforestation to sequester carbon.

Bosque Sustentable has also helped local landowners access programs of payments for environmental services of the National Forestry Commission (CONAFOR) for services of biodiversity and hydrologic protection. Bosque Sustentable sees these emerging markets as an important opportunity to join global and local interests, and to link ecologic interests with human well-being.

To fully demonstrate the broad range of ecosystem services and community benefits that are being provided by the program of Carbon Sequestration in Communities of Extreme Poverty in the Sierra Gorda of Mexico, Bosque Sustentable submits this project for join validation under the Climate, Community and Biodiversity Project Standards (CCB) and the Verified Carbon Standard (VCS).

II. Project activity

Activity Description: The project activity involves the reforestation of areas that were deforested prior to 1990 for agricultural and livestock purposes in two project zones:

Zone 1: Sierra Gorda Biosphere Reserve in the state of Querétaro
This zone is primarily focused on the highlands of the municipalities of Pinal de Amoles, Jalpan de Serra and Landa de Matamoros. It also includes a few reforestations in the municipality of Arroyo Seco. The reforestations are primarily established in areas in which the natural mature vegetation type is pine, pine-oak, or oak forest, although a few reforestations have been established in areas with other natural mature vegetation types such as dry tropical forest and former transition zones to cloud forest.

Zone 2: Municipalities of Xilitla and Aquismón in the state of San Luis Potosí
This zone is primarily focused on an area of influence of the SGBR in the highlands of the municipalities of Xilitla and Aquismón, located in the neighboring state of San Luis Potosí. The reforestations are primarily established in areas in which the natural mature vegetation types are pine, pine-oak, or oak forest, although a few reforestations may also be established in areas with other natural mature and secondary vegetation types.

In almost all cases, the reforestations are non-contiguous, scattered throughout the mountains in areas that contain a mosaic of agriculture, livestock and natural vegetation. A minimum size of .5 hectare of reforestation has been established for participation in this project activity. From 1997-2009, there were 138 reforestations established. The average size is 1.1 hectare, and the largest is 8.0 hectares. Through 2013, the project activity is expected to include a total of 305.7 hectares. Actual numbers will depend upon reforestation success and participant compliance with program requirements.

In order to achieve the goal for carbon capture and ensure its permanence, thinning will only be permitted consistent with management programs developed by Bosque Sustentable and approved by the corresponding authority, for the benefit of the health of the forest and existing biodiversity. All species utilized are indigenous to the planting area.

The hallmark of this project activity is its adaptation to conditions of poverty. It is designed as a pilot project with the potential for replication in other protected and non-protected rural areas of poverty throughout Mexico, Latin American and other regions.

Climate Benefits: The project activity is projected to result in net anthropogenic greenhouse gas removals by sinks of 100,134 tCO_2e through the year 2042.

Community Benefits: The project activity is providing an alternative income source and related training to hundreds of poor landowners, landholders, *ejidatarios* and *comuneros* in numerous communities in conditions of poverty. The project activity will also provide climate change adaptation benefits to communities in an area projected to suffer increased temperatures and decreased precipitation as a result of global warming. Benefits include increased local water infiltration promoting more consistent water yield from local springs, soil retention and temperature moderation on the reforestation sites, and reduced erosion leading to reduced sedimentation in regional streams and rivers and the Jalpan Reservoir, the principal water source for numerous communities. In addition, since 2008, select communities are being provided with water storage tanks in exchange for reforestation activities.

Biodiversity Benefits: The project activity is providing biodiversity benefits by increasing forest cover in project areas, providing greater forest connectivity around those areas and improving habitat conditions for desired forest species.

Compliance with CCB Project Design Standards

This CCB validation document is intended to be used in conjunction with the Project Design Document for Carbon Sequestration in Communities of Extreme Poverty in the Sierra Gorda of Mexico (PDD) that has been prepared following the CDM-SSC-AR-PDD template and the CDM methodology AR-AMS0001 / Version 06. When the information corresponding to a CCB standard is found in the main document of the PDD, the corresponding section in the PDD is indicated.

Table of Contents

GENERAL SECTION

G1. Original Conditions in the Project Area

Concept

The original conditions at the project area and the surrounding project zone before the project commences must be described. This description, along with projections **(G**2), will help to determine the likely impacts of the project.

Indicators

The project proponents must provide a description of the project zone, containing all the following information:

General Information

1. The location of the project and basic physical parameters (e.g., soil, geology, climate).

The location of the project activities is described in section A.4 of the PDD.

Basic physical parameters are provided in section A.5.2 of the PDD.

2. The types and condition of vegetation within the project area.

Prior to the commencement of project activities, the types of vegetation in the project areas are the following:

a. Grasslands: Areas previously deforested and containing a combination of native and invasive grass species, usually in poor conditions and severely eroded due to livestock grazing and location on steep slopes.

b. Croplands: Areas previously deforested and containing crops, most commonly corn and beans, frequently of poor quality due to location on steep slopes with high rates of erosion and soil loss.

3. The boundaries of the project area and the project zone.

The boundaries of the project area are the boundaries of the 138 reforestations totaling 145.7 hectares established from 1997-2009 and the boundaries of reforestations that will be established from 2010-2013 with approximately 40 additional hectares per year. Annex 3 provides a detailed inventory of existing reforestations. Maps showing the boundaries of each existing reforestation have been provided in a KML file and in Assessment of Land Condition/Suitability sheets prepared for each reforestation parcel.

The project zone includes the project area, adjacent communities and surrounding areas of the SGBR and of the adjoining municipalities of Xilitla and Aquismón in the state of San Luis Potosí.

Climate Information

4. Current carbon stocks within the project area(s), using land-use stratification and methods of carbon calculation (such as biomass plots, formulae, default values) from the Intergovernmental Panel on Climate Change's 2006 Guidelines for National GHG Inventories for Agriculture, Forestry and Other Land Use (IPCC 2006 GL for AFOLU) or a more robust and detailed Methodology.

This information is provided in Sections B.1 through B.6 of the PDD.

Community Information

5. A description of communities located in the project zone, including basic socio-economic and cultural information that describes the social, economic and cultural diversity within communities (wealth, gender, age, ethnicity etc.) including specific groups such as indigenous peoples and a description of any community characteristics.

a) The project zone is defined to include the project area, adjacent communities and surrounding areas of the SGBR and of the adjoining municipalities of Xilitla and Aquismón in the state of San Luis Potosí. For that reason and because some reforestations planted from 2010-2013 may be located in communities distinct from those planted from 1997-2009, the project proponent first presents a description of socioeconomic and cultural characteristics of this broader area. [1]

Socioeconomic conditions
Occupational opportunities in the Sierra Gorda are very limited with low salaries, because of which large portions of the population, primarily male, are forced to leave their communities to seek work, often in the United States. According to the 2000 General Census of Population and Housing, migration in the SGBR reached a level of 31,953 people, equal to 30% of the population. This has important socio-cultural implications. Agricultural work is losing importance, and there are problems of family disintegration caused by the absence of one or more senior male members of the family for long periods of time. Many women are obligated to assume the responsibilities of maintaining and directing the family, something which is not always easily accepted by the community as a whole. For their part, young migrants spend much of their time in very different environments with a consequent loss of values. Unfortunately the Sierra Gorda economy and society have become dependent upon the flow of resources from these migrants for its maintenance and well-being. See Annex 2 of the PDD for poverty levels and additional socioeconomic indicators for the municipalities of the project zone.

Age diversity
The population of the SGBR is predominantly infants and juveniles. The population breakdown is 43.8% from 0-14 years old, 11.5% from 15-19, 8.0% from 20-24, and 11.1% from 25-34.

Ethnicity and cultural diversity
The population in the SGBR is primarily *mestizo.* During the colonial period up until it was pacified in the 18th century, the Sierra Gorda was a haven for the indigenous populations of Chichimecas, Pames, and Jonaces. Despite its late occupation and pacification, however, only a small contingent of the indigenous population still retains its customs and culture. Although there is still an important percentage of indigenous population, above all in the municipality of Pinal de Amoles, most of the

[1] The information in the following sections regarding Zone 1 is taken primarily from CONANP, 2008.

population has lost its identity. Currently, the indigenous population of the SGBR is estimated at 1,035 inhabitants, primarily belonging to the pueblos of Pame (xi´úi) and of Teenek or Huastecos, the product of migration from communities in the state of San Luis Potosí such as Aquismón and Santa María Acapulco. Pames are located primarily in the region of Tancoyol in communities such as Las Flores, El Rincón, Las Nuevas Flores, and San Antonio Tancoyol. Las Nuevas Flores is the only community of pure Pames, the others being mixed with the *mestizo* population. The Teenek are located in the region of Valle Verde, in communities such as Carrizal de los Durán, La Cercada, San Juan de los Durán and El Pocito, where, with the exception of La Cercada, they form only a minority of the population. The indigenous groups are among the population in most extreme poverty within the state of Querétaro. Because of this, federal, state and local governments have channeled important public investments that have permitted an increase in their standard of living in recent years.

In Zone 2 of the reforestations, in the municipalities of Xilitla and Aquismón, there is a larger presence of indigenous groups. Those with greatest presence are the Nahuas, the Teenek or Huastecos and the Pames. Based upon language, 44% of the population of Xilitla and 71% of Aquismón belong to an indigenous group.

Table 1: Indigenous languages in the municipalities of Xilitla and Aquismón

Municipality	Region	Total population of the municipality	Population of 5 years and older that speak an indigenous language	Náhuatl	Huasteco	Pame
Xilitla	**Huasteca**	**42,446**	**18,751**	**17,722**	**1,001**	
Aquismón	**Huasteca**	**36,056**	**25617**	**24,263**	**1,205**	**123**

Source: INEGI, 2000

b) In this section, the project proponent presents more detailed information on the communities with reforestations established from 1997-2009. These reforestations are located in 36 communities[2] of four municipalities in Zone 1 and 17 communities of two municipalities in Zone 2. Following is more detailed information on these communities based upon data from the 2000 census, the closest date to the project start for which for which this level of census detail is available at the community level.

The communities of both zones had similarly high levels of illiteracy. In Zone 1 communities, illiteracy levels among the population 15 years and older ranged from 11-43%, while in Zone 2 communities, they ranged from 11-42%. Education levels were also very low. In Zone 1 communities, the percentage of the same group that had not completed primary school ranged from 35-79%, and in Zone 2, the levels were even more striking. Only two of 17 communities had a majority that had finished primary school, and even in those two cases the majority was a slim 51%. Access to basic household services such as sanitary services, electricity and piped water was very low in many of the communities, and dirt floors and no refrigerators were the norm. In Zone 1, all but three communities were ranked as highly or very highly marginalized, while in Zone 2, all communities were ranked as having high or very high levels of marginalization. Tables 2 and 3 present more information on socioeconomic indicators for the communities in the two zones.

[2] The locality of El Durazno, Pinal de Amoles reported in the inventory is located near the border of the municipality of Jalpan de Serra and does not appear in the 2000 census. The closest locality reported in the census is La Mohonera.

Table 2: Socioeconomic indicators for communities in Zone 1 (with reforestations planted 1997-2009)

Municipality	Community	Total population	% illiteracy among population >= 15 years	% without primary school completed among population >= 15 years	% of homes without own sanitary services	% of homes without electricity	% of homes without piped water in the vicinity of the house	% of homes with dirt floors	% of homes without refrigerator	Degree of marginalization
Arroyo Seco	Agua Fría de los Fresnos	20	25	42	50	100	100	100.0	100.0	Very high
Arroyo Seco	La Florida	356	21	57	13	14	6	51.8	76.5	High
Arroyo Seco	San José de las Flores	173	15	35	25	6	0	71.9	87.5	High
Jalpan de Serra	Madroño	278	37	61	57	17	57	52.2	88.9	High
Jalpan de Serra	Rincón de Pitzquintla	506	24	57	41	19	84	61.3	95.0	High
Landa de Matamoros	Agua Zarca	1309	18	58	17	11	29	19.5	55.6	Medium
Landa de Matamoros	Cerro de San Agustín	168	41	77	67	50	97	53.3	88.9	Very high
Landa de Matamoros	El Lobo	588	24	50	9	7	14	35.3	61.5	High
Landa de Matamoros	El Madroño	371	15	44	11	19	27	35.4	59.3	Medium
Landa de Matamoros	Pinalito de la Cruz	407	19	63	44	3	65	30.6	78.4	High
Landa de Matamoros	Río Verdito	287	21	43	15	5	8	32.8	74.7	Medium
Pinal de Amoles	Agua Amarga	447	14	51	18	36	39	56.0	84.2	High
Pinal de Amoles	Agua del Maíz	215	29	65	51	71	56	58.5	82.0	Very high
Pinal de Amoles	Cuesta Blanca	138	43	62	70	23	100	53.3	60.0	Very high
Pinal de Amoles	El Arpa	92	20	40	33	92	100	66.7	68.4	High
Pinal de Amoles	El Gallo	130	25	58	86	100	86	85.7	90.0	Very high
Pinal de Amoles	El Madroño	412	11	42	56	8	95	40.0	53.4	High
Pinal de Amoles	El Ranchito	535	16	51	29	14	98	55.3	85.6	High
Pinal de Amoles	El Rodezno	220	31	73	71	98	88	95.1	97.1	Very high
Pinal de Amoles	Epazotes Grandes	199	34	72	55	98	100	98.0	86.2	Very high
Pinal de Amoles	Escanelilla	477	15	48	26	22	95	22.0	84.2	High
Pinal de Amoles	La Barranca	425	30	79	65	82	48	84.6	78.9	Very high
Pinal de Amoles	La Mohonera	284	33	64	60	98	49	79.1	100.0	Very high
Pinal de Amoles	La Mojonera	5	na[3]	na	na	na	na	na	na	na
Pinal de Amoles	La Tinaja	615	24	62	36	5	18	55.6	87.6	High
Pinal de Amoles	Loma Larga (Santa Cecilia)	207	18	58	31	33	78	72.2	90.5	High

[3] For very small population localities, the census does not provide detailed information.

Pinal de Amoles	Otomites	113	40	68	20	100	100	95.0	80.0	Very high
Pinal de Amoles	Puerto de Escanelilla	525	18	55	57	14	18	36.4	55.7	High
Pinal de Amoles	Rancho Nuevo	301	28	65	54	8	98	35.4	84.0	High
Pinal de Amoles	Río Escanela	250	31	67	83	15	100	50.0	100.0	Very high
Pinal de Amoles	San José Cochinito	103	34	75	50	60	50	70.0	100.0	Very high
Pinal de Amoles	San Pedro Viejo	564	28	67	36	5	71	39.2	77.5	High
Pinal de Amoles	Santa Águeda	468	14	46	41	19	27	45.3	68.8	High
Pinal de Amoles	Sauz de Guadalupe	619	21	64	40	28	46	53.1	86.4	High
Pinal de Amoles	Temascales	138	28	54	54	100	58	69.2	91.7	Very high
Pinal de Amoles	Tonatico	366	19	59	46	11	9	44.6	79.6	High

Source: CONAPO, 2000

Table 3: Socioeconomic indicators for communities in Zone 2 (with reforestations planted 1997-2009)

Municipality	Community	Total population	% illiteracy among population >= 15 years	% without primary school completed among population >= 15 years	% of homes without own sanitary services	% of homes without electricity	% of homes without piped water in the vicinity of the house	% of homes with dirt floors	% of homes without refrigerator	Degree of marginalization
Aquismón	Agua Amarga	303	41	57	5	80	64	79	98	Very high
Aquismón	La Soledad	177	11	49	0	18	91	71	85	High
Aquismón	Los Hornos	309	28	72	7	93	96	85	94	Very high
Aquismón	Octujub	641	42	64	28	94	36	88	98	Very high
Aquismón	Paxalja	949	40	67	6	50	29	95	96	Very high
Aquismón	San José Oija	212	25	56	7	36	27	87	90	High
Aquismón	Tamapatz	923	25	49	8	19	27	46	77	High
Aquismón	Tampaxal	936	27	56	16	20	29	47	90	High
Xilitla	Barrio San Pedro	496	18	54	7	64	60	86	86	High
Xilitla	Cerro Quebrado	189	15	52	0	100	15	100	91	High
Xilitla	El Retén	212	32	59	0	18	83	60	96	High
Xilitla	La Tinaja	245	13	51	5	98	40	90	95	High
Xilitla	Ollita del Pino	325	26	64	12	100	30	83	88	Very high
Xilitla	Potrerillos	531	23	51	12	13	45	52	83	High
Xilitla	Rancho Nuevo	424	21	73	23	96	65	94	96	Very high
Xilitla	Soledad de Zaragoza	551	22	59	10	39	35	60	96	High
Xilitla	Uxtuapan	517	18	51	5	17	100	78	91	High

Source: CONAPO, 2000

The 36 communities of Zone 1 had a total population of 12,311 and an average of 342 inhabitants per community. The 17 communities of Zone 2 had a total population of 7,940 and an average of 467 inhabitants per community. The gender breakdown was 49% male and 51% female in Zone 1 communities, and reversed in Zone 2. Tables 4 and 5 provide a breakdown per community.

Table 4: Gender breakdown of communities in Zone 1 (with reforestations planted 1997-2009)

Name of municipality	Name of community	Total population	Males	Females	Males ≥ 18 years	Females ≥ 18 years
Arroyo Seco	AGUA FRIA DE LOS FRESNOS	20	11	9	5	5
Arroyo Seco	FLORIDA, LA	356	178	178	94	101
Arroyo Seco	SAN JOSE DE LAS FLORES	173	89	84	36	43
Jalpan de Serra	MADROÑO	278	138	140	49	66
Jalpan de Serra	RINCON DE PITZQUINTLA	506	245	261	115	103
Landa de Matamoros	AGUA ZARCA	1309	598	711	281	372
Landa de Matamoros	CERRO DE SAN AGUSTIN	168	83	85	42	45
Landa de Matamoros	LOBO, EL	588	277	311	128	165
Landa de Matamoros	MADROÑO, EL	371	179	192	86	105
Landa de Matamoros	PINALITO DE LA CRUZ	407	217	190	90	83
Landa de Matamoros	RIO VERDITO	287	152	135	84	72
Pinal de Amoles	AGUA AMARGA	447	210	237	96	106
Pinal de Amoles	AGUA DEL MAIZ	215	108	107	40	48
Pinal de Amoles	ARPA, EL	92	49	43	25	20
Pinal de Amoles	BARRANCA, LA	425	212	213	91	97
Pinal de Amoles	CUESTA BLANCA	138	61	77	31	38
Pinal de Amoles	EPAZOTES GRANDES	199	103	96	51	51
Pinal de Amoles	ESCANELILLA	477	241	236	118	139
Pinal de Amoles	GALLO, EL	130	60	70	27	34
Pinal de Amoles	LOMA LARGA (SANTA CECILIA)	207	101	106	46	44
Pinal de Amoles	MADROÑO, EL	412	208	204	107	102
Pinal de Amoles	MOHONERA, LA	284	142	142	65	54
Pinal de Amoles	MOJONERA, LA	5	NA	NA	NA	NA
Pinal de Amoles	OTOMITES	113	61	52	26	22
Pinal de Amoles	PUERTO DE ESCANELILLA	525	270	255	116	110
Pinal de Amoles	RANCHITO, EL	535	271	264	118	134
Pinal de Amoles	RANCHO NUEVO	301	153	148	79	70
Pinal de Amoles	RIO ESCANELA	250	123	127	56	59
Pinal de Amoles	RODEZNO, EL	220	109	111	41	44

Pinal de Amoles	SAN JOSE COCHINITO	103	52	51	26	24
Pinal de Amoles	SAN PEDRO VIEJO	564	237	327	86	136
Pinal de Amoles	SANTA AGUEDA	468	251	217	105	101
Pinal de Amoles	SAUZ DE GUADALUPE	619	295	324	112	142
Pinal de Amoles	TEMASCALES	138	66	72	28	32
Pinal de Amoles	TINAJA, LA	615	288	327	135	151
Pinal de Amoles	TONATICO	366	195	171	94	87
TOTAL	36	12,311	6,033	6,273	2,729	3,005
% OF TOTAL		100.0%	49.0%	51.0%	22.2%	24.4%

Source: INEGI, 2000

Table 5: Gender breakdown of communities in Zone 2 (with reforestations planted 1997-2009)

Name of municipality	Name of community	Total population	Males	Females	Males ≥ 18 years	Females ≥ 18 years
Aquismón	AGUA AMARGA	303	151	152	73	72
Aquismón	HORNOS, LOS	309	166	143	72	64
Aquismón	OCTUJUB	641	324	317	174	153
Aquismón	PAXALJA	949	494	455	229	224
Aquismón	SAN JOSE OIJA	212	99	113	60	59
Aquismón	SOLEDAD, LA	177	98	79	37	34
Aquismón	TAMAPATZ	923	459	464	249	263
Aquismón	TAMPAXAL	936	457	479	232	239
Xilitla	BARRIO SAN PEDRO	496	252	244	127	108
Xilitla	CERRO QUEBRADO	189	96	93	41	43
Xilitla	OLLITA DEL PINO	325	172	153	88	77
Xilitla	POTRERILLOS	531	269	262	125	127
Xilitla	RANCHO NUEVO	424	214	210	120	97
Xilitla	RETEN, EL	212	100	112	53	52
Xilitla	SOLEDAD DE ZARAGOZA	551	296	255	144	128
Xilitla	TINAJA, LA	245	118	127	60	53
Xilitla	UXTUAPAN	517	279	238	156	131
TOTAL	17	7,940	4,044	3,896	2,040	1,924
% OF TOTAL		100.0%	50.9%	49.1%	25.7%	24.2%

Source: INEGI, 2000

Perhaps reflecting the lack of economic opportunities and the frequent need of people of working age to leave the communities to seek employment, the age breakdown for Zone 1 was 46.5% less than 15 years of age, 20.9% aged 15-49 and 32.6% aged 50 years or older. In Zone 2, the breakdown was 43.7% less than 15 years of age, 20.9% aged 15-49 and 35.4% aged 50 or older.[4] Tables 6 and 7 provide a more detailed breakdown of the population by the age categories presented by the 2000 census.

[4] Percentages calculated based upon INEGI, 2000.

Table 6: Age breakdown of communities in Zone 1 (with reforestations planted 1997-2009)

Name of municipality	Name of community	Total population	Population 0-4 years	Population ≥ 5 years	Population 6-14 years	Population ≥ 12 years	Population ≥ 15 years	Population 15-17 yrs	Population ≥ 18 years	Population 15-24 yrs	Population 15-49 yrs
Arroyo Seco	AGUA FRIA DE LOS FRESNOS	20	1	19	7	16	12	2	10	5	5
Arroyo Seco	FLORIDA, LA	356	44	302	74	244	217	22	195	52	77
Arroyo Seco	SAN JOSE DE LAS FLORES	173	24	145	48	103	89	10	79	32	39
Jalpan de Serra	MADROÑO	278	52	225	74	155	136	21	115	48	63
Jalpan de Serra	RINCON DE PITZQUINTLA	506	72	426	146	305	263	45	218	103	93
Landa de Matamoros	AGUA ZARCA	1309	176	1126	349	852	734	81	653	219	325
Landa de Matamoros	CERRO DE SAN AGUSTIN	168	22	145	39	116	100	13	87	30	38
Landa de Matamoros	LOBO, EL	588	62	520	166	391	336	43	293	93	128
Landa de Matamoros	MADROÑO, EL	371	55	312	91	247	215	24	191	54	86
Landa de Matamoros	PINALITO DE LA CRUZ	407	61	342	123	245	203	30	173	74	77
Landa de Matamoros	RIO VERDITO	287	33	246	55	208	185	29	156	69	72
Pinal de Amoles	AGUA AMARGA	447	75	369	130	263	228	26	202	72	100
Pinal de Amoles	AGUA DEL MAIZ	215	44	167	59	121	98	10	88	32	42
Pinal de Amoles	ARPA, EL	92	12	80	24	65	55	10	45	27	22
Pinal de Amoles	BARRANCA, LA	425	61	363	132	264	212	24	188	70	80
Pinal de Amoles	CUESTA BLANCA	138	18	119	33	89	82	13	69	22	31
Pinal de Amoles	EPAZOTES GRANDES	199	30	169	46	126	116	14	102	28	31
Pinal de Amoles	ESCANELILLA	477	65	412	110	327	288	31	257	98	108

Pinal de Amoles	GALLO, EL	130	25	105	33	80	69	8	61	20	29
Pinal de Amoles	LOMA LARGA (SANTA CECILIA)	207	28	173	66	128	104	14	90	29	33
Pinal de Amoles	MADROÑO, EL	412	38	368	106	280	248	39	209	93	88
Pinal de Amoles	MOHONERA, LA	284	42	242	88	166	144	25	119	58	55
Pinal de Amoles	MOJONERA, LA	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pinal de Amoles	OTOMITES	113	16	91	34	66	55	7	48	15	14
Pinal de Amoles	PUERTO DE ESCANELILLA	525	79	439	154	322	263	37	226	113	105
Pinal de Amoles	RANCHITO, EL	535	79	436	126	327	289	37	252	89	118
Pinal de Amoles	RANCHO NUEVO	301	40	257	67	201	176	27	149	63	51
Pinal de Amoles	RIO ESCANELA	250	27	210	70	156	132	17	115	40	53
Pinal de Amoles	RODEZNO, EL	220	32	180	76	125	98	13	85	20	36
Pinal de Amoles	SAN JOSE COCHINITO	103	18	83	20	64	59	9	50	20	19
Pinal de Amoles	SAN PEDRO VIEJO	564	87	477	195	317	263	41	222	81	128
Pinal de Amoles	SANTA AGUEDA	468	72	391	137	279	235	29	206	78	94
Pinal de Amoles	SAUZ DE GUADALUPE	619	110	498	192	351	286	32	254	82	109
Pinal de Amoles	TEMASCALES	138	21	117	41	88	72	12	60	28	31
Pinal de Amoles	TINAJA, LA	615	102	512	180	372	318	32	286	86	120
Pinal de Amoles	TONATICO	366	60	302	86	231	207	26	181	66	70
TOTAL	36	12,311	1,783	10,368	3,377	7,690	6,587	853	5,734	2,109	2,570
% OF TOTAL		100.0%	14.5%	84.3%	27.4%	62.5%	53.5%	6.9%	46.6%	17.1%	20.9%

Source: INEGI, 2000

Table 7: Age breakdown of communities in Zone 2 (with reforestations planted 1997-2009)

Name of municipality	Name of community	Total population	Population 0-4 years	Population ≥ 5 years	Population 6-14 years	Population ≥ 12 years	Population ≥ 15 years	Population 15-17 yrs	Population ≥ 18 years	Population 15-24 yrs	Population 15-49 yrs
Aquismón	AGUA AMARGA	303	46	253	77	187	164	19	145	48	59
Aquismón	HORNOS, LOS	309	56	253	82	184	157	21	136	51	59
Aquismón	OCTUJUB	641	99	540	160	413	362	35	327	107	142
Aquismón	PAXALJA	949	140	809	261	611	526	73	453	194	210
Aquismón	SAN JOSE OIJA	212	27	185	48	157	134	15	119	40	47
Aquismón	SOLEDAD, LA	177	34	143	57	96	80	9	71	18	33
Aquismón	TAMAPATZ	923	100	815	221	645	567	55	512	178	218
Aquismón	TAMPAXAL	936	113	822	260	617	534	63	471	166	207
Xilitla	BARRIO SAN PEDRO	496	85	410	121	309	271	36	235	92	100
Xilitla	CERRO QUEBRADO	189	39	147	47	105	95	11	84	32	39
Xilitla	OLLITA DEL PINO	325	41	284	91	220	187	22	165	55	55
Xilitla	POTRERILLOS	531	88	440	142	326	279	27	252	85	108
Xilitla	RANCHO NUEVO	424	63	360	115	277	236	19	217	78	86
Xilitla	RETEN, EL	212	30	181	57	138	116	11	105	31	40
Xilitla	SOLEDAD DE ZARAGOZA	551	78	465	139	346	305	33	272	88	107
Xilitla	TINAJA, LA	245	45	200	61	156	136	23	113	59	48
Xilitla	UXTUAPAN	517	70	446	105	354	323	36	287	109	104
TOTAL	17	7,940	1,154	6,753	2,044	5,141	4,472	508	3,964	1,431	1,662
% OF TOTAL		100.0%	14.5%	85.1%	25.7%	64.7%	56.3%	6.4%	49.9%	18.0%	20.9%

Source: INEGI, 2000

Finally, reflecting the general discussion above regarding indigenous populations, Tables 8 and 9 show that the use of indigenous languages was much more common in the communities of Zone 2, where 41.6% of the population five years and older reported speaking an indigenous language, while in Zone 1 it was just .4%. To provide more information about the degree of marginalization of communities with speakers of indigenous languages, the census also identified how many of the indigenous language speakers also speak Spanish and how many do not. In the Zone 1 communities, there were no reports of people speaking an indigenous language but not speaking Spanish, while in Zone 2, 6.4% of the population fell into this category.

Table 8: Use of indigenous language in Zone 1 (with reforestations planted 1997-2009)

Name of municipality	Name of community	Total population	Population ≥ 5 years that speaks an indigenous language	Population ≥ 5 years that speaks an indigenous language and does not speak Spanish	Population ≥ 5 years that speaks an indigenous language and also Spanish
Arroyo Seco	AGUA FRIA DE LOS FRESNOS	20	0	0	0
Arroyo Seco	FLORIDA, LA	356	4	0	4
Arroyo Seco	SAN JOSE DE LAS FLORES	173	3	0	3
Jalpan de Serra	MADROÑO	278	0	0	0
Jalpan de Serra	RINCON DE PITZQUINTLA	506	3	0	2
Landa de Matamoros	AGUA ZARCA	1309	0	0	0
Landa de Matamoros	CERRO DE SAN AGUSTIN	168	1	0	1
Landa de Matamoros	LOBO, EL	588	24	0	22
Landa de Matamoros	MADROÑO, EL	371	0	0	0
Landa de Matamoros	PINALITO DE LA CRUZ	407	0	0	0
Landa de Matamoros	RIO VERDITO	287	0	0	0
Pinal de Amoles	AGUA AMARGA	447	0	0	0
Pinal de Amoles	AGUA DEL MAIZ	215	1	0	1
Pinal de Amoles	ARPA, EL	92	0	0	0
Pinal de Amoles	BARRANCA, LA	425	1	0	1
Pinal de Amoles	CUESTA BLANCA	138	0	0	0
Pinal de Amoles	EPAZOTES GRANDES	199	0	0	0
Pinal de Amoles	ESCANELILLA	477	1	0	1
Pinal de Amoles	GALLO, EL	130	0	0	0
Pinal de Amoles	LOMA LARGA (SANTA CECILIA)	207	0	0	0
Pinal de Amoles	MADROÑO, EL	412	6	0	4
Pinal de Amoles	MOHONERA, LA	284	1	0	0
Pinal de Amoles	MOJONERA, LA	5	NA	NA	NA
Pinal de Amoles	OTOMITES	113	0	0	0
Pinal de Amoles	PUERTO DE ESCANELILLA	525	3	0	3
Pinal de Amoles	RANCHITO, EL	535	2	0	2

Pinal de Amoles	RANCHO NUEVO	301	0	0	0
Pinal de Amoles	RIO ESCANELA	250	0	0	0
Pinal de Amoles	RODEZNO, EL	220	1	0	1
Pinal de Amoles	SAN JOSE COCHINITO	103	0	0	0
Pinal de Amoles	SAN PEDRO VIEJO	564	0	0	0
Pinal de Amoles	SANTA AGUEDA	468	0	0	0
Pinal de Amoles	SAUZ DE GUADALUPE	619	0	0	0
Pinal de Amoles	TEMASCALES	138	0	0	0
Pinal de Amoles	TINAJA, LA	615	2	0	2
Pinal de Amoles	TONATICO	366	0	0	0
TOTAL	36	12,311	53	0	47
% OF TOTAL		100.0%	0.4%	0.0%	0.4%

Source: INEGI, 2000

Table 9: Use of indigenous language in Zone 2 (with reforestations planted 1997-2009)

Name of municipality	Name of community	Total population	Population ≥ 5 years that speaks an indigenous language	Population ≥ 5 years that speaks an indigenous language and does not speak Spanish	Population ≥ 5 years that speaks an indigenous language and also Spanish
Aquismón	AGUA AMARGA	303	239	65	172
Aquismón	HORNOS, LOS	309	52	1	49
Aquismón	OCTUJUB	641	533	156	377
Aquismón	PAXALJA	949	804	197	602
Aquismón	SAN JOSE OIJA	212	50	3	42
Aquismón	SOLEDAD, LA	177	130	8	122
Aquismón	TAMAPATZ	923	257	23	233
Aquismón	TAMPAXAL	936	179	2	173
Xilitla	BARRIO SAN PEDRO	496	402	43	359
Xilitla	CERRO QUEBRADO	189	19	0	19
Xilitla	OLLITA DEL PINO	325	1	0	1
Xilitla	POTRERILLOS	531	6	0	6
Xilitla	RANCHO NUEVO	424	310	10	298
Xilitla	RETEN, EL	212	2	0	2
Xilitla	SOLEDAD DE ZARAGOZA	551	1	0	1
Xilitla	TINAJA, LA	245	83	1	82
Xilitla	UXTUAPAN	517	237	3	230
TOTAL	17	7,940	3,305	512	2,768
% OF TOTAL		100.0%	41.6%	6.4%	34.9%

Source: INEGI, 2000

6. A description of current land use and customary and legal property rights in the project zone, identifying any ongoing or unresolved conflicts or disputes (see also G5).

There are three types of customary and legal property rights in the project zone: private property, *ejidos* and community property. There are no conflicts or disputes in the project zone. However, because of exorbitant notary and legal costs, it is not financially feasible for many project participants to update the legal titles to their lands. A common situation is the possession of a property title in the name of a deceased relative. In these cases, the project requires that the project participants present a certificate from the municipal government, confirming their legitimate possession of the land.

Biodiversity Information

7. A description of current biodiversity within the project zone (diversity of species and ecosystems) and threats to that biodiversity, using appropriate methodologies, substantiated where possible with appropriate reference material.

A. Diversity of ecosystems

The principle biological characteristic of the project zone, including the highlands of Xilitla and Aquismón, which share biological characteristics with the SGBR, is eco-diversity, which indicates that in a relatively small area are a great number of distinct ecosystems with high diversity of life forms. The project zone includes at least seven different natural ecosystems.

Conifer forests: The Sierra Gorda harbors a high diversity of conifer species. There are representatives of five families in eight genera (*Abies* spp., *Pinus* spp., *Juniperus* sp., *Taxus* sp., *Taxodium* sp., *Cupressus* sp., *Pseudotsuga* sp. and *Podocarpus* sp.). Pure conifer forests occupy a relatively small surface area in the highest parts of the Sierra, generally in the form of isolated patches among mixed pine-oak forests. In Jalpan de Serra and Landa de Matamoros these forests are comprised of Juniper (*Juniperus flaccida*), and White Cedar (*Cupressus lusitanica*). There are forests of pinyon pines (*Pinus cembroides* and *P. pinceana*) in Pinal de Amoles and Peñamiller. There is one stand of almost pure Sacred Fir (*Abies religiosa*), Guatemalan Fir (*A. guatemalensis*) and Douglas Fir (*Pseudotsuga menziesii*) in a gully on the Pingüica Mountain in the Municipality of Pinal de Amoles. According to Zamudio (1996), the juniper and white cedar forests constitute sub-types of vegetation within the tree communities that form the coniferous forests of the area.

Mixed pine-oak forest: This association is widely distributed in the high areas of the project zone, covering 38,250 has in the SGBR. Species present include pines such as *Pinus patula, P. teocote.,* and *P. greggii,* mixed with oaks such as *Quercus laurina, Q. obtusata, Q. crasssifolia* and *Q. affinis,* in addition to Madrone *(Arbutus xalapensis)* and Butterfly Bush *(Buddleia cordata).*

Oak forests: Oak woodlands occupy the second greatest surface area in the SGBR, with approximately 61,500 hectares distributed in the five municipalities of the SGBR, and are also present in the municipalities of Xilitla and Aquismón. They range in altitude from 800 to 3,000 masl with heterogeneous precipitation, which results in these forests having a varied physiognomy and composition. The principal species are oaks such as *Quercus affinis, Q. polymorpha, Q. laurina, Q. mexicana, Q. crassifolia,* among others, in addition to species such as the Alder *(Alnus acuminata),* Madrone *(Arbutus xalapensis),* Butterfly Bush *(Buddleia cordata)* and wild walnuts and hickories *(Carya ovata* and *Juglans mollis).*

Cloud forest: These forests are found as small islands on sites with a northeast exposure that receive a direct flow of humid air from the Gulf or on sites protected from intense sun in the municipalities of Pinal de Amoles, Landa de Matamoros, Jalpan de Serra, Xilitla and Aquismón. This forest type depends on a regimen of constant fog and a minimum precipitation of 1,000 mm annually. In the SGBR, they are especially diverse, distributed at altitudes from 800 masl in the canyon of the Tancuilín River to 2,750 masl in the canyons of Los Granadillos and Agua Fría in the municipality of Pinal de Amoles, because of which their composition and physiognomy vary considerably. Their principal species are Sweetgum *(Liquidambar styraciflua),* Mexican Elm *(Ulmus mexicana),* Mexican Rosewood *(Dalbergia paloescrito),* Black Cabbage-Bark *(Lonchocarpus rugosus),* magnolias *(Magnolia dealbata* and *M. schiedana),* Yew *(Taxus globosa),* White Cedar *(Cupressus lusitanica),* Basswood *(Tilia mexicana),* Guatemalan Fir, *(Abies guatemalensis),* Tree Fern *(Nephelea mexicana),* and *Escobillo* oaks *(Quercus laurina).* There is also a small population of Podocarps *(Podocarpus recheii)* as well as abundant presence of epiphytes such as bromeliads and orchids. Despite the deforestation of large areas in the past, there are still patches more or less well conserved, such as the Joya del Hielo core protected area, Llano Chiquito, Cerro de la Media Luna and Cañada del Tancuilín in the municipality of Landa de Matamoros, in the Cañada de las Avispas core protected area, Hoya Verde and La Mesa in Jalpan de Serra, as well as small areas in Agua del Maíz, El Durazno, Quirambal and other canyons in the high part of the Sierra in the municipality of Pinal de Amoles.

Riparian forests: These are distributed along the principal streams of the Sierra Gorda with millennial Mexican Cypress *(Taxodium mucronatum),* Mexican Sycamore *(Platanus mexicanus)* and willows *(Salix* spp.*).*

Tropical deciduous forest: This forest type occupies the greatest surface area within the SGBR with about 145,250 has. It is located primarily in the inter-mountain valleys of the SGBR and the canyons of the Moctezuma and Santa María rivers in the municipalities of Landa de Matamoros, Arroyo Seco, Jalpan de Serra, and small areas of Pinal de Amoles at altitudes that range from 300 to 1,400 masl Characteristic species of this vegetation type are Feather Tree *(Lysiloma microphylla), Tepehuaje (Lysiloma acapulcensis),* Sartre Guava *(Psidium sartorianum),* Berlandier's Jopoy *(Esenbeckia berlandieri),* Gumbo-limbo *(Bursera simaruba),* Bastard Cedar *(Guazuma ulmifolia),* Laurel *(Phoebe tampicensis)* and columnar cacti *(Neobauxbamia polylopha),* among others. It is characterized by small trees that lose their leaves during the dry season, recovering their greenness with the arrival of the rains.

Tropical sub-deciduous forest: This type of vegetation is well-represented in the most eastern part of the Santa María River canyon, in areas that because of their exposure receive a greater amount of humidity. A good part of the patches of this biome are protected within the Barranca de Paguas core protected area, as well as in the canyons of the Tancuilín and Moctezuma rivers. Representative species of this vegetation type are Spanish Cedar *(Cedrela odorata),* Hoary Caper *(Capparis incana),* Bread-nut Tree *(Brosimum alicastrum),* Central American Fig *(Ficus pertusa),* Gumbo-limbo *(Bursera simaruba)* and the Elephant Ear *(Enterolobium cyclocarpum)* among others. Differing from the tropical deciduous forests, this vegetation type is characterized by larger trees, many of which maintain their leaves during the dry season.

B. Diversity of Species

Fungi

At least 127 species of macro-fungi are present within the Sierra Gorda, of which 42.5% are edible species; in other words 54 species have varying degrees of edibility and palatability. More than 41% are mycorrhizal fungi associated with various species of pine and oak. The Sierra Gorda does not have a strong rural tradition of consumption and use of fungi, as compared to other states. Rural people only consume the Corn Smut *(Ustilago maydis),* Button Mushroom *(Agaricus bisporus),* and the Puffball *(Calvatia cyathiformis),* as they are unaware of other species of superior taste and have a fear of toxic and poisonous species. Estimates regarding the potential quantity of wild mushrooms that could be obtained per hectare during each rainy season range from 1,448.4 up to 10,861.7 kg. Without a doubt these numbers suggest the great potential that wild mushrooms have as an excellent source of essential amino acids and fatty acids for the diet of local rural people if sustainably managed.

Flora

There is not a specific record of flora for the entire project area, but to date 2,308 species of vascular plants have been registered for the SGBR, a relatively small number considering the diverse vegetation types found in the SGBR, which gives us a good idea of how much there still is to investigate in terms of the area's natural resources. As a result of botanical investigations conducted by the Institute of Ecology A.C., 22 species have been discovered and described in this area in recent years.

The ecodiversity of the area can be appreciated by the presence of wholly Nearctic species such as the Douglas Fir *(Pseudotsuga menziesii)* and the Poplar *(Populus tremuloides)* in the highest part of the Sierra of Pinal de Amoles and species which are found in the jungles of southeast Mexico, such as the Kapok *(Ceiba pentandra),* and the Breadnut *(Brosimum alicastrum),* as well as species present in the humid cloud forests of Chiapas, such as the Mexican Elm *(Ulmus mexicana)* and the Tree Fern *(Nephelea mexicana).*

Fauna

The impressive diversity of fauna is proportional to the large diversity of vegetation. There are 600 vertebrate species reported in the SGBR, including 332 bird species, 110 mammal species, 97 reptile species and 34 amphibian species. Twenty-seven fish species have been identified in the rivers and streams of the SGBR. The only invertebrate groups studied within the SGBR are the Lepidoptera or daytime butterflies with 650 registered species.

Table 10: Fauna diversity in the SGBR

Group	Total SGBR	National Total	Percentage
Birds	332	1107	30
Mammals	110	529	20
Reptiles	97	850	11
Amphibians	34	372	9
Fish	27	519	6
Daytime butterflies	650	2610	25

The richness of the region's fauna is evident from sightings of Black Bear (*Ursus americanus*), representative of the fauna of the Nearctic zone, and the presence of the Crested Guan (*Penelope purpurascens*) and the Military Macaw (*Ara militaris*), representatives of the Neotropical zone, which

suggests that the Sierra Gorda can be considered one of the most important and best-conserved transition zones between these biogeographical zones in the country. The presence of the black bear within the SGBR, south of its natural distribution in the states of Nuevo León and Tamaulipas, has been documented with many testimonies and sightings, some from as much as 50 years ago and others as recent as last year. There are also pictures of bears that have been hunted in the past within the area which is now the SGBR. Of the mammalian fauna species that have become extinct in the area, it is worth mentioning the Spider Monkey *(Ateles geoffroyii)*, a species formerly found in the canyons of the Tancuilín and the Moctezuma rivers, as well as areas to the east of Valle Verde in the municipality of Jalpan de Serra. This species has apparently disappeared due to habitat loss and poaching.

Birds

There are 332 bird species which belong to 19 orders, 53 families and 220 genera. There are 92 species which are Neotropical migrants, seeking winter refuge in the forests of the Sierra Gorda. Due to the richness of the species and their importance for conservation, the SGBR was recognized by the International Council for the Preservation of Mexican Birds (CIPAMEX) and Bird Life International as one of the Important Areas for Bird Conservation in the country. The list of important species includes five parrot species and the Military Macaw (*Ara militaris)* which survives as a small population in the Cañon del Infiernillo and Sotano del Barro, from where they travel to different areas in search of food. The Great Curassow *(Crax rubra)*, which lives in the forests of the canyon of the Santa María River, also stands out. Significant birds of prey are the Peregrine Falcon (*Falco peregrinus*), the Ornate Hawk Eagle *(Spizaetus ornatus)* and the Collared Forest Falcon (*Micrastur semitorquatus)*.

Mammals

The SGBR also stands out as a very rich protected area in mammals with 110 species, of which at least 22 can be considered of global importance, the SGBR being the third richest in species in the country, after the Montes Azules Biosphere Reserve and El Triunfo Biosphere Reserve, with 126 and 112 respectively.

One of the groups that is best represented is the rodents with 38 species, amongst which various Cricetidae species stand out (*Peromyscus, Reithrodontomys, Sigmodon, Neotoma, Microtus, Oryzomys*), heteromyidae rodents (*Dipodomys ordii*, *Perognathus flavus*, *Liomys irroratus*), squirrels (*Glaucomys volans, Sciurus* sp., *Spermophilus variegatus*), and other, larger animals such as the Paca (*Cuniculus paca*) and the Porcupine (*Coendou mexicanus*). There is also a gopher that until recently was considered a separate species and an endemic of the state of Querétaro (*Cratogeomys neglectus*) but that recent studies have placed within the species *Cratogeomys fumosus*.

Another of the best-represented groups are bats with 39 species, the majority insect eaters *(Pteronotus* sp., *Myotis* sp., *Corynorhinus* sp., *Eptesicus* sp., *Lasiurus* sp., *Tadarida brasilienis, Eumops perotis, Molossus rufus*, etc.). The Big-eared Bat *(Euderma maculatum)* stands out as it is one of the rarest bats in the country. There are also five pollen-feeding bats (*Leptonycteris nivalis, L. yerbabuenae, Anoura geoffroyi, Choeronycteris mexicana* and *Glossophaga soricina*), eight fruit feeders (genuses *Artibeus, Dermanura* and *Sturnira*) and two species of blood-sucking bats (*Desmodus rotundus* and *Diphylla ecaudata).*

Carnivores are another group with various species. The Sierra Gorda has populations of the six feline species found in Mexico: Jaguar (*Panthera onca*), Puma (*Puma concolor*), Bobcat (*Lynx rufus*), Margay (*Leopardus wiedii*), Ocelot (*Leopardus pardalis*) and Jaguarundi (*Herpailurus yagouaroundi*). There are other carnivores such as the Coyote (*Canis latrans*), Fox (*Urocyon cinereoargenteus*), skunks (*Conepatus leuconotus, Mephitis macroura* and *Spilogale angustifrons*), Raccoon (*Procyon*

lotor), White-nosed Coati (*Nasua narica*), Ring-tailed Cat (*Bassariscus astutus*) and Long-tailed Weasel (*Mustela frenata*). Recent efforts to monitor jaguar populations by Grupo Ecológico have resulted in a variety of records of the species including recent photographs. For this reason there is now much better knowledge of distribution and presence. There have been recent sightings of Tayra (*Eira barbara*), locally named "old man of the forest" or *tepemiche* and the River Otter (*Lontra longicaudis*). There are unconfirmed sightings of Black Bear (*Ursus americanus*) that would make the Sierra Gorda the southernmost sighting of this species.

The groups with the fewest species are the shrews (*Sorex saussurei*, *Cryptotis mexicana* and *C. parva*), opossums (*Didelphis virginiana* and *D. marsupialis*), even-toed ungulates (*Tayassu tajacu, Mazama temama* and *Odocoileus virginianus*), lagomorphs (*Sylvilagus brasiliensis* and *S. floridanus*) and Armadillos (*Dasypus novemcinctus*). It is worth mentioning the Spider Monkey (*Ateles geoffroyi*), which was found in the area but that disappeared due to habitat loss and poaching.

Unfortunately, research on mammals in the region is lacking, except for Schmidly and Martin (1973) and León-Paniagua et al. (1990). These capture-and-release studies were carried out by the sides of the roads, which are not representative of the SGBR as a whole. On one hand, in recent years there has been an increase in the number of discovered species in the SGBR. On the other hand, errors have been identified within the species list (duplicate species, changes in taxonomic classification or absence in the SGBR). Even so it is projected that the number of described species will rise as more research is carried out in the area, particularly for the bat group.

Amphibians and reptiles

According to a relatively recent evaluation, (Margules and Pressey, 2000), the SGBR is second among protected areas in the country for diversity of amphibian and reptile species, with 131 species, exceeded only by the Los Tuxtlas Biosphere Reserve in Veracruz (145 species), which shows how important this area is as a refuge for this taxa.

Thirty-four species of amphibians have been registered, belonging to two orders, eight families and 18 genuses. There are four frog species belonging to the order Anura (*Lithobates* sp.), five toads *(Bufonidae)*, two spadefoot toads (*Scaphiopus couchi* and *Spea hammondi*), seven tree frog species *(Hylidae)* and seven species of saddleback toads *(Brachycephalidae).*

Ninety-seven species of reptiles have been reported, comprised of three orders, 19 families and 53 genuses. There are 40 species with protected status and 32 endemic species. Only two turtle species are reported, *Kinosternon integrum* and *K. scorpioides cruentatum*. There are recordings by local people of Crocodiles (*Crocodylus acutus*) in some locations of the Santa María River.

There are 30 species within the group Sauria among which are two species of Anguidae, which local people believe are poisonous, although they are in fact harmless. Among the lizards the most abundant genus is Scleporus with 10 species, although there are also four nocturnal lizard species (*Lepidophyma* sp.). Another well represented group is the skinks, locally known as *linceres* of which there are five species (*Plestiodon* sp. and *Scincella* sp.). It is worth mentioning the presence of a recently-discovered species of *Xenosaurus* sp., awaiting description. The best-represented reptile group is the serpents with 53 species. Those that stand out are the Boa (*Boa constrictor*), various terrestrial snakes (*Masticophis, Salvadora, Conopsis*), aquatic snakes (*Thamnophis* sp.), tree snakes (*Oxybelis aeneus*), burrowing blind snakes (*Leptotyphlops* sp.) and nine venomous snakes such as the Coral Snake (*Micrurus tener*), a pitviper (*Bothrops asper*) and six rattlesnake species (*Crotalus* sp.).

The SGBR is a poorly studied area and most of the studies have been limited to main roads. Very few studies have focused their sampling outside the roads which has resulted in recent discoveries of some species such as the Jumping Pitviper (*Atropoides nummifer,* Lopez *et al*, 2006). It is expected that the number of species will increase as more studies are conducted in the least studied zones and also that new species will be found such as *Xenosaurus* sp.

Fish

Although fish are the least-studied vertebrate group in the SGBR, 27 species are reported, which form particular fish communities based upon their distribution in the different watersheds of the Santa María and Moctezuma rivers. These communities are also influenced by the different physiographical, geological and climatic conditions of the region (Morales and Gutiérrez, 2004); Morales (2004) mentions that Neotropical species dominate the Moctezuma watershed (51.5%), while Nearctic species make up 20%, 8.5% are indirect and 20% are introduced species. This shows that the watershed of the Moctezuma River, surrounded by that of the Pánuco, functions as an ecological corridor between the two biogeographical zones that divide the country.

Two species of genus *Notropis* identified as *N.* cf[5] *saladonis* and *N.* cf. *Chihuahua* have been found in the SGBR. They are normally found further north, which suggests that they may be new species that share morphological features with the northern species which causes confusion when trying to identify them. The same occurs with the specimens of genus *Xiphophorus* that have been collected in small streams that drain directly into the Moctezuma River whose identification has not been possible as they are unlike any known species (Morales and Gutiérrez, 2003).

Last but not least, is the presence of a catadromous species which swims up river from the ocean to complete its life cycle, locally known as *Sardinia* or *Trucha* (*Agonostomus monticola*); this, together with the Flathead Catfish (*Pylodictis olivaris*) makes up the most important fishery resource of the region.

Invertebrates

In terms of invertebrates, the only group which has been studied is the Lepidoptera or butterflies, with 650 registered species. This figure greatly exceeds expectations for the quantity and variety of fauna, representing eight families, 29 subfamilies and 294 genuses, which places SGBR in second place on a national scale for diversity of butterfly species, after Montes Azules in the Lacandona Rainforest of Chiapas. From a comparative study with nine other regions studied north of the parallel 19°N, Sierra Gorda stands out as a location of high diversity within North America, well above the total richness of the states of Sonora (355 species), Quintana Roo (384) or the Huasteca of San Luis Potosí (556) and logically, any location within the United States or Canada. Equally, it is relevant to mention that Sierra Gorda hosts nearly 30% of the species present in Mexico in a tiny fraction of its territory. Among the sites sampled, the Canyon of the Tancuilín River in the Municipality of Landa de Matamoros undoubtedly stands out as one of the richest locations in Querétaro with 469 species of butterflies, which together with the richness of other groups of flora and fauna make this site a top priority for conservation. *Hermeutypchia* aff. *callista* was discovered here in addition to other relevant species, previously only described in Costa Rica. Exclusively Nearctic species have also been registered in the highest peaks of the Sierra Gorda, which tell of its geological history as these species are relicts of the glacial period and past alpine climates.

[5] ***cf*** refers to the spp. it is most similar to.

C. Threats to biodiversity and other natural resources

The ecosystems and other natural resources in the project zone are an invaluable treasure. They provide environmental services that allow the continuing presence of approximately 100,000 people. They satisfy basic needs and support productive activities that help sustain the regional economy. At the same time, conservation of these resources is complicated by the presence of residents as they carry out the social and economic activities necessary to maintain themselves, and who require roads, water systems, and other infrastructure that result in important environmental disturbances.

The threats faced by the biodiversity of the area include the development of public works infrastructure and accompanying land-use changes without any environmental criteria, forest fires, forest diseases and pests, illegal hunting, and capture and killing of flora and fauna. Additional threats include open-air trash dumps, the contamination of water sources, growing scarcity of water sources and the lack of enforcement of environmental laws and regulations.

Status of original forest resources
Historically, a number of factors have contributed to the clearing of the Sierra Gorda and resulted in the loss of important temperate and tropical forests and scrublands. Significant forest cover was lost at the beginning and middle of the 20th century when due to isolation and lack of other options people logged forests for timber, mining, and to create pasture and space for crops. Despite these activities in areas that are clearly more appropriate for forest, there still are well-conserved forest areas that provide environmental services that benefit a large number of people. These remaining areas are fragmented by the physical and ecological characteristics of the Sierra, which has led to the establishment of a complex mosaic of eco-diversity, and by the loss of cover due to human factors.

The Sierra of Pinal de Amoles is particularly affected. This mountain range runs in a north-south direction in the municipalities of Pinal de Amoles and Jalpan de Serra, bounded to the north by the Atarjea Arroyo and to the south by the Extoraz River and still has the highest diversity of species of conifers in the state of Querétaro, with the presence of genuses such as *Pinus* spp., *Abies* spp., *Pseudotsuga* sp., *Cupressus* sp., *Taxus* sp., *Juniperus* sp., and *Taxodium* sp. This area of mountains also stands out as the principal zone for the recharge of aquifers and the production of water in the SGBR, particularly in the watershed of the Escanela River.

The Sierra of Pinal Amoles reaches elevations of 3,100 masl, resulting in rain shadows that have permitted the establishment of ancient xerophyllous scrublands in the basin of the Extoraz River to the west. There are nearly undisturbed mixed forests of conifers and oaks on the upper slopes of these mountains that make sharp contrast to the lower slopes that once were covered by oak (*Quercus* spp.) and small areas of cloud forest. These slopes are now densely populated and greatly changed by communities, fields and pastures, resulting in a patchwork of fragmented forest areas and areas dominated by human occupation.

In the Sierra de la Florida, located in the western part of the municipality of Arroyo Seco, there still are relatively undisturbed forests of oaks, mixed junipers and oaks, and small relics of pine forests. These forests still exist because they occupy small areas with little commercial value. Dividing the intermountain valleys from the lower parts of the Sierra (previously covered by deciduous forests), running also in a north-south direction, are lower ranges such as those of the communities of La Tinaja, San Juan Buenaventura, Tancoyolillo and Sabino Grande, and others in the surrounding areas of

Tancoyol, La Reforma and Tilaco with oaks at higher elevations, interspersed with scrub and deciduous forests in the canyons and lowlands.

The principal range of the Eastern Sierra Madre lies in the eastern part of the project zone in the municipalities of Landa de Matamoros, Jalpan de Serra, Xilitla and Aquismón. This part of the project zone, bounded to the south by the Moctezuma River and to the north by the Santa María River, contains extensive and well-conserved areas of temperate and cloud forests. It is a very important biological corridor and plays a key role in the recharge of aquifers. Thanks to its ample forest cover, high precipitation, and karst substrata, it supplies significant volumes of water to the neighboring region of the Huasteca Potosina. An indication of its biological and conservation importance is the presence of three of the most valuable core protected areas of the SGBR – Barranca de Paguas, Cañada de las Avispas, and Joya del Hielo. Only in the area of Agua Zarca in the southeast part of the range and in valleys such as Tres Lagunas, Valle de Guadalupe, San Juan de los Durán and Valle Verde are significant human impacts found, where areas of cloud forests, oaks and pine-oaks were cleared during the beginning and middle of the past century for the establishment of pastures and to a lesser degree for cultivation.

Contrary to the trend of net loss of forest that exists in most of Mexico, forests of the SGBR are increasing due to the abandonment of fields and pastures as a result of mass migration to the United States in search of employment. Much of the community no longer depends directly on the resources of their land since remittances from migrants have become the main source of income in the area. Also contributing to forest recovery are reforestation activities, establishment of forest plantations and management of natural regeneration. These projects have involved a great number of residents and, in many cases, have resulted in a change in their perception of the environment. This trend of forest recovery applies to most parts of the SGBR, with the exception of the main population centers that are undergoing rapid expansion.

In the municipalities of Aquismón and Xilitla, located to the east of the SGBR in its area of influence in the state of San Luis Potosí, former areas of extraordinary biodiversity have suffered systematic and brutal deforestation from the agricultural practices of the indigenous Huastecos. However, in the most inaccessible areas, especially in the high part of the Sierra, relicts of cloud forests and temperate forests have escaped destruction.

Wildlife trends

It is only recently that different institutions (National Autonomous University of Mexico (UNAM), Autonomous University of Querétaro (UAQ), Institute for the Conservation of World Biodiversity, Center for the Study of Tropical Birds, Institute of Ecology of the UNAM, Grupo Ecológico, Institute of Ecology A.C., etc.) have begun to conduct systematic studies to determine the distribution and composition of wildlife in groups such as Lepidoptera, herpetofauna, birds and mollusks, and even the state of populations of priority species such as the Jaguar (*Panthera onca*) and Bearded Wood-Partridge (*Dendrortyx barbatus*). There is a need for more research that fully encompasses the project zone, and it is probable that the numbers of species identified will be greater.

Despite the threats to wildlife, there are a high number of sightings, encounters, and records, even in areas where they had previously disappeared (white-tailed deer for example). So even if there is no scientific evidence, it appears that there are healthier populations of animals than there were in past years, prompted by the community´s greater awareness of the importance of wildlife and pride in its natural heritage, increased understanding and application of environmental regulations and presence of authority, as well as a greater area of land dedicated to conservation, either as private reserves, or under

programs of renting for conservation or payment for hydrological environmental services or for protection of biodiversity.

Public works
The area that is affected each year by agriculture is much smaller compared to the past. The current leading cause of loss of forest cover is public works activities executed in an irresponsible manner and with no criteria for sustainability, as in the expansion and construction of dirt roads, opening gaps for the introduction of electric lines and the growth of towns and urban areas.

Logging
Another threat to forests is illegal and unregulated logging. An important factor is the high costs of technical forest services and preparation of corresponding forest management programs and environmental impact statements, and of the registration of such documents with the Ministry of Environment and Natural Resources. The technical forest services have been characterized by poor quality and lack of professionalism in which usually only the service providers benefit economically, from the production of documents without quality. These service providers are people from outside the area or who stay for a short time before moving on to other areas, usually leaving a scant profit for the producers and a plundered forest. This problem is compounded by an inadequate and outdated infrastructure in the operating sawmills, which also results in the waste of a significant volume of wood. This has been corrected to a certain degree by equipping the producers of San Juan de los Durán and the Union of Forest Ejidos "Benito Juárez" with machinery that gives added value to their wood. Usually the principal wood utilized is pine and less often oak (*Quercus* sp.*)*, juniper (*Juniperus* sp.), and white cedar (*Cupressus* sp.). Comparatively speaking, this sector employs few people, there being many more rural workers who labor in farming and cattle ranching.

Currently, the Ejido of Madroño in the municipality of Landa de Matamoros has an approved Forest Management Program. In addition to the planned volumes of wood, the *ejido* harvests wood of pine trees affected by the bark beetle *(Dendroctonus* sp.*)* from its own lands and from the properties of others in the region by buying the wood, an approach that is also utilized by the other two private sawmills in that area.

Illegal logging without an approved management program is usually conducted by the owners of the land or they may "sell" the trees to other people, who extract and sell the timber at low prices to profiteers who need to harvest significant volumes to obtain adequate profit. In turn, the illegality of the activities in some cases is exacerbated by irregularity in the land tenancy, as it is common that even though the properties are in the possession of communities or landowners, they do not have the legal property titles, which impedes authorization of a management program by the appropriate authority.

Approved harvesting for domestic uses (such as poles, supports and wood for construction) in volumes up to 50 m^3 satisfies the local demand for wood in the communities or of the owners of the property, although sometimes this involves removing timber legally and later selling it illegally.

It is of upmost importance to simplify procedures in a way that promotes regulation of the timber extraction processes, to provide high-quality technical services at low or no cost to the producers, as well as to improve equipment and training, all of which in the long run will permit more efficient use of the forestry resource. Nowadays, Bosque Sustentable offers high-quality technical services, promoting conservation-oriented forest management for the provision of ecosystem services rather than traditional forest harvesting.

Forest fires
Forest fires are almost always derived from human activities. They are another threat to the biodiversity. Forest fires along with the presence of extensive cattle grazing in forests may prevent natural regeneration following fires. Human-induced fires are largely the result of the use of fire to clear areas for agricultural or livestock activities or from carelessness. The Sierra Gorda's mountainous topography makes the work of fire-fighting and control difficult, while facilitating the spread of forest fires. This threat may increase in the future, given projections for increased temperatures and decreased participation as a result of climate change.

Forest diseases and pests
The presence of exotic invasive species and pests are also a concern. As human activities modify ecosystems the intentional or unintentional introduction of exotic species with the capacity for dispersion presents a great threat to ecosystems and the biodiversity they shelter. Forest stress due to climate change may increase this risk in the future. Threats include the pine-bark beetle, mistletoe, wild dogs and wild burros. There is also concern about packs of feral dogs that harass and kill deer, small wildlife and calves. There is an urgent need to form a common front among authorities and citizens to control this problem.

Illegal hunting and capture of wildlife
Wildlife is used by the local population as part of their livelihood and tradition, but not always in the most efficient and appropriate manner. In the past it was common to trap birds, reptiles, and mammals, with consequent damage to their populations.

Faced with the decrease in the population of several species and the extinction of others (spider monkeys and wild turkey), the leaders of the SGBR and civil society organizations have undertaken an intense campaign of prevention and education through meetings with residents of communities and via the media on illegal trapping, assault, and capture of wildlife, and their marketing. This campaign has significantly decreased the frequency of illegal activities within the SGBR. While there continue to be illegal hunting of species such as White-Tailed Deer (*Odocoileus virginianus*), Brocket Deer (*Mazama temama*), Great Curassow (*Crax rubra*), and Paca (*Cuniculus paca*), especially in more remote areas, the frequency and intensity of these activities have dropped considerably as awareness among rural people about the value of these resources, better knowledge of environmental regulations, more effective surveillance of this type of illegal activity, and non-acceptance by many landowners of these activities on their properties have increased. In spite of this, some species of herpetofauna, like snakes, lizards, and salamanders, are still persecuted since there are still beliefs about their supposed danger. Snakes are especially persecuted based on the belief that all snakes are poisonous. In certain communities birds still are hunted by children and youths who are irresponsibly provided with slingshots and bb guns. Migratory Neotropical birds are seen as constituting novel kills among the potential prey.

Another type of harassment is that of predators like the Jaguar (*Panthera onca*) and Puma (*Puma concolor*), since their habitat in the forests is being used for grazing by cattle and goats, which has led to the occasional feeding by the wildlife on these easy prey; thus, the wildlife are persecuted and sometimes killed by farmers. Another disadvantage and disruption to wildlife caused by livestock, in this case to wild herbivores, is the fact that during the dry season the herbivores are competing for food with livestock, which can affect the reproductive success and health of the wildlife populations, particularly in years of severe drought. This in turn has impacts upon the populations of larger predators.

However, it appears that small carnivores such as Opossum (*Didelphys virginiana*), Gray Fox (*Urocyon cinereoargentus*), White-Nosed Coati (*Nasua narica*) and some raptors such as hawks (*Accipiter striatus, A. cooperii*) and the Collared Forest-Falcon *(Micrastur semitorquatus)*, on the whole cause greater damage, both economically and in terms of sheer numbers, since they continuously prey on poultry which exists in practically every house in the countryside.

Contamination of soils and water

Population growth, the increased use and consumption of manufactured products and natural resources, and other normal daily human activities, have resulted in impacts on the environment. These are mostly unintentional resulting from the introduction of foreign chemical substances to the environment. In the project zone, the greatest impacts are from the contamination of soils, streams and bodies of water, rather than of the atmosphere.

Soils contamination stems mainly from the use and abuse of pesticides on agricultural crops. Many farmers apply pesticides at rates much higher than recommended. Because of this farmers overexpose themselves (a health risk) and crops, soil, and water (a soil and water contamination problem). Once in water and soil, pesticides bio-accumulate in the food chain.

Air pollutants have increased due to the larger number of vehicles in the area. A large proportion of these are older foreign vehicles generally in poor mechanical condition, so that the volume of emissions per vehicle is high. However, the dispersion of population, the relatively low density of vehicles on the road, and the geographical and natural features of the area, allow the emissions to be dispersed and prevent the accumulation of high concentrations locally.

However, the main source of water contamination inside the SGBR is the direct discharge of sewage into rivers and streams and to a lesser extent into the many natural sinkholes that exist in the area, as well as the proliferation of illegal garbage dumps in inappropriate sites, usually in ravines and streams.

The discharge of wastewater into water currents unfortunately is widespread. The principal discharges are those of the communities of Ahuacatlán de Guadalupe, Escanelilla, Jalpan de Serra, and Purísima de Arista into the Jalpan River, which undoubtedly is the most contaminated stream. In addition, there is heavy metal contamination arising from the extraction of mercury that occurred on a broad scale in the middle of the last century. A large amount of these mineral wastes accumulated at the entrances to mines and therefore are exposed to physical and chemical erosion by precipitation and end up being deposited in streams.

Most of the discharge in the Extoraz, Ayutla, and Santa María rivers comes from communities that are upstream in the states of Guanajuato and San Luis Potosí. Because of distance, the water has been reoxygenated, and the contamination is less severe by the time they reach the SGBR. The degree of contamination of the Jalpan River and the fact that it is the main source of drinking water for several major towns in the project zone make sanitation and restoration of this stream a priority. It is also a priority to install water treatment plants in the principal population centers, which fortunately is already happening in towns like Ahuacatlan de Guadalupe, Jalpan de Serra, Purísima and Landa de Matamoros, as well as to provide treatment for communities that discharge wastewater into sinkholes and other natural cavities.

The case of illegal dumping of garbage is a growing problem and difficult to resolve. There is a high cost for handling of solid waste due to the rugged topography, geology, and dispersed population of the zone, exceeding the capacity of the municipalities. Currently the production of solid waste in the Sierra

region reaches more than 1,920 tons per month, of which only a fraction receives adequate treatment through the network of recycling centers (more than 100) operated by Grupo Ecológico in conjunction with local communities and the cooperation of local governments. This network has enabled the recycling of hundreds of tons of cardboard, paper, glass, and plastic. The extension of these activities to the entire SGBR is needed. Grupo Ecológico has now strengthened local buyers, who are equipped and will provide added value as they consolidate this activity. In the future, Grupo Ecológico will continue to raise consciousness and monitor the collection centers as well as the proper management of sanitary landfills.

8. An evaluation of whether the project zone or the area of project influence includes any of the following high conservation values (HCV) and a description of the qualifying attributes:

8.1. Globally, regionally or nationally significant concentrations of biodiversity values;

a. protected areas

The SGBR, decreed in 1997 by the federal government of Mexico, is the thirteenth Mexican natural protected area to join the World Network of Biosphere Reserves of UNESCO's Man and the Biosphere Programme (MAB-2003). It contains the Jalpan Reservoir, designated a Ramsar site, is designated an Important Area for the Conservation of Birds and is considered a Priority Land Region by the National Commission for the Knowledge and Use of Biodiversity (CONABIO). The project zone also contains part of the Sierra de Xilitla National Forest Reserve, decreed in 1923.

b. threatened species

Fungi
In the fungi kingdom, five species have protected status.

Flora
Of the 2,308 species of vascular plants that have been registered in the SGBR, 26 are found under protected status: 11 threatened, five endangered, four with special protection and six as rare. On the Red List of the IUCN are the Guatemalan Fir *(Abies guatemalensis)* – Vulnerable, Yew (*Taxus globosa*) – Near Threatened, White Cedar (*Cupressus lusitanica*) – Least Concern, Red Cedar *(Cedrela dugesii)* – Least Concern, Rosewood (*Dalbergia paloescrito)* – Least Concern*),* and Douglas Fir *(Pseudotsuga menziesii)* – Least Concern.

Fauna
Among the species of fauna within the project zone on the IUCN Red List are the following: Jaguar (*Panthera onca)* – Near Threatened; Military Macaw *(Ara militaris)* – Vulnerable; Bearded Wood-Partridge *(Dendrortyx barbatus)* – Vulnerable; Margay *(Leopardus wiedii)* – Near Threatened; Ocelot *(Leopardus pardalis)* – Least Concern; Red-crowned Parrot (*Amazona viridigenalis)* – Endangered; Tamaulipas Pygmy-Owl *(Glaucidium sanchezi)* – Least Concern; Great Curassow (*Crax rubra)* – Near Threatened; Neotropical Otter *(Lontra longicaudis)* – Data Deficient, Decreasing; and Emerald Toucanet (*Aulacorhynchus prasinus)* – Least Concern.

According to NOM-059-SEMARNAT-2001, 41 bird species have protected status; four are endangered, 21 threatened, eight with special protection and eight are rare. There are 19 mammal species registered in the CITES (Convention for the Trade of Endangered Species), 11 on the IUCN

Red List and 18 in the NOM-059. There are 11 endemic species, a very low number when compared to other groups such as amphibians and reptiles.

Ten amphibians have protected status. The Caudata order stands out because all of its species have protected status and are on the IUCN Red List: the Plateau Tiger Salamander *(Ambystoma velasci)* – Least Concern, the salamanders of the genus *Chiropterotriton: C. multidentatus* and *C. chondrostega* – both Endangered and *C. magnipes* – Critically Endangered, and the salamanders *Pseudoeurycea bellii* – Vulnerable and *Pseudoeurycea cephalica* – Near Threatened.

c. endemic species

Flora
At least 22 species have been described recently, the majority of which are endemic, including: *Adiantum andicola, Agave tenuifolia, Neobauxbamia polylopha, Ceratozamia sabatoi, C. microstrobila, Pinguicola acnata, P. montezumae, P. calderoninae* and *Velascoa recondita.* Due to their geological, topographic, and climactic characteristics which have produced the appropriate conditions for the evolution of their unique flora, the most salient endemic distribution areas are the principal range of the Eastern Sierra Madre, the canyons of the Moctezuma and Santa María rivers, and the Extoraz River watershed.

Fauna
The SGBR shelters 27 species of birds endemic to Mexico. A particularly valuable endemic species with protection status (Vulnerable according to the Red List of the IUCN and in Appendix I of the CITES), is the Maroon-fronted Parrot *(Rhynchopsitta terrisi),* which occupies a small area in the states of Nuevo Leon, Coahuila and Tamaulipas. Due to the devastating 1998 forest fires that ravaged that section of the sierra, these parrots, in groups of 20 to 200, began to make seasonal migrations to the temperate forests of the eastern SGBR looking for food. Given that they are a threatened species with fragile populations that have lost a sizeable sector of their habitat because of logging and forest fires, it would be most appropriate to protect the feeding sites to which they return after their long migration.

In addition, the Bearded Wood-Partridge, *(Dendrortyx barbatus),* an endemic bird to the cloud forests found in a short section of the Eastern Sierra Madre, has within the SGBR its most critical sanctuary over the long term due to the fact that it still contains a compact area of forests, in contrast to surrounding areas in the states of San Luis Potosí, Hidalgo, Puebla and Veracruz that are deforested and fragmented. This state of affairs has placed the Bearded Wood-Partridge under the threat of extinction according to a recent study (Eitniear et al 2000). In the SGBR various NGOs have designated this species' critical habitats as privately owned natural reserves with protected status, thus ensuring that approximately 3,000 hectares provide sanctuary habitats for these birds. According to the IUCN Red List, the Bearded Wood-Partridge is in the Vulnerable species category. Thus any forestry or ranching development effort that alters in any significant way this small sanctuary habitat for this bird should be restricted.

Populations of the Red-crowned Parrot *(Amazona viridigenalis)* are found in the northeast of the SGBR in tropical sub-deciduous and oak forests in areas that are relatively well conserved and now in many instances under conservation plans or in privately owned natural reserves like Las Arenitas. Las Arenitas contains 500 hectares of tropical oak forests which serve as nesting sites and consequently, is an area of critical important for the conservation of this threatened species.

A mammal species endemic to the Sierra Gorda is the Querétaro Pocket Gopher *(Pappogeomys neglectus),* whose habitat is restricted to the highlands of Pinal de Amoles.

Fish species endemic to the main watershed of the Pánuco River include the Mexican Tetra (*Astyanax mexicanus*), known locally as *sardinita* (little sardine), which is found in most streams of the SGBR; the Lantern Minnow (*Dionda ipni*), known locally as the *carpita* (little carp), which is found in the Río Verdito Arroyo and the Moctezuma River; the Cortez Swordtail (*Xhiphophorus cortezi*), also found in the Río Verdito Arroyo; and the *X. nigresins*, locally known as the *pez espada* (sword fish), confined to a stream near Carrizal de los Durán.

The distribution of the Dusky Splitfin (*Goodea gracilis*), considered a Vulnerable species on the IUCN's Red List, is restricted to the watershed of the Extoraz River; the Lowland Cichlid (*Herichthys carpintis*) is distributed in the Santa María River; the *H. labridens*, which is included in the NOM-059-ECOL-2001 as a threatened species and on the IUCN's Red List as Vulnerable, is found in the Santa María and Moctezuma rivers; the Buffalofish (*Ictiobus bubalus),* prized in the regional fishing industry and unfortunately a threatened species (NOM-059-ECOL-2001), has a restricted range of distribution in the Santa María River; the Bagre de Río Verde (*Ictalurus mexicanus*), also of regional fishing importance, is subject to special protected status (NOM-059-ECOL-2001) and listed as Vulnerable on the IUCN's Red List, with a distribution limited to certain zones of the Santa María River; the Bagre del Pánuco (*I. australis*) is a threatened species (NOM-059-ECOL-2001) with regional fishing importance that is distributed in the Santa María River.

The number of amphibian species endemic to Mexico is high, with 16 species, of which 10 have protection status.

d. areas that support significant concentrations of a species during any time in their lifecycle (e.g. migrations, feeding grounds, breeding areas).

The project zone is located on the migration route of the Monarch Butterfly *(Danaus plexippus)* and is part of the bio-corridor by which the monarch seasonally travels from Canada and the United States to its wintering sites in central Mexico. The zone also receives 93 species of Neotropical migrating birds that depend for their survival on the protection of the local biomes.

8.2. Globally, regionally or nationally significant large landscape-level areas where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance;

Especially in the eastern part of the project zone, in the principal cordillera of the Eastern Sierra Madre, which forms an enormous bio-corridor from the Moctezuma River to the Santa María River, a good part of the biological integrity has been conserved, as evidenced by extensive forest cover and the preponderance of the original components of its ecosystems. Clear evidence of this are the populations of Jaguars *(Panthera onca),* which are able to find shelter and nutritional sustenance, thus demonstrating the richness of the Sierra's ecosystems and food chains. To the best of our knowledge, the only species that has become extinct in the SGBR is the Spider Monkey *(Ateles geoffroyi vellerosus),* a previously abundant subspecies that lived on the eastern slope of the Sierra and that was wiped out through loss of habitat and hunting. This was a national-level extinction of the only native monkey species of northeastern Mexico.

8.3. Threatened or rare ecosystems;

Without doubt, the most valuable and threatened ecosystem sheltered by the Sierra Gorda is the cloud forest, which covers less than 1% of the national territory and which nevertheless sustains a highly diverse array of living organisms per surface unit. This ecosystem contains a rich mix of Neotropical and Nearctic species, in addition to endemic species that have evolved within it over time. Within the project zone, cloud forest "islands" can be found in five municipalities: Pinal de Amoles, Landa de Matamoros, Jalpan de Serra, Xilitla and Aquismón, located at altitudes that vary from 800 to 2,800 masl on slopes with a northeastern exposure. Even though these regions suffered a major assault from human activities in the past and many were cleared, the remaining areas are repositories of rich biodiversity with various threatened species endemic to this ecosystem.

Another ecosystem that is even more reduced in size are the high elevation shrub oak forests found on the peaks of two mountains — Cerro Grande and La Pingüica. Because these mountains are the highest peaks in the SGBR they sustain communities of shrubs — *Quercus microphylla*, *Arctostaphyllos pungens*, *Litsea glauscecens* — due to their cold and windy climate. It is possible that this ecosystem is a glacial relict. Nationally it occupies a minimal land surface.

8.4. Areas that provide critical ecosystem services (e.g. hydrological services, erosion control, fire control, and where a breakdown in these services would have serious, catastrophic or cumulative socio-economic or environmental impacts);

The entire project zone provides vital ecosystem services, including water production, biodiversity, scenic beauty, carbon capture and storage, soil formation and retention, and air decontamination. The production of water services is an example. The project zone is part of the watershed of the Pánuco River. It has been estimated that the SGBR, via the Moctezuma and Santa María rivers, provides the Pánuco more than 158.1 million cubic meters of water per year. Particularly productive are the highlands of the Sierra de Pinal de Amoles, the Sierra de la Florida in Arroyo Seco, and the main range of the Eastern Sierra Madre in the eastern part of the zone, the principal forest mass of the project zone. The forest mass ensures that surface water infiltrates where it is captured underground by the karst geology, recharging subterranean aquifers.

The protection and conservation of the SGBR is vital because it is an island of conservation when compared to the neighboring regions in other states and to the southern part of the state of Querétaro. If this effort fails, there will be severe socio-environmental fallout not only to the region but also to neighboring areas.

8.5. Areas that are fundamental for meeting the basic needs of local communities (e.g., for essential food, fuel, fodder, medicines or building materials without readily available alternatives); and

Due to the extensive migration of the labor force to the United States, ethnic and social characteristics, and the land ownership situation, basically each land owner satisfies his needs through the management of his or her own parcel of land or by remittances from the U.S. This is not an area in which the indigenous cultures carry out traditional management of the land. In addition, with the introduction of butane gas, the gathering of firewood has decreased significantly, thus significantly easing pressure on forests.

8.6. Areas that are critical for the traditional cultural identity of local communities (areas of cultural, ecological, economic or religious significance identified in collaboration with the local communities).

Does not apply for this area.

G2. Baseline Projections

Concept

A baseline projection is a description of expected conditions in the project zone in the absence of project activities. The project impacts will be measured against this "without-project" reference scenario.

Indicators

The project proponents must develop a defensible and well-documented "without-project" reference scenario that must:

1. Describe the most likely land-use scenario in the absence of the project following IPCC 2006 GL for AFOLU or a more robust and detailed methodology, describing the range of potential land-use scenarios and the associated drivers of GHG emissions and justifying why the land-use scenario selected is most likely.

This information is provided in Section B of the Project Design Document.

2. Document that project activities would not have been undertaken anyway, explaining how existing laws or regulations would likely affect land use and justifying that the benefits being claimed by the project are truly "additional", i.e. would be unlikely to occur without the project.

This information is provided in Section B of the Project Design Document.

3. Calculate the estimated carbon stock changes associated with the "without project" reference scenario described above. This requires estimation of carbon stocks for each of the land-use classes of concern and a definition of the carbon pools included, among the classes defined in the IPCC 2006 GL for AFOLU. The timeframe for this analysis can be either the project lifetime (see G3) or the project accounting period, whichever is more appropriate. Estimate the net change in the emissions of non-CO2 GHG emissions such as CH4 and N2O in the "without project" scenario if those gases are likely to account for more than 5% (in terms of CO2-eq.) of the project's overall GHG impact, or provide evidence that they will not account for more than 5% of the total project emissions reductions over each monitoring period.

This information is provided in Section B of the Project Design Document.

Projects generating carbon credits from activities that reduce GHG emissions going into the atmosphere (such as those reducing emissions from deforestation and forest degradation REDD, or avoiding conversion of non-forest land and certain improved forest management projects), must include an analysis of the relevant drivers and rates of deforestation and/or degradation and a description and justification of the approaches, assumptions and data used to perform this analysis. Regional-level estimates can be used at the project's planning stage as long as there is a

commitment to evaluate locally-specific carbon stocks and to develop a project-specific spatial analysis of deforestation/degradation using an appropriately robust and detailed carbon accounting methodology before the start of the project.

Does not apply for this project.

4. Describe how the "without project" reference scenario would affect communities in the project zone, including the impact of likely changes in water and soil and other locally important ecosystem services.

The "without project" reference scenario would adversely affect local communities in the following manner:

Water Capture: Communities would continue to experience greater direct runoff after rainfall events and lower stream and spring flow between events, lower water yield from streams and springs during drought periods, and decreased productivity of springs and streams as precipitation decreases and temperature increases with global warming.

Communities in the project zone are largely dependent on springs for water for drinking and other uses. Springs are expressions of groundwater where it reaches the land surface. Springs, especially those high in watersheds, are dependent on groundwater recharge to keep flowing throughout drought periods.

The quantity of groundwater available is dependent on whether rainfall infiltrates into the soil or runs off over the soil. Rainfall is more likely to infiltrate into the soil when its impact on the soil surface is low as a result of interception by tree crowns and understory vegetation, and when the soil contains high amounts of organic material that acts as a sponge to soak up water.

Without reforestation, the normally highly sloping pasture and agricultural lands in the Sierra Gorda lose topsoil. Loose topsoil, including organic matter is eroded, and subsoil with lower infiltration capacity becomes exposed. When this happens, the rate of infiltration during rainfall and total quantity of water infiltrating into the soil is reduced, [6] and underground aquifers receive less recharge. More water leaves watersheds as overland flow, which results in more flash floods and lower water availability during the annual six month or more periods without rainfall.

Soil Conservation: The communities in the project zone would experience continued high rates of erosion and consequently decreasing agricultural and livestock productivity. The eroded soils will continue to be deposited in downstream waterways, catchments, and reservoirs, especially the Jalpan Reservoir, which is the source of water for the city of Jalpan and other communities. Without the project there would be decreased capacity in the Reservoir and increased costs for removing sediments.

Temperature Regulation: The ecosystem service of local temperature regulation would continue at low levels in the project areas.

[6] Ventura (2008) provides extensive evidence that forests increase rates of infiltration as compared to areas without forest. In particular, see the section on modelling of Sierra Gorda watersheds beginning on page 61, in which infiltration was one of the hydrologic indicators analyzed.

Poverty Reduction: Communities in the project zone would continue to generate very low levels of income from the project areas, and participants would not receive payments for carbon capture. Linked to their low level of water capture and soil conservation as well as projections for increased temperatures and reduced precipitation from climate change, the already damaged project areas would continue to degrade, reducing their economic productivity and their contribution to the economic well-being of the community. In addition, under this scenario, the project areas would not make any contribution to reducing community expenses for the purchase of wood for domestic use.

Training: The participants in the project would not receive project-financed training for the establishment and management of reforestations, or the sustainable harvesting of wood products for domestic use.

Community Participation and Quality of Life: In the baseline scenario, the communities in the project zone would not receive project benefits of increased community participation and contribution to an improved quality of life. Instead, the pressures of migration, loss of local values and family separation and disintegration would continue on their present trajectory.

5. Describe how the "without project" reference scenario would affect biodiversity in the project zone (e.g., habitat availability, landscape connectivity and threatened species).

Without this project, there would be no forest cover in project areas, less forest connectivity around those areas and corresponding degraded habitat for desired forest species. Lower forest cover would reduce water quality through erosion and spring water quantity in dry months by diverting rainfall into overland flow instead of infiltration into soils. The continuation of farming on the project areas would result in erosion of topsoil into streams and waterways. At the end of their productive lives, agricultural fields would be converted into livestock pasture, compacting soil and preventing the regeneration of the natural forest plant communities. Overgrazing on these pastures often leads to local desertification and the development of ecosystems that do not serve as habitat for the naturally occurring forest species that once used these areas as their habitat.

G3. Project Design and Goals

Concept

The project must be described in sufficient detail so that a third-party can adequately evaluate it. Projects that operate in a transparent manner build confidence with stakeholders and outside parties and enable them to contribute more effectively to the project. Furthermore, transparent communication of the GHG emissions reductions or removals generated by the project is important to maintain the integrity of the carbon market. This includes reporting whether the carbon offsets are intended for sale within the regulatory or voluntary markets and how they will be registered or retired so that ownership can be tracked and double-counting avoided.

Indicators

The project proponents must:

1. Provide a summary of the project's major climate, community and biodiversity objectives.

Climate Objectives

1. To achieve net anthropogenic greenhouse gas removals by sinks of 100,134 tons of CO_2e through the year 2042 in reforestations in communities of extreme poverty
2. To increase the resilience of local communities to the impacts of climate change

Community Objectives

1. To increase water capture services in the project areas
2. To increase soil retention services in the project areas
3. To increase local temperature-regulation services in the project areas
4. To provide local residents with $9.8 million MXN ($817,000 USD) of new income through 2042 from carbon capture in reforestations in communities of extreme poverty
5. To provide 528 local residents with training and new skills[7]
6. To increase community participation and the quality of life in the project zone

Biodiversity Objectives

1. To reforest 305.7 ha with native species
2. To increase forest connectivity around project areas
3. To improve habitat conditions in project areas for desired forest species

2. Describe each project activity with expected climate, community and biodiversity impacts and its relevance to achieving the project's objectives.

Activity: Reforestation with native species of 305.7 hectares of lands that were deforested prior to 1990 for agricultural and livestock purposes. For a description of the technology to be employed, please see section A.5.4 of the PDD.

Relevance to climate objectives: This project activity will achieve net anthropogenic greenhouse gas removals by sinks of 100,134 tons of CO_2e through the year 2042 and increase the resilience of local communities to climate change by increasing water capture and moderating local temperature extremes.

Relevance to community objectives: This project activity will increase water capture, soil retention and local temperature-regulation services in the project areas, provide local residents with $9.8 million MXN ($817,000 USD) of new income through 2042, provide those residents with training on how to establish and manage reforestations, increase community participation in activities of conservation and contribute to an increased quality of life.

Relevance to biodiversity objectives: By reforesting with native species, the project will enhance forest cover and connectivity of forests that are more similar to natural forests in structure and composition than the simplified agroecosystems they replace, and improve habitat quality and potentially diversity of desired native forest species on the project areas.

Activity: Build and renovate water storage tanks in select communities

Relevance to community objectives: This project activity will increase water capture in communities with limited access to water.

[7] For each reforestation, it is estimated that one landholder and one family member will receive training.

Additional information relevant to this standard is provided in the project theory of change sections of indicators CM1.1 and B1.1.

3. Provide a map identifying the project location and geo-referenced boundaries of the project area(s), where the project activities will occur, of the project zone and of additional surrounding locations that are predicted to be impacted by project activities (e.g. through leakage).

Maps are provided in Section A.4 of the PDD, in a KML file and in Assessment of Land Condition/Suitability Sheets prepared for each reforestation parcel. The project zone includes the project area, adjacent communities and surrounding areas of the SGBR and of the adjoining municipalities of Xilitla and Aquismón in the state of San Luis Potosí. Leakage is not predicted to occur outside of the project area or zone. This will be confirmed during project implementation by the use of a leakage survey.

4. Define the project timeframe and crediting period and explain and justify any differences between them. Define an implementation schedule, indicating key dates and milestones in the project's development.

Project timeframe, crediting period and starting date are provided in Section A.9 of the PDD.

Implementation schedule

Start date: January 1, 1997
Initial proposals and studies for carbon projects: 1997
Reforestation dates: annually during rainy season, usually July-September
Preparation of Project Information Note and Project Quantification Document and Verification Protocol: 2004
First transaction in voluntary market: 2006
Implementation of internal verification procedures: annually
Preparation of Project Design Document using CDM small-scale format: 2008-2011
CCB and VCS validations: 2011
Subsequent CCB and VCS verifications: every 5 years
End date of project: 2042

5. Identify likely natural and human-induced risks to climate, community and biodiversity benefits during the project lifetime and outline measures adopted to mitigate these risks.

Risk: Climate change results in less precipitation for the project zone.

Mitigation measures

1. Reforestation in area of the SGBR with most natural springs to promote the recuperation of those springs
2. Reforestation in the upper watershed of the Jalpan Reservoir to reduce erosion and extend the useful life of the reservoir
3. Provision of water storage structures to select communities in exchange for reforestation commitments

Risk: Extreme weather events, fires, forest diseases and pests and illegal logging may threaten the permanence of project benefits

Mitigation measures

- 20% of the tCO_2e projected to be sequestered from each reforestation is withheld from transactions as part of a project self-insurance buffer. The tCO_2e in this buffer will be used to compensate for any non-permanence due to unplanned loss, as well as insufficient carbon capture in any reforestation.
- Training landholders in treatment of forest diseases and pests
- The parcels that compose the project area for reforestations are seldom contiguous and are located in different areas of the Sierra Gorda. As a result, forest fires, tree diseases and pests and local extreme weather events such as hurricanes are unlikely to affect a significant proportion of the project area.
- Contracts with participants specifically list vigilance of reforestations as one of the required management activities on the part of the participants and include requirements for replanting in the case of unexpected tree loss. The organizations of the Sierra Gorda Alliance for Conservation operate long-term successful programs of enforcement of environmental laws and regulations as well as environmental education with substantial community involvement that have resulted in substantial reduction of illegal logging in the area.

Risks:

- Worldwide economic downturn reduces income received by residents from migrants to the United States
- Worldwide drop in oil prices and demand would curtail government spending at all levels, including programs to promote reforestation.

Mitigation measures

The creation of an alternative source of income for project participants through payments for carbon sequestration helps to mitigate these risks.

For additional risk information, please see the application of the Verified Carbon Standard's tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination annexed to the Project Design Document.

6. Demonstrate that the project design includes specific measures to ensure the maintenance or enhancement of the high conservation value attributes identified in G1 consistent with the precautionary approach.

All of the proposed activities are designed to maintain or enhance the high conservation value attributes of the project zone. Please see indicators 1 and 2.

7. Describe the measures that will be taken to maintain and enhance the climate, community and biodiversity benefits through and beyond the project lifetime.

This is addressed in Section A.8 of the Project Design Document, the response to indicator 6, and by the application of the Verified Carbon Standard's tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination, annexed to the Project Design Document.

The best guarantee of long-term project benefits, however, is the strength of the institutions that comprise the Sierra Gorda Alliance for Conservation, which utilizes a co-management model of

conservation involving both the government and civil society, and which has a long-term successful trajectory of promoting conservation and sustainable development.

8. Document and defend how communities and other stakeholders potentially affected by the project activities have been identified and have been involved in project design through effective consultation, particularly with a view to optimizing community and stakeholder benefits, respecting local customs and values and maintaining high conservation values. Project developers must document stakeholder dialogues and indicate if and how the project proposal was revised based on such input. A plan must be developed to continue communication and consultation between project managers and all community groups about the project, its impacts and potential adaptation of implementation throughout the life of the project.

Consultation of stakeholders is addressed in Section F of the PDD.

Ongoing consultation between project managers and stakeholders will take place through the SGBR Advisory Council and its Productive Projects Committee, which include representatives from the three levels of government as well as community representatives.

9. Describe what specific steps have been taken, and communications vehicles used, to publicize the CCBA public comment period to the communities and to other stakeholders and facilitate their submission of comments to CCBA. Project proponents must play an active role in distributing key project documents to affected communities and stakeholders and hold widely publicized information meetings in relevant local or regional languages.

Newspaper announcements and radio spots were utilized to publicize the CCBA public comment period to the communities and other stakeholders, and a public information meeting was held. Summaries of key information were distributed in Spanish to stakeholders, and community members without internet access could submit comments in writing to the Sierra Gorda Alliance for Conservation for subsequent submission to CCBA. The CCBA document was placed on the Sierra Gorda website for downloading and notification of its presence was sent to the Climate-L Listserve.

10. Formalize a clear process for handling unresolved conflicts and grievances that arise during project planning and implementation. The project design must include a process for hearing, responding to and resolving community and other stakeholder grievances within a reasonable time period. This grievance process must be publicized to communities and other stakeholders and must be managed by a third party or mediator to prevent any conflict of interest. Project management must attempt to resolve all reasonable grievances raised, and provide a written response to grievances within 30 days. Grievances and project responses must be documented.

Formal procedures for handling conflicts and grievances that meet all requirements of this standard have been established and will be distributed to all project participants. Written documentation of all conflicts and grievances will be maintained and made available for review by external auditors during subsequent external verifications of the project.

11. Demonstrate that financial mechanisms adopted, including projected revenues from emissions reductions and other sources, are likely to provide an adequate flow of funds for project implementation and to achieve the anticipated climate, community and biodiversity benefits.

This information was provided as financial projections for the project. The financial projections are confidential and are not to be distributed without prior approval.

G4. Management Capacity and Best Practices

Concept

The success of a project depends upon the competence of the implementing management team. Projects that include a significant capacity-building (training, skill building, etc.) component are more likely to sustain the positive outcomes generated by the project and have them replicated elsewhere. Best practices for project management include: local stakeholder employment, worker rights, worker safety and a clear process for handling grievances.

Indicators

The project proponents must:

1. Identify the project proponent and the composition and governance of the management entity describing the roles and responsibilities of the participating organizations or individuals where appropriate.

The project proponent is Bosque Sustentable. Key partners include other members of the Sierra Gorda Alliance for Conservation, such as Grupo Ecológico and SGBR.

Bosque Sustentable forestry promoters are responsible for the field work with the project participants, including the establishment and management of the reforestations. The promoters are also responsible for implementation of the monitoring plan. A forestry engineer of Bosque Sustentable is responsible for field supervision of the forestry organizers, training, the review and processing of the data, the carbon calculations, the preparation of monitoring reports and the overall supervision of the monitoring program. Both the forestry engineer and the director of Bosque Sustentable have responsibilities for the development and implementation of reforestation management programs. Bosque Sustentable will be the organization that signs contracts with community participants to receive carbon rights and will execute transactions with project donors seeking the retirement of offsets.

Grupo Ecológico, through the operation of the Sierra Gorda Earth Center, will provide education and training services related to the project in coordination with Bosque Sustentable, as well as provide assistance with the marketing and promotion of the carbon offsets being generated by the project.

The SGBR will participate in overall project coordination and support Bosque Sustentable with activities involving enforcement of environmental laws and regulations, and combating of fires and forest diseases and pests.

2. Document key technical skills that will be required to implement the project successfully, including community engagement, biodiversity assessment and carbon measurement and monitoring skills. Document the management team's expertise and prior experience implementing land management projects at the scale of this project. If relevant experience is lacking, the proponents must demonstrate how other organizations will be partnered with to support the project and/or have a recruitment strategy to fill the gaps.

Key technical skills required and their source:

- Carbon measurement and monitoring skills will be provided by Marco Miguel, forestry engineer of Bosque Sustentable.

- Sustainable forestry management and community engagement and training skills will be provided by staff of Bosque Sustentable with support of Grupo Ecológico.

- Fund raising, promotion and negotiation skills will be provided by the general director and fund raising and public relations coordinator of Grupo Ecológico.

- Biodiversity and hydrological assessment skills will be provided by expert staff of Bosque Sustentable and Grupo Ecológico.

Please see Annex 1 for curricula vitae of the Grupo Ecológico, Bosque Sustentable, their directors and key staff.

3. Include a plan to provide orientation and training for the project's employees and relevant people from the communities with an objective of building locally relevant skills and knowledge to increase local participation in project implementation, ensuring that capacity building targets a wide range of people in the communities including minority and underrepresented groups.

I. Training plan for Bosque Sustentable staff

Staff responsible: Gabriel Domínguez Cabrera and Marco Antonio Miguel Martínez

Topics to be covered:

1. Promotion of project among communities.
2. Participation requirements.
3. Financial and other benefits for communities.
4. Contracts between Bosque Sustentable and reforesters.
5. Determining the size and location of reforestations, including the use of GPS.
6. Techniques for establishment of reforestations.
7. Documentation requirements.
8. Management of reforestations: replanting, weeding, pruning, thinning, etc.
9. Monitoring plan for carbon. (Marquez, 2000 and/or Pearson et al, 2005 will serve as training manuals.)
10. Leakage monitoring.
11. Monitoring plan for community benefits. (Training to be implemented following development of full monitoring plan.)
12. Monitoring plan for biodiversity benefits. (Training to be implemented following development of full monitoring plan)
13. Information management and quality control procedures.

Date: January 17, 2011

Staff responsible: Marco Antonio Miguel and Avram Primack.

Topics covered:

1. Use of GPS in the field.
2. Basic tools for field sampling.
3. Basic concepts for decision-making during field sampling.
4. Use of field formats.
5. Field practice.

Date: January 15 and 24-25, 2011

Staff responsible: David Flores and Miguel Martinez

Topics covered:

1. Management of database utilizing Access.
2. Identification and correction of errors in the operating processes of the project.
3. Project implementation steps.

II. Training plan for reforesters

A. Individual training

Personalized training is provided to each reforester in the field by Bosque Sustentable promoters.

Dates: Numerous dates, prior to and during the establishment of the reforestations and their management.

Staff responsible: Bosque Sustentable promoters

Topics covered:

1. Participation requirements.
2. Financial benefits.
3. Contracts between Bosque Sustentable and reforesters.
4. Techniques for establishment of reforestations.
5. Documentation requirements.
6. Management of reforestations: replanting, weeding, pruning, thinning, etc.

B. Group training

Group training is provided periodically at the Sierra Gorda Earth Center.

Date: August 21, 2009

Staff responsible: Gabriel Domínguez Cabrera, Marco Antonio Miguel Martínez, Martha Isabel Ruiz Corzo and Mariana Reyna

Topics covered:

1. Carbon capture. *Mariana Reyna and Martha Isabel Ruiz Corzo*
2. Rights and obligations. *Gabriel Domínguez Cabrera*

3. Requirements for entering the program. *Gabriel Domínguez Cabrera*

Date: November 6, 2009

Staff responsible: Gabriel Domínguez Cabrera, Marco Antonio Miguel Martínez, Martha Isabel Ruiz Corzo and David Ross

Topics covered:

1. Carbon capture. *Mariana Reyna and Martha Isabel Ruiz Corzo*
2. Rights and obligations. *Gabriel Domínguez Cabrera*
3. Requirements for entering the program. *Gabriel Domínguez Cabrera*
4. Signing of contracts with reforesters. *Marco Antonio Miguel Martínez and Martin Granadero,* legal representative of Bosque Sustentable A.C.
5. Payments to reforesters. *Marco Antonio Miguel Martínez*

Date: February 20, 2010

Staff responsible: Gabriel Domínguez, Marco Miguel, Martha Isabel Ruiz Corzo and David Ross

Topics covered:

1. Project overview.
2. Participation requirements.
3. Management requirements.
4. Financial benefits.
5. Contracts.
6. Carbon measurement.

Date: May 20, 2010

Title of workshop: Carbon Dioxide Capture by Small Rural Producers

Topics covered and staff responsible:

1. The biological process of carbon capture and fixation in plants and trees. *Mariana B. Reyna.*
2. ¿What are the provisions of the contracts between Project participants and Bosque Sustentable A.C.? *Gabriel Domínguez*
3. Project participation requirements. *Marco Miguel.*
4. Field practice: ¿How is carbon monitored on the reforestation sites? *Gabriel Domínguez.*

Date: October 8, 2010

Staff responsible: Gabriel Domínguez Cabrera and Marco Antonio Miguel Martínez

Topics covered:

1. ¿What are the provisions of the contracts between Project participants and Bosque Sustentable A.C.? *Gabriel Domínguez*

2. Project participation requirements. *Marco A. Miguel*
3. Signing of contracts. *Diana Marín, Marco A. Miguel* and *Francisco Sarabia*, legal representative, Bosque Sustentable A.C.

Date: March 9, 2011

Staff responsible: Martha Isabel Ruiz Corzo, Marco Miguel, David Ross, Oscar Estrada and Magdalena Ramírez

Topics covered:

1. Overview of project *Martha Isabel Ruiz Corzo*
2. The project in the communities *Marco A. Miguel*
   * Participation requirements
   * Responsibilities of participants
   * Role of Bosque Sustentable
3. Markets, validation, benefits and legal arrangements *David Ross*
4. Questions and comments
5. Reception of payments *Oscar Estrada and Magdalena Ramírez*

As this project is implemented in communities of high and very high levels of poverty, almost all participants are considered part of underrepresented groups in the state and national economy.

4. Show that people from the communities will be given an equal opportunity to fill all employment positions (including management) if the job requirements are met. Project proponents must explain how employees will be selected for positions and where relevant, must indicate how local community members, including women and other potentially underrepresented groups, will be given a fair chance to fill positions for which they can be trained.

All employment activities involving reforestation establishment and management are carried out by the participating landowners, landholders, *ejidatarios* and *comuneros* who in some cases may contract the services of neighbors. As opening for management and technical staff positions of Grupo Ecológico and Bosque Sustentable occur, people from the communities will be given an equal opportunity to fill those positions. Future openings for employment positions with the project will be publicized locally. Staff will be selected based upon criteria of education, training, job experience and other employment-related attributes. The policy of the Sierra Gorda Alliance for Conservation is to provide preference to local community members when job requirements are equally met by various candidates.

As this project is implemented in communities of high and very high levels of poverty, almost all participants are considered part of underrepresented groups in the state and national economy.

5. Show that the project will inform workers about their rights and guarantee that the project meets or exceeds all applicable laws and/or regulations covering worker rights.

In the case of employees of Bosque Sustentable and Grupo Ecológico, the project meets the following laws and regulations covering worker rights:

a. Federal Labor Law,

b. Payment of taxes in accordance with the regulations of the Ministry of Finance and Public Credit, and
c. Mexican Institute for Social Security Law.

In the case of project participants in the communities, they are receiving payments for their management activities, for which the project meets the requirements established by the Ministry of Finance and Public Credit.

Employees are informed of their rights and obligations during the hiring process, and community participants are informed of their rights and obligations during meetings to explain the operation of the program as well as prior to signing individual contracts.

6. Comprehensively assess situations and occupations that pose a substantial risk to worker safety. A plan must be in place to inform workers of risks and to explain how to minimize such risks. Where worker safety cannot be guaranteed, project proponents must show how the risks will be minimized using best work practices.

A Risk Prevention and Mitigation Plan has been prepared and will be incorporated into the project training plan. Please see Annex 8.

7. Document the financial health of the implementing organization(s) to demonstrate that financial resources budgeted will be adequate to implement the project.

The development of this pilot project has received financial backing from established NGOs, government sources and international organizations, and its ongoing operation will be financed by donations for carbon offsets in the voluntary carbon market, a number of which have already been received. A 30-year financial projection has been prepared and has been made available to the CCB auditors. This information is considered confidential.

G5. Legal Status and Property Rights

Concept

The project must be based on a solid legal framework (e.g., appropriate contracts are in place) and the project must satisfy applicable planning and regulatory requirements.

During the project design phase, the project proponents should communicate early on with relevant local, regional and national authorities in order to allow adequate time to earn necessary approvals. The project design should be sufficiently flexible to accommodate potential modifications that may arise as a result of this process.

In the event of unresolved disputes over tenure or use rights to land or resources in the project zone, the project should demonstrate how it will help to bring them to resolution so that there are no unresolved disputes by the start of the project.

Indicators

Based on information about current property rights provided in **G1**, the project proponents must:

1. Submit a list of all relevant national and local laws and regulations in the host country and all applicable international treaties and agreements. Provide assurance that the project will comply with these and, where relevant, demonstrate how compliance is achieved.

Relevant national laws and regulations

- **Decree of the establishment of the Sierra Gorda Biosphere Reserve (May 19, 1997)**
- **Sierra Gorda Biosphere Reserve Management Program (September 1999)**

The decree divides the SGBR into 11 core-protected areas and one buffer zone, while the management program further divides the buffer zone into subzones of controlled use, sustainable use and intensive use and identifies the administrative regulations and management activities corresponding to each classification. The project areas of reforestations are all in zones of sustainable use. Approval of all project activities by the director of the SGBR assures compliance with applicable regulations.

Following is a list of laws, decrees, regulations and other legal dispositions applicable to activities within the SGBR or its area of influence:

1. Political Constitution of the United States of Mexico
2. Law of Federal Public Administration
3. General Law of Ecologic Equilibrium and Protection of the Environment
4. General Law of Sustainable Forestry Development
5. General Law of Wildlife
6. National Waters Law
7. Law of Biosecurity and Genetically Modified Organisms
8. Federal Law of Rights
9. Expropriation Law
10. General Law of National Property
11. Federal Penal Code (Provisions Relating to Environmental and Patrimonial Matters)
12. Internal Regulations of the Ministry of Environment and Natural Resources
13. Regulations of the National Waters Law
14. Regulations of the General Law of Ecologic Equilibrium and Protection of the Environment, in matters of Natural Protected Areas
15. Regulations of the General Law of Ecologic Equilibrium and Protection of the Environment, in matters of Evaluation of Environmental Impact
16. Regulations for the Protection of the Environment against Noise Pollution
17. Regulation of Environmental Impact and Risk
18. Regulations of the General Law of Sustainable Forestry Development
19. Regulations of the Institute of Administration and Valuation of National Property
20. Agreement regarding procedures and services entered in the Federal Register of Procedures and Services that apply to the Ministry of Environment and Natural Resources
21. Intergovernmental Treaty that serves as a Framework for National Action and International Cooperation in favor of the Conservation and Rational Use of Wetlands and their Resources
22. Mexican Official Rule NOM-059-SEMARNAT-2001. Environmental Protection- Mexican Native Species of Wild Flora and Wildlife – Categories of risk and specifications for their inclusion, exclusion or change- List of species at risk (Official Journal of the Federation, February 13, 2002).

Applicable international treaties and agreements

- **United Nations Framework Convention on Climate Change (1992)**
- **Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997)**

Although designed for the voluntary market with elements not contemplated under the Clean Development Mechanism of the Kyoto Protocol, the project contributes to UNFCC's goal of stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

- **Convention on Biological Diversity (1992)**

The project contributes to the convention goals of conservation of biological diversity and the sustainable use of its components.

- **United Nations Convention to Combat Desertification (1994)**

The project contributes to the convention's goals by restoring vegetation, increasing water capture and availability for local communities and decreasing soil erosion on degraded lands.

- **Millenium Development Goals (2000)**

The project contributes to the following millennium development goals:

i. Goal 1: Eradicate extreme poverty and hunger
ii. Goal 7: Ensure environmental sustainability
iii. Goal 8: Develop a global partnership for sustainability

2. Document that the project has approval from the appropriate authorities, including the established formal and/or traditional authorities customarily required by the communities.

The project has been approved by the director of the SGBR. When the reforestation management plans are developed, approval will be obtained from the corresponding authority. For common-use areas of *ejidos*, acts of the *ejido* assemblies will be obtained authorizing the use of lands for this project. For community lands, documents will be required accrediting the use of the property by the participants according to the uses and customs of the community. For small private property and parceled *ejido* lands, no additional approvals are required.

3. Demonstrate with documented consultations and agreements that the project will not encroach uninvited on private property, community property, or government property and has obtained the free, prior, and informed consent of those whose rights will be affected by the project.

Participation in the program is completely voluntary, and the landholders, landowners, *ejidatarios* and *comuneros* themselves establish and manage the plantations. In cases in which the title of the property is not in the name of the participant, the participant must obtain a certificate of possession from the local municipal authority to demonstrate his or her legitimate possession of the land.

4. Demonstrate that the project does not require the involuntary relocation of people or of the activities important for the livelihoods and culture of the communities. If any relocation of habitation or activities is undertaken within the terms of an agreement, the project proponents must demonstrate that the agreement was made with the free, prior, and informed consent of those concerned and includes provisions for just and fair compensation.

The project does not involve any relocation of people, and all lands will remain in the possession of local residents. Participation is completely voluntary. In most cases, landowners, landholders, *ejidatarios* and *comuneros* participate with only a part of their land, maintaining other areas to meet their housing, agricultural or livestock needs. The project proponent discusses openly and honestly with project participants that carbon and ecosystem services income is not currently adequate to provide a sufficient living income and that participants should maintain areas with uses necessary to meet their livelihood needs. In all cases, participants are fully informed of their obligations and are provided with compensation.

5. Identify any illegal activities that could affect the project's climate, community or biodiversity impacts (e.g., logging) taking place in the project zone and describe how the project will help to reduce these activities so that project benefits are not derived from illegal activities.

The activities of illegal logging and illegal hunting and capture of wildlife are discussed in the section on threats to biodiversity and other natural resources of Indicator G.1.7. The project activities are specifically designed to help further reduce these illegal activities through vigilance and the provision of communities with alternative income sources, thus reducing pressure on local resources. The organizations of the Sierra Gorda Alliance for Conservation operate long-term successful programs of enforcement of environmental laws and regulations as well as environmental education with substantial community involvement that have resulted in high levels of support for conservation among area residents, as well as a substantial reduction of illegal activities.

6. Demonstrate that the project proponents have clear, uncontested title to the carbon rights, or provide legal documentation demonstrating that the project is undertaken on behalf of the carbon owners with their full consent. Where local or national conditions preclude clear title to the carbon rights at the time of validation against the Standards, the project proponents must provide evidence that their ownership of carbon rights is likely to be established before they enter into any transactions concerning the project's carbon assets.

Bosque Sustentable utilizes clearly defined requirements for the documentation of land possession rights by all participants and also utilizes legal contracts with participants that include a clause stating that in the case of transference of the property to a third party, the obligations of the contract shall be transferred to the new landowner or landholder. A sample contract has been provided to the CCB auditor and is considered confidential.

CLIMATE SECTION

CL1. Net Positive Climate Impacts

Concept

The project must generate net positive impacts on atmospheric concentrations of greenhouse gases (GHGs) over the project lifetime from land use changes within the project boundaries.

Indicators

The project proponents must:

1. Estimate the net change in carbon stocks due to the project activities using the methods of calculation, formulae and default values of the IPCC 2006 GL for AFOLU or using a more robust and detailed methodology. The net change is equal to carbon stock changes *with* the project minus carbon stock changes *without* the project (the latter having been estimated in G2). This estimate must be based on clearly defined and defendable assumptions about how project activities will alter GHG emissions or carbon stocks over the duration of the project or the project GHG accounting period.

This information is provided in Section C of the PDD.

2. Estimate the net change in the emissions of non-CO2 GHG emissions such as CH4 and N2O in the *with* and *without* project scenarios if those gases are likely to account for more than a 5% increase or decrease (in terms of CO2-equivalent) of the project's overall GHG emissions reductions or removals over each monitoring period.

Changes in non-CO_2 GHG emissions are not significant.

3. Estimate any other GHG emissions resulting from project activities. Emissions sources include, but are not limited to, emissions from biomass burning during site preparation, emissions from fossil fuel combustion, direct emissions from the use of synthetic fertilizers, and emissions from the decomposition of N-fixing species.

Burning for site preparation and synthetic fertilizers are not utilized in the project. Estimation of emissions from fossil fuel combustion is not required by the small-scale A/R methodology selected, and decomposition of N-fixing species is not significant.

4. Demonstrate that the net climate impact of the project is positive. The net climate impact of the project is the net change in carbon stocks plus net change in non-CO2 GHGs where appropriate minus any other GHG emissions resulting from project activities minus any likely project-related unmitigated negative offsite climate impacts (see CL2.3).

This information is provided in Section C.5 of the PDD.

5. Specify how double counting of GHG emissions reductions or removals will be avoided, particularly for offsets sold on the voluntary market and generated in a country with an emissions cap.

GHG removals are always identified with their corresponding reforestation, which is given a unique identifier based on the year and a number assigned to each polygon as it is entered into the database. This information has been made available for review by CCB auditors.

CL2. Offsite Climate Impacts ('Leakage')

Concept

The project proponents must quantify and mitigate increased GHG emissions that occur beyond the project area and are caused by project activities (commonly referred to as 'leakage').

Indicators

The project proponents must:

1. Determine the types of leakage that are expected and estimate potential offsite increases in GHGs (increases in emissions or decreases in sequestration) due to project activities. Where relevant, define and justify where leakage is most likely to take place.

Though leakage is not expected, a survey of landholders' practices will be undertaken. The ex-ante estimate of leakage is 0 tCO_2e. Details are provided in Section A.5.6, Sections B.8 and B.8.1, and Section C.3 of the PDD.

2. Document how any leakage will be mitigated and estimate the extent to which such impacts will be reduced by these mitigation activities.

Project measures to minimize leakage are described in Section A.5.6 of the PDD.

3. Subtract any likely project-related unmitigated negative offsite climate impacts from the climate benefits being claimed by the project and demonstrate that this has been included in the evaluation of net climate impact of the project (as calculated in CL1.4).

This ex-ante estimate of leakage is zero. Sections B.8 and B.8.1 of the PDD explain how this will be monitored and subtracted in the future if necessary.

4. Non-CO2 gases must be included if they are likely to account for more than a 5% increase or decrease (in terms of CO2-equivalent) of the net change calculations (above) of the project's overall off-site GHG emissions reductions or removals over each monitoring period.

Non-CO_2 gases will not account for more than a 5% increase or decrease of the net change calculations of the project's overall off-site GHG emissions removals over each monitoring period.

CL3. Climate Impact Monitoring

Concept

Before a project begins, the project proponents must have an initial monitoring plan in place to quantify and document changes (within and outside the project boundaries) in project-related carbon pools, project emissions, and non-CO2 GHG emissions if appropriate. The monitoring plan must identify the types of measurements, the sampling method, and the frequency of measurement.

Since developing a full monitoring plan can be costly, it is accepted that some of the plan details may not be fully defined at the design stage, when projects are being validated against the Standards. This is acceptable as long as there is an explicit commitment to develop and implement a monitoring plan.

Indicators

The project proponents must:

1. Develop an initial plan for selecting carbon pools and non-CO2 GHGs to be monitored, and determine the frequency of monitoring. Potential pools include aboveground biomass, litter, dead wood, belowground biomass, wood products, soil carbon and peat. Pools to monitor must include any pools expected to decrease as a result of project activities, including those in the region outside the project boundaries resulting from all types of leakage identified in CL2. A plan must be in place to continue leakage monitoring for at least five years after all activity displacement or other leakage causing activity has taken place. Individual GHG sources may be considered 'insignificant' and do not have to be accounted for if *together* such omitted decreases in carbon pools and increases in GHG emissions amount to less than 5% of the total CO2-equivalent benefits generated by the project. Non-CO2 gases must be included if they are likely to account for more than 5% (in terms of CO2-equivalent) of the project's overall GHG impact over each monitoring period. Direct field measurements using scientifically robust sampling must be used to measure more significant elements of the project's carbon stocks. Other data must be suitable to the project site and specific forest type.

The application of the monitoring methodology and monitoring plan to the project activity is described in Section B.8 of the PDD.

2. Commit to developing a full monitoring plan within six months of the project start date or within twelve months of validation against the Standards and to disseminate this plan and the results of monitoring, ensuring that they are made publicly available on the internet and are communicated to the communities and other stakeholders.

The full monitoring plan for CCB validation has already been developed and is presented in the PDD. Results of monitoring will be made publicly available on the internet and communicated to the communities and other stakeholders.

COMMUNITY SECTION

CM1. Net Positive Community Impacts

Concept

The project must generate net positive impacts on the social and economic well-being of communities and ensure that costs and benefits are equitably shared among community members and constituent groups during the project lifetime.

Projects must maintain or enhance the High Conservation Values (identified in **G1**) in the project zone that are of particular importance to the communities' well-being**.**

Indicators

The project proponents must:

1. Use appropriate methodologies to estimate the impacts on communities, including all constituent socio-economic or cultural groups such as indigenous peoples (defined in G1), resulting from planned project activities. A credible estimate of impacts must include changes in community well-being due to project activities and an evaluation of the impacts by the affected groups. This estimate must be based on clearly defined and defendable assumptions about how project activities will alter social and economic well-being, including potential impacts of changes in natural resources and ecosystem services identified as important by the communities (including water and soil resources), over the duration of the project. The 'with project' scenario must then be compared with the 'without project' scenario of social and economic well-being in the absence of the project (completed in G2). The difference (i.e., the community benefit) must be positive for all community groups.

a) Background and context

The carbon sequestration project is a component of a larger project for the conservation of biodiversity and promotion of sustainable development in the SGBR and its area of influence. The 1997 starting date for CCB validation is the same as the year of the decree of the SGBR by the Mexican government. The carbon capture project and related biodiversity impacts were among the themes discussed at the numerous participatory public meetings that led to the establishment of the SGBR and development of the SGBR Management Program using an objectives oriented project planning methodology (INE, 1999). The carbon sequestration project is an explicit component of this Management Program, which contains relevant evaluation indicators. Impacts on communities and biodiversity have been monitored and reported according to requirements of responsible federal agencies (SEMARNAP, SEMARNAT and CONANP) and project donors.

In 2000, a full-scale project of the Global Environment Facility (GEF) was developed utilizing GEF's Logical Framework Approach project design methodology. This project, Biodiversity Conservation in the Sierra Gorda Biosphere Reserve, was implemented from 2001-2009. The GEF project was implemented by the United Nations Development Programme (UNDP) and executed by the Ministry of Environment and Natural Resources (SEMARNAT) through the National Commission of Natural Protected Areas (CONANP) and subcontracts with the Mexican NGOs Grupo Ecológico and Bosque Sustentable and other complementary subcontracts. The development of the carbon capture project was a specific component of the GEF project (see Project Document, GEF, 2000), and the preliminary

results of the carbon capture project were among those monitored and evaluated during project implementation and in the final project evaluation (Vela, Plaza and Muench, 2009). It was during the GEF project that a Project Information Note (PIN), Project Quantification Document and Verification Protocol were prepared, that the first transaction in the voluntary market was achieved, and that the decision was made to seek joint CCB and VCS validation. Early drafts of the PDD were developed that included indicators for estimating and monitoring community and biodiversity impacts, and all indicators were developed consistent with UNDP-GEF requirements for results-oriented monitoring and evaluation (UNDP Evaluation Office, 2002).

Since the end of the GEF project, the carbon project has continued to be implemented as part of the SGBR Management Program. It is now also a part of part of the project of "Support for the Recharge and Rehabilitation of Priority Water Springs in the SGBR," sponsored by the Río Arronte Foundation, and the project of "Restoration of Watersheds, Soil Regeneration, Water Storage, Carbon Capture and Development of Productive Projects in the SGBR," sponsored by Bombardier Aerospace, México (GESG, 2010a; GESG, 2006; GESG, 2010b; and GESG 2011). These projects are discussed in more detail in GL1.4.

The implementation of the carbon capture project in coordination with these larger more integrated efforts means that the project is contributing to biodiversity and community benefits much broader than those presented in this PDD. For external evaluations of the benefits of the broader Sierra Gorda project, please see the final evaluation of the GEF project (Vela, Plaza and Muench, 2009) as well as the Sierra Gorda Social Return on Investment Analysis Report prepared by the Social Venture Technology Group (Galimidi and Olsen, 2007).

Table 11 summarizes the most important steps in the development of the carbon capture project:

Table 11: Development of the carbon capture project

Dates	Development of carbon project
1997	Project start date Initial proposals and studies
1999	Project included in SGBR Management Program , developed with objectives oriented project planning methodology of INE
2000	Carbon project included in development of GEF project with Logical Framework Approach project design methodology
2001-2009	Carbon project implemented as part of SBGR Management Program and UNDP-GEF project
2004	Preparation of Project Information Note, Project Quantification Document and Verification Protocol
2006	First transaction in voluntary market
2008	Letter of commitment for CCB and VCS validation
2008-2011	Preparation of Project Design Documents
2009-present:	Implemented as part of SGBR Management Program and other integrated projects

b) Project theory of change

The project proponent used what is known as a "theory of change" or "causal model" methodology for project design and assessment of community impacts. This was done with broad participation from communities, representatives of local, state and federal government agencies, and other stakeholders. As original conditions and baseline projections are presented in more detail in other sections of this document, this section focuses more specifically on the community-impacts causal chain, which can be summarized as follows.

The starting social conditions are project participants that live in communities with few sources of income and high levels of poverty and marginalization. There are low levels of participation in conservation activities and although living in an area that supports forests, project participants lack the training and resources necessary to establish and manage reforestations and enter markets for ecosystem services. The starting conditions for natural resources identified as important by the communities include high levels of water runoff from project areas after rainfall events, low stream and spring flows between events and during drought periods, high levels of erosion and sedimentation of streams and a local reservoir, and a lack of temperature regulation services that forests provide, with conditions expected to deteriorate as a result of climate change. By providing the project participants with materials and training for establishing and managing reforestations, as well as providing them with professional services for the quantifying of carbon capture and entering voluntary carbon markets, there will be new household income, increased participation in conservation activities, improved natural resources important to the communities and an improved quality of life. Table 12 presents a summary of the community-impacts causal chain that shows the connection between activities, outputs, outcomes and impacts.

Table 12: Summary of project's causal chain for community impacts

Impacts	$9.8 million MXN ($817,000 USD) of new household income through 2042 from carbon capture in reforestations in communities of extreme poverty[8]
	Improvement in quality of life
	Increased access to water for domestic and animal use from water storage tanks in select communities
	Increased water infiltration and lower direct runoff
	Longer periods of flow in streams during droughts
	More even and predictable water production from local and regional water springs even with global warming
	Lower levels of erosion from project areas and decreased levels of sedimentation in streams and the Jalpan Reservoir
	Moderation of temperature extremes
	Increased resiliency to climate change impacts
Outcomes	305.7 hectares of new forest areas
	Diversification of income sources
	528 people with new skills in forest management
	Greater community participation in conservation activities
	Additional capture of rainwater in storage tanks in select communities
Outputs	305.7 hectares planted and managed
	528 people trained on the establishment and management of reforestations and the sustainable use of wood from thinning activities for domestic use
	528 people participating in a new conservation activity
	Donations received for retirement of carbon offsets
	Payments to 264 project participants
	Water storage tanks built and renovated in select communities
	Monitoring and verification reports on community benefits
Activities	Plant 305.7 hectares with native tree species from 1997-2013
	Prepare and implement reforestation management plans that permit domestic use of wood from thinning activities from 2011-2042
	Train 528 project participants and family members on the establishment and management of reforestations and the sustainable use of wood from thinning activities for domestic use from 1997-2042
	Sign contracts with landholders to receive carbon rights, establish mutual rights and responsibilities and calendar of payments from 2007-2014
	Implement a promotion and public relations campaign to obtain donations for retirement of carbon offsets from 2006-2014
	Pay 264 project participants for their services of reforestation plantation and management
	Build and renovate water storage tanks in select communities
	Prepare and implement community benefits monitoring plan from 2011-2042

[8] Although some community impact assessments manuals make the case that increased household income is an outcome rather than an impact, other expert sources do consider it an impact. For example, see GEF Evaluation Office, p. 8.

The activities are the practical, time-bound actions that the project carries out to deliver the desired project outputs. These include planting trees, preparing and implementing management plans, training, signing contracts, obtaining donations for carbon offsets, paying project participants for their services, building and renovating water tanks, and preparing and implementing a monitoring plan. If carried out, these activities will then logically result in the project outputs, which are defined as the goods and services that the project must deliver in order to achieve the project outcomes. Outputs are within the direct control of the project to deliver. They include planted and managed reforestations, people trained, people participating in a new conservation activity, donations received, payments to project participants, water tanks built and renovated, and monitoring and verification reports. If properly produced, the project outputs will logically result in the project outcomes, which are defined as the short to medium term behavioral or systemic effects that the project makes a contribution towards, and that are designed to help achieve the project's impacts. Achievement of outcomes will be influenced both by project outputs and additional factors that may be outside the direct control of the project. The project outcomes include new areas of forest, diversification of income sources, people with new skills in forest management, greater community participation in conservation activities and additional capture of rainwater in storage tanks. If the project outcomes are achieved, then logically the project will contribute to the achieving the project impacts, which are defined as fundamental and durable changes in the condition of people and their environment brought about by the project. A project will only expect to contribute to the achievement of impact, and often the impact will only be realized many years after project completion. Project impacts include new household income, an improvement in quality of life, increased access from water tanks, as well as various community natural resource impacts. (For the source of the definitions utilized, please see GEF Evaluation Office, 2009, p.8)

c) Poverty reduction, training of the local population, community participation and improvement in the quality of life

Selection of benefits to evaluate

As demonstrated above, these social community benefits can be derived from the project's theory of change and fall into the categories of outcomes and impacts. These benefits have been identified as important by the residents of the SGBR and multiple stakeholder groups, and evidence of this is provided by the SGBR management program (INE, 1999) and the Project Document of the GEF project (GEF, 2000). Table 13 contrasts the "without-project" scenario described in G2 to the "with-project" scenario that will result from the implementation of the project described in G3. The final column summarizes the expected net community benefits, all of which are positive.

Table 13: Social benefits for communities

Social benefits for communities	Without project	With project	Community benefits
Poverty reduction	* already low levels of income from agricultural activities on the project areas decline further * sources of income remain limited	* $9.8 million MXN ($817,000 USD) of new income through 2042 from carbon capture in reforestations in communities of extreme poverty	* increased income levels in communities of project zone * diversification of income sources

Training	* project participants do not receive training	* 528 project participants and family members receive training for the establishment and management of reforestations and the sustainable use of wood from thinning activities for domestic use	* new forest management capabilities of participants in reforestations
Community participation	* lower levels of community participation in conservation activities	* 528 people participating in a new conservation activity	* greater community participation in conservation activities
Quality of life[9]	* participants' perception of quality of life stays on present trajectory	* participants report an improvement in their quality of life as a result of the project	* higher quality of life

Evidence of the without-project scenario

Evidence of the without-project scenario can be found in the Socioeconomic Characteristics and Problems sections of the SGBR Management Program and in the Project Context and Baseline Activities sections of the GEF Project Document.

Methodology for estimation of benefits

Poverty reduction: New income was estimated by taking the estimation of net anthropogenic GHG removals by sinks from Table 5 of the main PDD document, subtracting a 20% buffer, multiplying by previous and projected donation amounts per ton of CO_2e and then multiplying by the percent that will be directed to payments to reforesters.[10]

Training: The number of people to be trained was estimated utilizing the projection of landholder participants calculated in "Annex 3 Inventory and Projections" and assuming that on average one additional family member per landholder also will receive training.

Community participation: This was estimated utilizing the projection of landholder participants as calculated in Annex 3 and assuming that on average one additional family member per landholder will also participate in the project. It is hoped that the project will have spillover effects in causing additional participation by the project participants and their families in other conservation activities. This is supported by the Social Return on Investment Analysis Report, which showed that the larger Sierra Gorda project has had this result (Galimidi and Olsen, 2007, pp. 15-16).

Quality of life: The estimate that participants will report an increase in their perception of quality of life as a result of the project is based upon the methodology used in the Social Return on Investment Analysis Report, which showed that the larger Sierra Gorda project has had this result (Galimidi and Olsen, p. 14). The monitoring of this impact will include differentiation of responses of women and indigenous peoples to ensure that the project has a positive impact on these groups.

[9] The monitoring of the impact on quality of life will include differentiation of responses of women and indigenous peoples to ensure that the project has a positive impact on these groups.

[10] This calculation is shown in the confidential financial projections presented to the VCS-CCB auditors.

Assumptions

Important assumptions utilized in the estimates included the following:

- The project will receive donations at an amount that is above the market average for carbon offsets. This is justified because of the proven track record of the project proponent and its partners, the excellent reputation of the organizations and the fact that CCB and VCS validation is expected to provide added value.
- The project will achieve participation of eligible properties and landholders at levels in the upcoming years than are higher than those achieved in previous years. This is justified as through the process of seeking validation the project proponent has developed the tools for determining eligibility early on in the process.
- Establishment and survival rates of the reforestations will be adequate to reach the projections of 40 additional hectares per year from 2010-2013. This assumption is justified by the experience of the project proponent with reforestation and the use of strategies to increase levels of water capture and humidity around the seedlings, as described in GL1.2
- The participants in this carbon capture project are similar to the participants in the larger Sierra Gorda project who were surveyed as part of the Social Return on Investment Analysis Report. This is justified as reforesters were among the various groups interviewed as part of that analysis.
- Increased income has a positive social impact. The validity of this assumption is supported by the conditions of poverty found in the communities and will be checked by monitoring of the indicator of increased quality of life.

d) Water capture, soil conservation and temperature regulation

Selection of benefits to evaluate

As demonstrated above, these natural resource benefits for communities can be derived from the project's theory of change and fall into the category of impacts. Water and soil have been identified as important natural resources by the residents of the SGBR and multiple stakeholder groups, and evidence of this is provided by the SGBR management program (INE, 1999) and the Project Document of the GEF project (GEF, 2000). In interviews regarding the benefits of reforestations, residents also frequently mention clean and fresh air and shade, difficult to define values that are included in the idea of natural resources, and for which Bosque Sustentable decided to evaluate the benefit of temperature regulation. Table 14 contrasts the "without-project" scenario described in G2 to the "with-project" scenario that will result from the implementation of the project described in G3. The final column summarizes the expected net community benefits, all of which are positive.

Table 14: Water capture, soil conservation and temperature regulation benefits for communities

Natural resource benefits for communities	Without project	With project	Community benefits
Water capture	* greater direct runoff after rainfall events and lower stream and spring flow between events * lower water yield from streams and springs during drought periods * decreased productivity of springs and streams as precipitation decreases and temperature increases with global warming	* increased water infiltration and lower direct runoff * longer periods of flow in streams during droughts * more even and predictable water production from local and regional water springs even with global warming * water storage tanks built in some communities	* more predictable water supplies in dry periods of the year and periods of streamflow during drought * additional capture of rainwater in storage tanks * increased resiliency in the hydrologic cycle to effects of climate change
Soil conservation	* continued soil erosion * increased sedimentation in streams and the Jalpan Reservoir	* lower levels of erosion from the project area * decreased levels of sedimentation in streams and the Jalpan Reservoir	* conservation and restoration of soils on project areas * greater capacity of lower elevation streams and Jalpan Reservoir, benefitting thousands of water users * increased resiliency to climate change
Temperature regulation	* no local temperature regulation on non-forested project areas * increase in temperatures due to effects of climate change	* increased temperature regulation on reforested project areas	* moderation of temperature extremes * increased resiliency to climate change impacts

Evidence of the without-project scenario

According to the SGBR management program, water and soil resources in the SGBR are under pressure from deforestation. It states that "deforestation around water springs and watersheds (above-all on the mountain mass of Pinal de Amoles) is the situation that most affects the capture of water for the region and could result in grave supply problems in the future." It also notes that "in recent years droughts have reduced the levels of springs and affected the vegetative cover" (INE, 1999, p. 39) and that "deforestation and inappropriate agricultural practices have caused erosion problems and consequent loss of soil in many zones of the Sierra Gorda, above all in Pinal de Amoles and Peñamiller" (INE, 1999, p. 43).

Due to climate change, the communities in the project zone are expected to experience increased temperatures and reduced rainfall and resulting substantial negative impacts. Please see sections GL1.1 and GL1.3 for documentation of the likely impacts of climate change upon the communities in the project zone.

Methodology for estimation of benefits

It is well known that plants in general and trees specifically play significant roles in regulating the water cycle:

- tree canopies intercept a proportion of precipitation, which is then evaporated back to the atmosphere (canopy interception);
- tree and plant litter slow down overland runoff promoting infiltration into the soil;
- plant roots create macropores - large conduits - in the soil that increase infiltration of water;
- plants contribute to terrestrial evaporation and reduce soil moisture via transpiration;
- plant litter and organic residue increase soil organic content which increases the soil capacity to store water; and
- plant leaves control the humidity of the atmosphere by transpiring. About 99% of the water absorbed by the roots is transpired in the leaves.

Hydrologic studies in the SGBR

The project proponent and its partners have conducted studies of the interaction of forests with hydrologic processes for several years in order to demonstrate their value. The goal of these studies has been to document the magnitude of the functions and services that forests provide, and seek an economic evaluation of these services. In particular, Ventura (2008) investigated the difference between infiltration, runoff, microclimate, and erosion in several locations within the SGBR. He used paired plots to examine the difference between mature forest and nearby areas with open soil prepared as if it were going to be used for hillside agriculture.

The results of Ventura (2008) demonstrate the climatic and hydrologic benefits of forest over open land in the Sierra Gorda. In a mixed oak pine forest, he found that the daily range of temperatures was larger by almost 4° C and that the extremes were greater outside the forest than inside (Ventura, 2008, p. 35). The mean average temperatures inside the forest were warmer in winter and cooler in summer by up to 1°C (Ventura, 2008, p. 35). At least in part due to these temperature differences the forests retained more humidity than open land (Ventura, 2008, pp. 32-36). In a pine forest in the municipality of Pinal de Amoles, water tension in the soils of forests was lower than on open land, suggesting that pine forests retained more soil moisture (Ventura, 2008, pp. 54-55).

At the same site, pine forests reduced surface flow up to 90 percent over agricultural ground. Practically none of the rain that fell in forest plots ran off over the land. Because the surface flow was reduced so drastically, the energy of surface flow was close to nil, and the amount of sediment material eroded in the forest plots was almost nil compared to 88 kg per m^2 in open agricultural ground. (Ventura, 2008, pp. 51-53)

Watershed scale models

Ventura (2008) also modeled several watersheds using AGWA, a program for modeling runoff and erosion from medium-sized watersheds (pp. 61-134). AGWA is a GIS based watershed modeling tool created and managed by the U.S, Department of Agriculture Agricultural Research Service. More information about it can be found at http://www.tucson.ars.ag.gov/agwa/. It consists of two models,

Kineros, an event based model that describes hydrologic processes in small watersheds, and SWAT, a continuous model that works on a longer time scale using daily average data.

One of the uses of AGWA is to model the difference between alternative land use management schemes on runoff and erosion, for instance the difference between current land use, which is a mixture of forest and agriculture, and all agriculture, or all forest. AGWA was used to model the effect of forests on runoff, infiltration and erosion in several small watersheds in the SGBR. Of special relevance to the carbon capture project was the study of the effects of pine forests in the Escanela River watershed, located in the heart of Zone 1 of the carbon project (Ventura, 2008, pp. 61-69). The result of these models show that without forest there was more direct runoff, lower infiltration, and more erosion than the landscape with forest.

Spring flow study

As part of the second phase of the project of "Support of the Recharge and Rehabilitation of Priority Watersheds in the SGBR," sponsored by the Gonzalo Río Arronte Foundation, Bosque Sustentable monitored changes in the flow of springs in communities in which reforestation and other activities took place. Although highly variable rains made it difficult to measure spring flows under comparable conditions, communities that previously were left without water during the dry season and whose residents had to travel up to two hours to obtain water (Epazotes Grandes, for example), reported after the restoration of their watersheds that their wells and springs continued to produce water during the dry season, in spite of low rain levels during the year (GESG, 2010a).

The estimation that water tanks will capture additional water is also supported by the same methodology and study of the UAQ, as the tanks are built in areas that do not have trees, so the rain that is captured would have been lost to runoff rather than captured.

The estimation of decreased levels of sedimentation of lower elevation streams and Jalpan Reservoir is a logical conclusion based upon the runoff impacts demonstrated by the methodology and study of the UAQ combined with the fact that Zone 1 is located in the upper part of the watershed of the Jalpan Reservoir.

The impact of reforestation on erosion rates was quantified by Ventura (2008). His studies found that bare land prepared for planting lost about 88 kg per m^2 as opposed to almost none for nearby forested land (Ventura, 2008, pp. 51-53). While his studies were conducted on small bare plots which behave differently than large fields with growing corn and beans, it is reasonable to assume reforestation will significantly reduce erosion rates at the field level.

Assumptions

Important assumptions utilized in the estimates included the following:

- That the baseline land uses of the project areas are comparable to the control parcels used in the UAQ study. This is justified as the UAQ study used nearby areas with open soil prepared as if it were going to be used for hillside agriculture.
- That the forests to be created on the project areas are comparable to the forests utilized in the UAQ studies. This is justified because the UAC forests were mature pine with well developed soil and duff layers similar to what the reforestations will be in 30 years. Between now and then there will be a gradual improvement of the soil conditions as the trees grow.

Impact on constituent socio-economic or cultural groups such as indigenous peoples

As previously described in this document, project activities take place in areas of high and very high levels of poverty and marginalization. Although dispersed and largely assimilated, indigenous peoples are found in the project zone, especially in Zone 2. The monitoring of the impact on quality of life will include differentiation of responses of women and indigenous peoples to ensure that the project has a positive impact on these groups.

2. Demonstrate that no High Conservation Values identified in G1.8.4-6 will be negatively affected by the project.

The critical ecosystem services identified in **G1.8.4** will be positively affected by the project. The positive impacts on carbon-related ecosystem services are described in the PDD. The positive impacts on water capture, soil conservation and temperature regulation ecosystem services are summarized above in Table 14, while the positive impacts on biodiversity ecosystem services are summarized in Table 18 of the Biodiversity Section.

The project will not negatively affect areas that are fundamental for meeting the basic needs of local communities. Participating landholders reforest only a part of their properties and maintain other areas to meet their needs. As previously discussed in **G1.8.5**, due to the extensive migration of the labor force to the United States, ethnic and social characteristics, and the land ownership situation, basically each land owner satisfies his needs through the management of his or her own parcel of land or by remittances from the U.S. This is not an area in which the indigenous cultures carry out traditional management of the land.

G1.8.6 does not apply to this project.

CM2. Offsite Stakeholder Impacts

Concept

The project proponents must evaluate and mitigate any possible social and economic impacts that could result in the decreased social and economic well-being of the main stakeholders living outside the project zone resulting from project activities. Project activities should at least 'do no harm' to the well-being of offsite stakeholders.

Indicators

The project proponents must:

1. Identify any potential negative offsite stakeholder impacts that the project activities are likely to cause.

All offsite stakeholder impacts are positive.

2. Describe how the project plans to mitigate these negative offsite social and economic impacts.

Not applicable.

3. Demonstrate that the project is not likely to result in net negative impacts on the well-being of other stakeholder groups.

Offsite stakeholder impacts are all very positive. The project will have substantial benefits for stakeholders in the watershed, increasing subterranean hydrological recharge and reducing erosion of streams and the Jalpan Reservoir, a source of water for numerous communities and thousands of people.

CM3. Community Impact Monitoring

Concept

The project proponents must have an initial monitoring plan to quantify and document changes in social and economic well-being resulting from the project activities (for communities and other stakeholders). The monitoring plan must indicate which communities and other stakeholders will be monitored, and identify the types of measurements, the sampling method, and the frequency of measurement.

Since developing a full community monitoring plan can be costly, it is accepted that some of the plan details may not be fully defined at the design stage, when projects are being validated against the Standards. This is acceptable as long as there is an explicit commitment to develop and implement a monitoring plan.

Indicators

The project proponents must:

1. Develop an initial plan for selecting community variables to be monitored and the frequency of monitoring and reporting to ensure that monitoring variables are directly linked to the project's community development objectives and to anticipated impacts (positive and negative).

Table 15 summarizes the initial plan for monitoring the environmental and social benefits of the project for communities.

Table 15: Initial Monitoring Plan for Community Benefits

Environmental and social benefits for communities	Areas or stakeholders to be monitored	Indicators	Methodologies	Frequency of measurement
Poverty reduction	* Reforestation participants	* Number of inhabitants receiving additional income * Total amount of new income in Mexican pesos and U.S. dollars	Social Return on Investment Analysis (SROI)	Annual

Training of the local population	* Reforestation participants	* Number of local people receiving training * Hours of training given	Social Return on Investment Analysis (SROI)	Annual
Community participation	* Reforestation participants	* Number of community members participating in reforestation	Social Return on Investment Analysis (SROI)	Annual
Improvement in quality of life[11]	* Reforestation participants	* Responses to interviews	Interviews	Every 5 years
Water capture[12]	* Reforestations	* m^3 of avoided rainwater runoff and its value in Mexican pesos and U.S. dollars	Eusebio Ventura, Ph.D. of the UAQ and his students have carried out several projects that measure climate and erosion levels in several areas around the SGBR. These studies used standard hydrologic modeling tools to make field measurements of rainfall, temperature, and erosion. Their conclusions may be extended to the study area. (Mendoza, 2008; Benítez, 2007; Ventura, 2008; and Ventura, 2007).	Every 5 years
Soil conservation	* Reforestations	* Tons of avoided erosion and its value in Mexican pesos and U.S. dollars		Every 5 years

2. Develop an initial plan for how they will assess the effectiveness of measures used to maintain or enhance High Conservation Values related to community well-being (G1.8.4-6) present in the project zone.

For the critical ecosystem services identified in **G1.8.4,** carbon capture will be monitored as defined in the PDD. Water capture and soil conservation ecosystem services will be monitored as described above in Table 15, while biodiversity ecosystem services will be monitored as described in B3.2 and Annex 9.

The project does not impact areas that are fundamental for meeting the basic needs of local communities. Participating landholders reforest only a part of their properties and maintain other areas to meet their needs. As previously discussed in **G1.8.5**, due to the extensive migration of the labor force to the United States, ethnic and social characteristics, and the land ownership situation, basically each land owner satisfies his needs through the management of his or her own parcel of land or by

[11] The monitoring of the impact on quality of life will include differentiation of responses of women and indigenous peoples to ensure that the project has a positive impact on these groups.

[12] The inclusion of water capture and soil conservation in the final monitoring plan, as well as the determination of their indicators and monitoring methodology are dependent upon technical and financial feasibility.

remittances from the U.S. This is not an area in which the indigenous cultures carry out traditional management of the land.

G1.8.6 does not apply to this project.

3. Commit to developing a full monitoring plan within six months of the project start date or within twelve months of validation against the Standards and to disseminate this plan and the results of monitoring, ensuring that they are made publicly available on the internet and are communicated to the communities and other stakeholders.

The full monitoring plan will be developed within 12 months of validation, and its results will be made publicly available on the internet and communicated to the communities and other stakeholder via meetings with project participants and meetings of the Advisory Council of the SGBR, which includes representatives from the communities as well as agencies from the three levels of government.

BIODIVERSITY SECTION

B1. Net Positive Biodiversity Impacts

Concept

The project must generate net positive impacts on biodiversity within the project zone and within the project lifetime, measured against the baseline conditions.

The project should maintain or enhance any High Conservation Values (identified in **G1**) present in the project zone that are of importance in conserving globally, regionally or nationally significant biodiversity**.**

Invasive species populations must not increase as a result of the project, either through direct use or indirectly as a result of project activities.

Projects may not use genetically modified organisms (GMOs) to generate GHG emissions reductions or removals. GMOs raise unresolved ethical, scientific and socio-economic issues. For example, some GMO attributes may result in invasive genes or species.

Indicators

The project proponents must:

1. Use appropriate methodologies to estimate changes in biodiversity as a result of the project in the project zone and in the project lifetime. This estimate must be based on clearly defined and defendable assumptions. The 'with project' scenario should then be compared with the baseline 'without project' biodiversity scenario completed in G2. The difference (i.e., the net biodiversity benefit) must be positive.

a. Background and context[13]

The carbon sequestration project is a component of a larger project for the conservation of biodiversity and promotion of sustainable development in the SGBR and its area of influence. The 1997 starting date for CCB validation is the same as the year of the decree of the SGBR by the Mexican government. The carbon capture project and related biodiversity impacts were among the themes discussed at the numerous participatory public meetings that led to the establishment of the SGBR and development of the SGBR Management Program using an objectives oriented project planning methodology (INE, 1999). The carbon sequestration project is an explicit component of this Management Program, which contains relevant evaluation indicators. Impacts on communities and biodiversity have been monitored and reported according to requirements of responsible federal agencies (SEMARNAP, SEMARNAT and CONANP) and project donors.

In 2000, a full-scale project of the Global Environment Facility (GEF) was developed utilizing GEF's Logical Framework Approach project design methodology. This project, Biodiversity Conservation in the Sierra Gorda Biosphere Reserve, was implemented from 2001-2009. The GEF project was implemented by the United Nations Development Programme (UNDP) and executed by the Ministry of

[13] The Background section presented here was previously presented in Section CM1.1. It has been repeated here to assist those who are not reading this PDD in sequential order.

Environment and Natural Resources (SEMARNAT) through the National Commission of Natural Protected Areas (CONANP) and subcontracts with the Mexican NGOs Grupo Ecológico and Bosque Sustentable and other complementary subcontracts. The development of the carbon capture project was a specific component of the GEF project (see Project Document, GEF, 2000), and the preliminary results of the carbon capture project were among those monitored and evaluated during project implementation and in the final project evaluation (Vela, Plaza and Muench, 2009). It was during the GEF project that a Project Information Note (PIN), Project Quantification Document and Verification Protocol were prepared, that the first transaction in the voluntary market was achieved, and that the decision was made to seek joint CCB and VCS validation. Early drafts of the PDD were developed that included indicators for estimating and monitoring community and biodiversity impacts, and all indicators were developed consistent with UNDP-GEF requirements for results-oriented monitoring and evaluation (UNDP Evaluation Office, 2002).

Since the end of the GEF project, the carbon project has continued to be implemented as part of the SGBR Management Program. It is now also a part of part of the project of "Support for the Recharge and Rehabilitation of Priority Water Springs in the SGBR," sponsored by the Río Arronte Foundation, and the project of "Restoration of Watersheds, Soil Regeneration, Water Storage, Carbon Capture and Development of Productive Projects in the SGBR," sponsored by Bombardier Aerospace, México (GESG, 2010a; GESG, 2006; GESG, 2010b; and GESG 2011). These projects are discussed in more detail in GL1.4.

The implementation of the carbon capture project in coordination with these larger more integrated efforts means that the project is contributing to biodiversity and community benefits much broader than those presented in this PDD. For external evaluations of the benefits of the broader Sierra Gorda project, please see the final evaluation of the GEF project (Vela, Plaza and Muench, 2009) as well as the Sierra Gorda Social Return on Investment Analysis Report prepared by the Social Venture Technology Group (Galimidi and Olsen, 2007).

Table 16 summarizes the most important steps in the development of the carbon capture project:

Table 16: Development of the carbon capture project

Dates	Development of carbon project
1997	Project start date Initial proposals and studies
1999	Project included in SGBR Management Program , developed with objectives oriented project planning methodology of INE
2000	Carbon project included in development of GEF project with Logical Framework Approach project design methodology
2001-2009	Carbon project implemented as part of SBGR Management Program and UNDP-GEF project
2004	Preparation of Project Information Note, Project Quantification Document and Verification Protocol
2006	First transaction in voluntary market
2008	Letter of commitment for CCB and VCS validation
2008-2011	Preparation of Project Design Documents
2009-present:	Implemented as part of SGBR Management Program and other integrated projects

b. Project theory of change

The project proponent used what is known as a "theory of change" or "causal model" methodology for project design and assessment of biodiversity impacts. This was done with broad participation from communities, representatives of local, state and federal government agencies, and other stakeholders. As original conditions and baseline projections are presented in more detail in other sections of this document, this section focuses more specifically on the biodiversity-impacts causal chain, which can be summarized as follows.

The starting condition is deforested farming and grazing lands with very limited native biodiversity. By reforesting with native species, the project will enhance forest cover and connectivity of forests that are more similar to natural forests (though by no means identical) in structure and composition than the simplified agroecosystems they replace, and improve habitat quality and potentially diversity of desired native forest species on the project areas. Table 17 presents a more detailed summary of the project chain, showing the connection between activities, outputs, outcomes and impacts.

Table 17: Summary of project's causal chain for biodiversity impacts

Impacts	Improved habitat conditions for desired forest species
Outcomes	305.7 hectares of new native species forest areas
	Increased forest connectivity around project areas
Outputs	305.7 hectares of native tree species planted and managed
	528 people trained on the establishment and management of reforestations
	Monitoring and verification reports on biodiversity benefits
Activities	Plant 305.7 hectares with native tree species from 1997-2013
	Prepare and implement reforestation management plans from 2011-2042
	Train 528 project participants and family members on the establishment and management of reforestations from 1997-2042
	Prepare and implement biodiversity monitoring plan from 1997-2042

The activities are the practical, time-bound actions that the project carries out to deliver the desired project outputs. These include planting native tree species, preparing and implementing management plans, training, and preparing and implementing a biodiversity monitoring plan. If carried out, these activities will then logically result in the project outputs, which are defined as the goods and services that the project must deliver in order to achieve the project outcomes. Outputs are within the direct control of the project to deliver. They include planted and managed native tree species, people trained, and monitoring and verification reports on biodiversity benefits. If properly produced, the project outputs will logically result in the project outcomes, which are defined as the short to medium term behavioral or systemic effects that the project makes a contribution towards, and that are designed to help achieve the project's impacts. Achievement of outcomes will be influenced both by project outputs and additional factors that may be outside the direct control of the project. The project outcomes include new areas of native species forest and increased forest connectivity around the project areas. If the project outcomes are achieved, then logically the project will contribute to the achieving the project impacts, which are defined as fundamental and durable changes in the condition of people and their environment brought about by the project. A project will only expect to contribute

to the achievement of impact, and often the impact will only be realized many years after project completion. The project impact will be improved habitat conditions for desired forest species. (For the source of the definitions utilized, please see GEF Evaluation Office, 2009, p.8)

c. Selection of variables for estimating changes in biodiversity[14]

As demonstrated above, new native species forest areas, increased forest connectivity and improved habitat for desired forest species can be derived from the project's theory of change and fall into the categories of outcomes and impacts.

Human impacts on forests also have impacts on biodiversity. Populations of forest flora and fauna may be reduced or extirpated following disturbances from humans using forests for firewood, fields, and grazing areas. Levels of biodiversity and species composition may change through the introduction of invasive and exotic species (such as cattle and associated introduced pasture grass) as large continuous stands of forest are opened and degraded and remaining stands become smaller and more isolated from one another, potentially resulting in population reduction or extinction of some native species.

Many factors that affect biodiversity are correlated with the size of forest stands and how well they are connected to one another. Large forest stands often contain more habitat types and room for species that require large continuous areas. Smaller more isolated forest stands will likely receive fewer immigrants than forests that are well connected to larger stands. Connections between forests provide avenues of dispersal so that populations of plants and animals may be less vulnerable to local extinction. For these reasons, forest cover and forest connectivity characteristics are being used to predict changes in biodiversity as a result of the carbon project; these are standard landscape measures used in conservation biology and natural resource management throughout the world. Trends toward greater connectivity and higher interior area in relation to perimeter both indicate improving forest quality for forest animals and plants (MacArthur and Wilson, 1967; Simberloff, 1974; Connell, 1978).

Table 18 contrasts key aspects of the "without-project" scenario described in G2 to the "with-project" scenario that will result from the implementation of the project described in G3. The final column summarizes the expected net biodiversity benefits of the project, all of which are positive.

Table 18: Changes in biodiversity as a result of the project

Factors	Without-project scenario	With-project scenario	Difference (net biodiversity benefit)
Forest cover	* no forest cover in project areas	* 305.7 ha of forest cover in project areas	* 305.7 ha of additional forest cover in project areas
Forest connectivity	* less forest connectivity around project areas	* greater forest connectivity around project areas	* increased forest connectivity around project areas

[14]Additional variables for measuring changes in biodiversity will be considered during the development of the final monitoring plan and may or may not be added depending on technical and financial feasibility. Examples of additional variables that could be considered are diversity of native woody species pre and post planting, reduction in edge effects for native forest fragments where reforestations are contiguous, increase in structural complexity of vegetation cover, a scoring system for habitat and its complexity over time, and the presence or absence of indicator species.

Habitat for desired forest species[15]	* degraded habitat for desired forest species	* improved habitat conditions for desired forest species	* improved habitat conditions for desired forest species

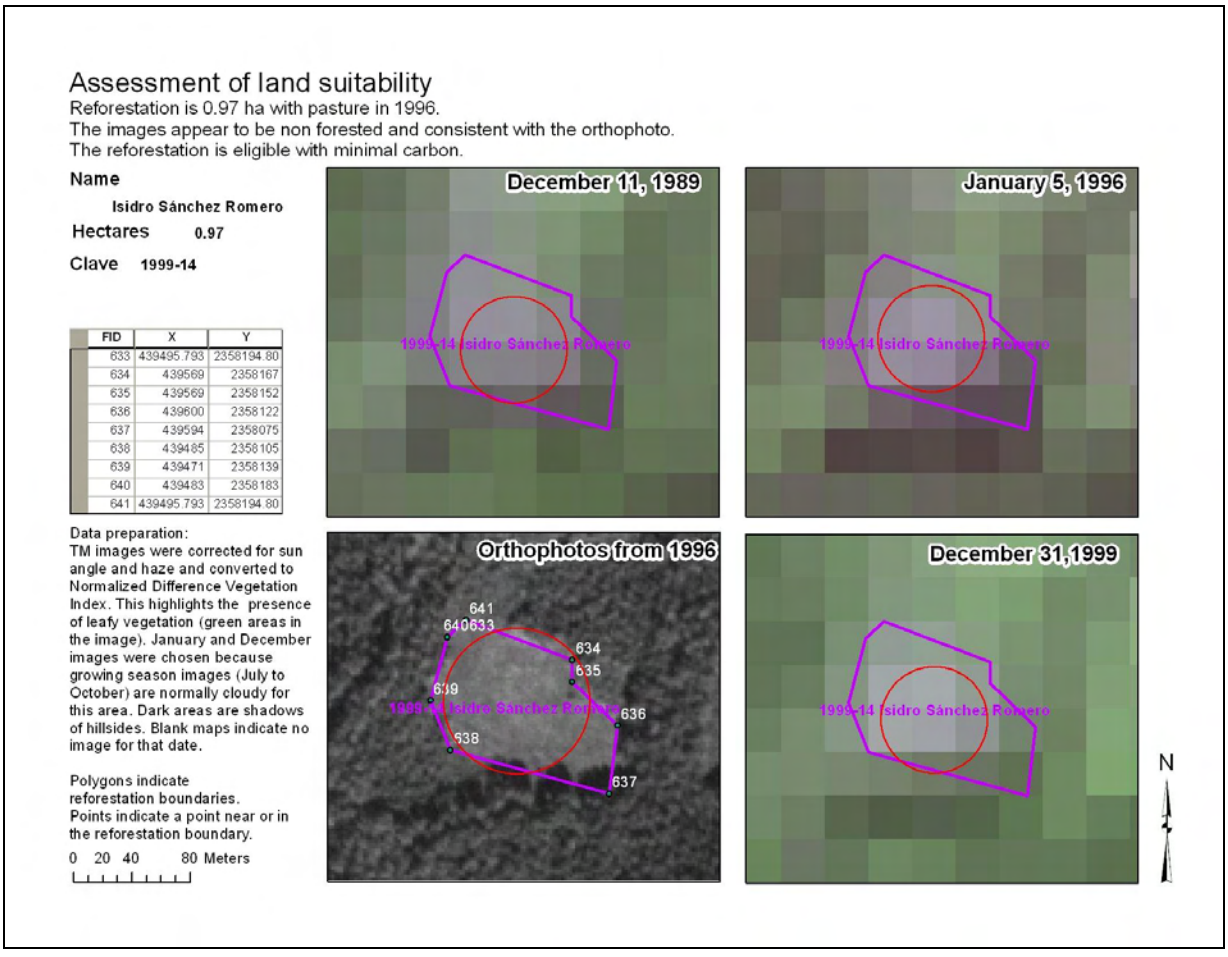
d. Methods for estimating changes related to biodiversity

The methods to estimate changes in biodiversity as a result of the project are indirect measures related to forest habitat quality.

Forest cover: The method for estimating the increase in forest cover was a direct correlation with the size of the project area to be reforested as calculated in "Annex 3 Inventory and Projections."

Forest connectivity: We have observed that the existing reforestations are often connected to other natural forest and other reforestations. We expect that this will be true of future reforestations. We expect that this will result in an increase in connectivity between reforestations and other forest areas.

Figure 1: Example of reforestation that will improve forest connectivity



Habitat quality for desired forest species: The projection of an improvement of habitat for desired forest species was made by applying principles of island biogeography to the projected changes in land

[15] Desired forest species is in comparison to edge and disturbed area species typical of the simplified agroecosystems being replaced.

use and forest connectivity, including changes in forest perimeter, and forest interior area. Many studies show that these measures are correlated with forest species diversity (MacArthur and Wilson, 1967; Turner 2008).

e. Assumptions

Some assumptions were made consisting of the following:

1. Establishment and survival rates of reforestations will be adequate to reach the projections of 40 additional hectares per year from 2010-2013. This assumption is justified by the experience of the project proponent with reforestation and the use of strategies to increase levels of water capture and humidity around the seedlings, as described in GL1.2.
2. It is assumed that forest habitat quality measures are related to biodiversity and that increased forest habitat quality will result in an increase of forest species. This assumption is justified as many studies show that decreased forest perimeter and increased forest interior area are correlated with forest species diversity (MacArthur and Wilson, 1967; Turner 2008).

2. Demonstrate that no High Conservation Values identified in G1.8.1-3 will be negatively affected by the project.

All activities impacting High Conservation Values are designed explicitly for the conservation of those values. The conservation goals of the protected areas identified in **G1.8.1.a**, the threatened and endemic species and areas that support significant concentrations of species during their lifecycle as identified in **G1.8.1.b-d,** the globally, regionally and nationally significant large landscape-level areas described in **G1.8.2,** and the threatened and rare ecosystems described in **G1.8.3** will all be maintained or positively affected by increasing native species forest cover. This will be monitored, as described in B3 of the Biodiversity Section.

3. Identify all species to be used by the project and show that no known invasive species will be introduced into any area affected by the project and that the population of any invasive species will not increase as a result of the project.

The project will exclusively use native species. This includes, depending on the site, *Pinus greggii, Pinus patula,* and *Cupressus lindleyi.*

4. Describe possible adverse effects of non-native species used by the project on the region's environment, including impacts on native species and disease introduction or facilitation. Project proponents must justify any use of non-native species over native species.

Not applicable

5. Guarantee that no GMOs will be used to generate GHG emissions reductions or removals.

This project will exclusively use native species and by no means GMO´s.

B2. Offsite Biodiversity Impacts

Concept

The project proponents must evaluate and mitigate likely negative impacts on biodiversity outside the project zone resulting from project activities.

Indicators

The project proponents must:

1. Identify potential negative offsite biodiversity impacts that the project is likely to cause.

As leakage from project activities has been found to be minimal, we expect that likewise negative impacts to biodiversity outside of the project area will also be minimal. Rather we expect that increasing forest cover in the upper watersheds of the SGBR and its area of influence will have benefits for biodiversity well outside of the project area.

2. Document how the project plans to mitigate these negative offsite biodiversity impacts.

Not applicable

3. Evaluate likely unmitigated negative offsite biodiversity impacts against the biodiversity benefits of the project within the project boundaries. Justify and demonstrate that the net effect of the project on biodiversity is positive.

As there are no negative offsite biodiversity impacts, the net effect of the project on biodiversity is positive, as described in B1.

B3. Biodiversity Impact Monitoring

Concept

The project proponents must have an initial monitoring plan to quantify and document the changes in biodiversity resulting from the project activities (within and outside the project boundaries). The monitoring plan must identify the types of measurements, the sampling method, and the frequency of measurement.

Since developing a full biodiversity-monitoring plan can be costly, it is accepted that some of the plan details may not be fully defined at the design stage, when projects are being validated against the Standards. This is acceptable as long as there is an explicit commitment to develop and implement a monitoring plan.

Indicators

The project proponents must:

1. Develop an initial plan for selecting biodiversity variables to be monitored and the frequency of monitoring and reporting to ensure that monitoring variables are directly linked to the project's biodiversity objectives and to anticipated impacts (positive and negative).

An initial biodiversity monitoring plan has been prepared. Please see Annex 9.

2. Develop an initial plan for assessing the effectiveness of measures used to maintain or enhance High Conservation Values related to globally, regionally or nationally significant biodiversity (G1.8.1-3) present in the project zone.

The initial plan for monitoring the effectiveness of measures used to maintain or enhance these High Conservation Values has been included in the biodiversity monitoring plan. Please see Annex 9.

3. Commit to developing a full monitoring plan within six months of the project start date or within twelve months of validation against the Standards and to disseminate this plan and the results of monitoring, ensuring that they are made publicly available on the internet and are communicated to the communities and other stakeholders.

The initial biodiversity monitoring plan presented in Annex 9 will be revised as needed to develop the final, full monitoring plan within twelve months of validation.[16] This plan and its results will be made publicly available on the internet and communicated to the communities and other stakeholder via meetings with project participants and meetings of the Advisory Council of the SGBR.

[16] Additional variables for measuring changes in biodiversity will be considered during the development of the final monitoring plan and may or may not be added depending on technical and financial feasibility. Examples of additional variables that could be considered are increase in diversity of native woody species pre and post planting, reduction in edge effects for native forest fragments where reforestations are contiguous, increase in structural complexity of vegetation cover, a scoring system for habitat and its complexity over time, and the presence or absence of identified indicator species.

GOLD LEVEL SECTION

GL1. Climate Change Adaptation Benefits

Concept

This Gold Level Climate Change Adaptation Benefits criterion identifies projects that will provide significant support to assist communities and/or biodiversity in adapting to the impacts of climate change. Anticipated local climate change and climate variability within the project zone could potentially affect communities and biodiversity during the life of the project and beyond. Communities and biodiversity in some areas of the world will be more vulnerable to the negative impacts of these changes due to: vulnerability of key crops or production systems to climatic changes; lack of diversity of livelihood resources and inadequate resources, institutions and capacity to develop new livelihood strategies; and high levels of threat to species survival from habitat fragmentation. Land-based carbon projects have the potential to help local communities and biodiversity adapt to climate change by: diversifying revenues and livelihood strategies; maintaining valuable ecosystem services such as hydrological regulation, pollination, pest control and soil fertility; and increasing habitat connectivity across a range of habitat and climate types.

Indicators

The project proponents must:

1. Identify likely regional climate change and climate variability scenarios and impacts, using available studies, and identify potential changes in the local land-use scenario due to these climate change scenarios in the absence of the project.

Likely climate change and climate variability scenarios and impacts have been identified by state and by sector in a joint effort of the National Institute of Ecology (INE) of SEMARNAT and the Center for Atmospheric Sciences of UNAM. The results are presented on the web site of Climate Change in Mexico: Information by Sector and State. The web site is part of the climate change portal of INE and was established with support of UNDP Mexico and GEF, complying with commitments of the Government of Mexico to the United Nations Framework Convention on Climate Change (UNFCCC), which in article 6, mandates that signatory countries offer the public a means of learning about climate change. (INE-SEMARNAT and UNAM)

According to climate change projections for the State of Querétaro, total annual precipitation is expected to diminish 5-15% and average annual temperatures to increase between 1.0 and 2.5°C by the year 2050 (INE-SEMARNAT and UNAM)[17]. Accompanying these projections is a description of vulnerabilities to these changes, including that the state will suffer medium increased pressures (20-40%) on water sources by 2025 (INE-SEMARNAT, 2006)[18], and that 50% of the state's surface area is projected to be affected by desertification (SEMARNAP, 1997)[19].

[17] www2.ine.gob.mx/cclimatico/edo_sector/estados/futuro_queretaro.html
[18] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_queretaro.html
[19] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_queretaro.html

Regarding changes to natural vegetation, climate change is expected to favor hot humid climates with tropical rain forests and increase hot sub-humid climates with tropical deciduous and sub-deciduous forests (Villers and Trejo, 1995)[20]. There is expected to be a reduction in the resilience of forests to extreme climate conditions and an increase in the tendencies of forest fires (INE-SEMARNAT and UNAM)[21].

The government of the State of Querétaro, with the assistance of the University of Querétaro, is currently preparing a State Climate Change Action Plan, which will include an analysis of climatic variability, impacts, vulnerability and risks, as well as adaptation proposals. Preliminary climate change modeling results project temperature increases and rainfall reduction throughout the state, with the largest decreases in precipitation expected in the northern part of the state, where the Sierra Gorda is located (Suzán et. al., 2011).

According to climate change projections for the State of San Luis Potosí, total annual precipitation is expected to change in a range that varies from an increase of 5% to a decrease of 10% by the year 2050 and decrease from 5-15% by the year 2080. Average annual temperatures are projected to increase between 1.5 and 2.5°C by the year 2050 and 2-4°C by 2080. (INE-SEMARNAT and UNAM)[22] Accompanying these projections is a description of vulnerabilities to these changes, including that the state will suffer very strong pressures (60-80%) on water sources by 2025 (INE-SEMARNAT, 2006), that droughts will result in prolonged water scarcity that will have consequences on the availability of water for various users and that floods associated with extraordinary precipitation caused by hurricanes will put many hectares of crops at risk (CAN, 2003)[23].

Regarding changes to natural vegetation, climate change is expected to increase areas with hot and semi-hot climates. Temperate climates will be displaced by hotter climates in such a manner that the vegetation communities will be semi-desert scrub exposed to hotter conditions, pasture land and temperate forests (Villers and Trejo, 1995)[24].

These climate changes in Querétaro, San Luis Potosí and other parts of the country are expected to negatively impact seasonal agriculture. Variation in rainfall will result in more frequent droughts or floods. Soil humidity is expected to decrease as a result of increased temperatures, resulting in greater water requirements (INE-SEMARNAT and UNAM)[25]. Under climate change, there will be recurring conditions similar to those presented during the El Niño phenomenon with a substantial decrease in summer rains, directly impacting seasonal agriculture and resulting in great losses unless large transformations are made for adaptation (INE-SEMARNAT and UNAM)[26]. Rural populations affected by climate change have begun to migrate to other zones, especially urban areas (INE-SEMARNAT and UNAM)[27].

[20] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_queretaro.html
[21] www2.ine.gob.mx/cclimatico/edo_sector/estados/queretaro.html
[22] www2.ine.gob.mx/cclimatico/edo_sector/estados/futuro_slp.html
[23] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_slp.html
[24] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_queretaro.html
[25] http://www2.ine.gob.mx/cclimatico/edo_sector/sector/sector-agricultura.html
[26] www2.ine.gob.mx/cclimatico/edo_sector/sector/amenaza-agricultura.html
[27] www2.ine.gob.mx/cclimatico/edo_sector/sector/amenaza-social.html

2. Identify any risks to the project's climate, community and biodiversity benefits resulting from likely climate change and climate variability impacts and explain how these risks will be mitigated.

Likely climate change and climate variability impacts increase the risks of reforestation establishment failure, reduced growth rates, and the frequency of forest fires, all of which would reduce the projected climate, community and biodiversity benefits of the project. These risks will be mitigated by utilizing techniques that maximize the capture of water and humidity around the trees,[28] the operation of a fire prevention and fighting campaign, dispersed reforestation locations that diminish the risk of a fire affecting a significant proportion of the project area and in the case of carbon the use of conservative growth projections and the retention of 20% of projected carbon capture as a self-insurance buffer.

3. Demonstrate that current or anticipated climate changes are having or are likely to have an impact on the well-being of communities *and/or* the conservation status of biodiversity in the project zone and surrounding regions.

Footnote 49 to this CCB standard states that "(p)roject proponents can demonstrate, for example, evidence of decreased access to natural resources of importance for communities' livelihoods and overall well-being. Climate change models that detail the predicted effects on these natural resources, such as freshwater, and participatory evaluations can be used to demonstrate anticipated impacts on communities."

Rainfall is a natural resource of importance for the livelihood and overall well-being of the communities in the project zone due to their dependence on rainwater for their primary economic activity of seasonal agriculture as well as for drinking and other household uses. The climate change projections previously presented in GL1.1 (and partially presented again below) make clear that communities in the project zone can expect less rainfall in the future, that the results will be negative, and that climate change adaptation activities are urgent.

According to climate change projections for the State of Querétaro, total annual precipitation is expected to diminish 5-15% and average annual temperatures to increase between 1.0 and 2.5°C by the year 2050 (INE-SEMARNAT and UNAM)[29]. Accompanying these projections is a description of vulnerabilities to these changes, including that the state will suffer medium increased pressures (20-40%) on water sources by 2025 (INE-SEMARNAT, 2006)[30], and that 50% of the state's surface area is projected to be affected by desertification (SEMARNAP, 1997)[31].

The government of the State of Querétaro, with the assistance of the University of Querétaro, is currently preparing a State Climate Change Action Plan, which will include an analysis of climatic variability, impacts, vulnerability and risks, as well as adaptation proposals. Preliminary climate change modeling results project temperature increases and rainfall reduction throughout the state, with the largest decreases in precipitation expected in the northern part of the state, where the Sierra Gorda is located (Suzán et. al., 2011).

[28] For details, please see 39) Conservación de humedad de las plantas.
[29] www2.ine.gob.mx/cclimatico/edo_sector/estados/futuro_queretaro.html
[30] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_queretaro.html
[31] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_queretaro.html

According to climate change projections for the State of San Luis Potosí, total annual precipitation is expected to change in a range that varies from an increase of 5% to a decrease of 10% by the year 2050 and decrease from 5-15% by the year 2080. Average annual temperatures are projected to increase between 1.5 and 2.5°C by the year 2050 and 2-4°C by 2080. (INE-SEMARNAT and UNAM)[32] Accompanying these projections is a description of vulnerabilities to these changes, including that the state will suffer very strong pressures (60-80%) on water sources by 2025 (INE-SEMARNAT, 2006), that droughts will result in prolonged water scarcity that will have consequences on the availability of water for various users and that floods associated with extraordinary precipitation caused by hurricanes will put many hectares of crops at risk (CAN, 2003)[33].

These climate changes in Querétaro, San Luis Potosí and other parts of the country are expected to negatively impact seasonal agriculture. Variation in rainfall will result in more frequent droughts or floods. Soil humidity is expected to decrease as a result of increased temperatures, resulting in greater water requirements (INE-SEMARNAT and UNAM)[34]. Under climate change, there will be recurring conditions similar to those presented during the El Niño phenomenon with a substantial decrease in summer rains, directly impacting seasonal agriculture and resulting in great losses unless large transformations are made for adaptation (INE-SEMARNAT and UNAM)[35]. Rural populations affected by climate change have begun to migrate to other zones, especially urban areas (INE-SEMARNAT and UNAM)[36].

4. Demonstrate that the project activities will assist communities *and/or* biodiversity to adapt to the probable impacts of climate change.

Footnote 51 to this CCB standard states that "where communities are predicted to experience or are experiencing decreased access to natural resources because of climate change, project proponents must demonstrate that activities are likely to decrease communities' dependence on these natural resources. For example, where freshwater access is affected by climate change, a project can improve water management for maximum efficiency or provide alternative agricultural methods or products that require less water. Project activities may also help communities adapt to new planting and harvesting schedules to ensure maximum yields. Other climate change adaptation assistance can involve helping communities prepare for extreme events such as floods, droughts and mudslides."

The carbon capture project will decrease community dependence upon previous levels of rainfall and improve adaptation to future lower levels of rainfall in the following ways:

a. The reforestations will increase the efficiency of local groundwater recharge, benefitting local springs, which are often local communities' sole source of water for drinking and other uses. As previously explained in Indicator G2.4, springs are expressions of groundwater where it reaches the land surface. Springs, especially those high in watersheds, are dependent on groundwater recharge to keep flowing throughout drought periods. The quantity of groundwater available is dependent on whether rainfall infiltrates into the soil or runs off over the soil. Rainfall is more likely to infiltrate into the soil when its impact on the soil surface is low as a result of interception by tree

[32] www2.ine.gob.mx/cclimatico/edo_sector/estados/futuro_slp.html
[33] www2.ine.gob.mx/cclimatico/edo_sector/estados/vulne_slp.html
[34] http://www2.ine.gob.mx/cclimatico/edo_sector/sector/sector-agricultura.html
[35] www2.ine.gob.mx/cclimatico/edo_sector/sector/amenaza-agricultura.html
[36] www2.ine.gob.mx/cclimatico/edo_sector/sector/amenaza-social.html

crowns and understory vegetation, and when the soil contains high amounts of organic material that acts as a sponge to soak up water. Without reforestation, the normally highly sloping pasture and agricultural lands in the Sierra Gorda lose topsoil. Loose topsoil including organic matter is eroded, and subsoil with lower infiltration capacity becomes exposed. When this happens, the rate of infiltration during rainfall and total quantity of water infiltrating into the soil is reduced, and underground aquifers receive less recharge Reforestation changes the hydrologic system towards higher rates of infiltration due to greater soil conservation and increase of canopy cover. Consequently there will be less water leaving watersheds as overland flow, which will result in fewer flash floods, higher aquifer recharge, and greater water availability during the annual six-month or more periods without rainfall. See the information provided in CM1.1 regarding hydrologic studies, watershed scale models and spring flow study for documentation that supports this section.

b. Reforestation will reduce the high rates of erosion that result in siltation and reduced capacity of downstream waterways, catchments, and reservoirs, especially the Jalpan Reservoir, which is the source of water for the city of Jalpan and other communities. Reducing siltation will contribute to increased capacity in the Reservoir and decreased costs for removing sediments. See the information provided in CM1.1 regarding hydrologic studies and watershed scale models for documentation regarding the impacts of reforestations upon erosion.

c. Reforestation counteracts the processes of desertification. The combination of increased water infiltration, improved soil conservation and restoration, along with the moderation of local temperature means and extremes, will all help counteract desertification.

d. Select communities will be provided water storage structures, capturing rainwater for domestic and livestock use that otherwise would have run off and out of the communities. So far, water storage tanks have been built or are in planning stages for 12 communities of the carbon capture project: La Barranca, San Pedro Viejo, La Tinaja, El Arpa, Santa Águeda, El Rodezno, Rancho Nuevo, Sauz de Guadalupe, Madroño, Agua del Maíz, San Pedro Escanela and Tonatico. Structures planned for 2011 will each have a capacity of 20,000 liters. (GESG, 2010a and GESG, 2011)

e. The project will provide an alternative income source to traditional activities of seasonal agriculture that are highly dependent upon rainfall. From the transaction of carbon offsets, the project is projected to provide $9.8 million MXN ($817,000 USD) of new income to community reforesters through 2042.

f. Finally, reforestation is complemented by related activities to reduce dependence on rainfall and promote adaptation to climate change as part of the project of "Support for the Recharge and Rehabilitation of Priority Water Springs in the SGBR," sponsored by the Río Arronte Foundation, and the project of "Restoration of Watersheds, Soil Regeneration, Water Storage, Carbon Capture and Development of Productive Projects in the SGBR," sponsored by Bombardier Aerospace, Mexico. These projects include an array of activities to increase the efficient capture and use of water in communities and also to develop alternative economic opportunities, such as the use of Permaculture techniques and Keyline Design, environmental education and sustainability training, operation of 27 community micro-businesses, watershed restoration, soil regeneration

for water and carbon storage, forest fire prevention and control, payments for hydrological environmental services and development of other ecosystem products and services for voluntary markets. (See proposals and reports for these projects; GESG 2006, 2010a, 2010b 2011).

Additional evidence that the project will assist communities and biodiversity to adapt to the probable impacts of climate change is its identification as a project of adaptation to climate change on the web page of Climate Change in Mexico: Information by Sector and State (INE-SEMARNAT and UNAM)[37] and its planned inclusion as an adaptation project under the Querétaro State Climate Change Action Plan (Torres, personal communication, 2011).

GL2. Exceptional Community Benefits

Concept

This Gold Level Exceptional Community Benefits criterion recognizes project approaches that are explicitly pro-poor in terms of targeting benefits to globally poorer communities **and** the poorer, more vulnerable households and individuals within them. In so doing, land-based carbon projects can make a significant contribution to reducing the poverty and enhancing the sustainable livelihoods of these groups. Given that poorer people typically have less access to land and other natural assets, this optional criterion requires innovative approaches that enable poorer households to participate effectively in land-based carbon activities. Furthermore, this criterion requires that the project will 'do no harm' to poorer and more vulnerable members of the communities, by establishing that no member of a poorer or more vulnerable social group will experience a net negative impact on their well-being or rights.

Indicators

Project proponents must:

1. Demonstrate that the project zone is in a low human development country OR in an administrative area of a medium or high human development country in which at least 50% of the population of that area is below the national poverty line.

Mexico is defined in the latest UNDP Human Development Report as a High Human Development Country. However, according to estimations of the Mexican National Commission for the Evaluation of Social Development Policy (CONEVAL), based on the 2008 National Survey of Household Income and Expenses (ENIGH), 18.2% of Mexicans live below the food-based national poverty line while 47.4% live below the asset-based national poverty line. The food-based poverty line is identified as a monthly income of less than 949 pesos ($69 USD) in urban areas or less than 707 pesos ($51 USD) in rural areas, amounts considered insufficient to obtain minimum food requirements even if the entire income were spent for this purpose. The asset-based poverty line is identified as a monthly income of less than 1,905 pesos ($138 USD) in urban areas or 1,282 pesos in rural areas ($93 USD), an amount considered inadequate for basic requirements of food, health, education, clothing, shoes, housing and public transportation, even if the entire income were dedicated exclusively to these purposes (CONEVAL, 2009).[38]

[37] See http://www2.ine.gob.mx/cclimatico/edo_sector/estados/acciones_queretaro.html. The project is referred to as "Repoblación forestal de la Reserva de la Biosfera Sierra."

[38] U.S. dollar equivalents are calculated using an exchange rate of 13.8 MXN to 1 USD, corresponding to December 31, 2008.

Information utilizing these income-based definitions of poverty is made available by CONEVAL at the level of states and municipalities (roughly equivalent to counties in the United States) and is presented in Table 19 for the municipalities represented in the project zone.

Table 19: Poverty levels in the municipalities of the project zone

State	Municipality	Total population	% Income poverty	
			Food poverty	Asset poverty
Querétaro	Pinal de Amoles	25,325	50	77
Querétaro	Arroyo Seco	12,493	33	62
Querétaro	Jalpan de Serra	22,025	30	57
Querétaro	Landa de Matamoros	18,905	26	56
San Luis Potosí	Aquismón	45,074	70	89
San Luis Potosí	Xilitla	50,064	54	81
TOTAL		**173,886**	**50**	**75**

Source: (CONEVAL, Mapas de Pobreza 2005)

2. Demonstrate that at least 50% of households within the lowest category of well-being (e.g., poorest quartile) of the community are likely to benefit substantially from the project.

The socioeconomic indicators of CONAPO previously presented in Tables 2 and 3 of section B1.5 provide indicators that can be used to rank households based upon access or lack of access to basic services (sanitation, piped water and electricity), construction characteristics (whether homes have dirt floors or not) and possession of common household appliances (refrigerators). Although no single indicator can accurately identify household well-being, for the purposes of this standard, the project proponent has selected a closely related indicator from the 2000 census that identifies how many households in each community lack all three of the following basic services: piped water, drainage and electricity. The results are presented in Tables 20 and 21. As can be seen, this indicator identifies 15% of the households within the Zone 1 communities and 23% of Zone 2 communities as falling into this category. The percentage within each individual community ranges from 0% in the case of San José de las Flores, Arroyo Seco in which all 32 households had these services to 100% in the case of Agua Fría de los Fresnos, Arroyo Seco in which all four households lacked these services.

Table 20: Zone 1 communities in lowest category of well being (defined as lacking piped water, drainage and electricity)

Name of municipality	Name of community	Total population	Number of inhabited private homes	Number of inhabited private homes with neither piped water, drainage nor electricity	% of inhabited private homes with neither piped water, drainage nor electricity
Arroyo Seco	AGUA FRIA DE LOS FRESNOS	20	4	4	100%
Arroyo Seco	FLORIDA, LA	356	85	3	4%
Arroyo Seco	SAN JOSE DE LAS FLORES	173	32	0	0%
Jalpan de Serra	MADROÑO	278	46	8	17%
Jalpan de Serra	RINCON DE PITZQUINTLA	506	80	14	18%
Landa de Matamoros	AGUA ZARCA	1309	292	17	6%
Landa de Matamoros	CERRO DE SAN AGUSTIN	168	30	10	33%
Landa de Matamoros	LOBO, EL	588	133	5	4%
Landa de Matamoros	MADROÑO, EL	371	79	8	10%
Landa de Matamoros	PINALITO DE LA CRUZ	407	72	1	1%
Landa de Matamoros	RIO VERDITO	287	61	1	2%
Pinal de Amoles	AGUA AMARGA	447	84	6	7%
Pinal de Amoles	AGUA DEL MAIZ	215	41	18	44%
Pinal de Amoles	ARPA, EL	92	12	9	75%
Pinal de Amoles	BARRANCA, LA	425	65	25	38%
Pinal de Amoles	CUESTA BLANCA	138	30	5	17%
Pinal de Amoles	EPAZOTES GRANDES	199	49	42	86%
Pinal de Amoles	ESCANELILLA	477	100	16	16%
Pinal de Amoles	GALLO, EL	130	28	20	71%
Pinal de Amoles	LOMA LARGA (SANTA CECILIA)	207	36	7	19%
Pinal de Amoles	MADROÑO, EL	412	85	5	6%
Pinal de Amoles	MOHONERA, LA	284	43	15	35%
Pinal de Amoles	MOJONERA, LA	5	NA[39]	NA	NA
Pinal de Amoles	OTOMITES	113	20	3	15%
Pinal de Amoles	PUERTO DE ESCANELILLA	525	77	1	1%
Pinal de Amoles	RANCHITO, EL	535	94	8	9%
Pinal de Amoles	RANCHO NUEVO	301	48	2	4%
Pinal de Amoles	RIO ESCANELA	250	46	7	15%
Pinal de Amoles	RODEZNO, EL	220	41	33	80%
Pinal de Amoles	SAN JOSE COCHINITO	103	20	8	40%
Pinal de Amoles	SAN PEDRO VIEJO	564	102	4	4%

[39] As previously mentioned, for very small population localities, the census does not provide detailed information.

Pinal de Amoles	SANTA AGUEDA	468	86	8	9%
Pinal de Amoles	SAUZ DE GUADALUPE	619	113	14	12%
Pinal de Amoles	TEMASCALES	138	26	14	54%
Pinal de Amoles	TINAJA, LA	615	126	1	1%
Pinal de Amoles	TONATICO	366	74	3	4%
TOTAL	36	12,311	2,360	345	15%

Table 21: Zone 2 communities in lowest category of well being (defined as lacking piped water, drainage and electricity)

Name of municipality	Name of community	Total population	Number of inhabited private homes	Number of inhabited private homes with neither piped water, drainage nor electricity	% of inhabited private homes with neither piped water, drainage nor electricity
Aquismón	AGUA AMARGA	303	56	28	50%
Aquismón	HORNOS, LOS	309	54	47	87%
Aquismón	OCTUJUB	641	129	41	32%
Aquismón	PAXALJA	949	171	31	18%
Aquismón	SAN JOSE OIJA	212	45	9	20%
Aquismón	SOLEDAD, LA	177	34	5	15%
Aquismón	TAMAPATZ	923	182	16	9%
Aquismón	TAMPAXAL	936	184	17	9%
Xilitla	BARRIO SAN PEDRO	496	88	43	49%
Xilitla	CERRO QUEBRADO	189	34	1	3%
Xilitla	OLLITA DEL PINO	325	66	19	29%
Xilitla	POTRERILLOS	531	99	11	11%
Xilitla	RANCHO NUEVO	424	77	35	45%
Xilitla	RETEN, EL	212	40	7	18%
Xilitla	SOLEDAD DE ZARAGOZA	551	105	17	16%
Xilitla	TINAJA, LA	245	42	1	2%
Xilitla	UXTUAPAN	517	109	16	15%
TOTAL	17	7,940	1,515	344	23%

The project proponent maintains that all community households, including those in the lowest category of well-being, will benefit substantially from the project as the result of its benefits for water capture, soil conservation, local temperature regulation and the social benefits described in Tables 13 and 14. The project proponent references section CM1.1 for supporting documentation regarding these benefits. The benefits of poverty reduction, training and community participation in conservation activities will directly involve individual landholders and their families in establishing reforestations, while providing additional benefits to the community at large, as new income by project participants will be used for the purchase of products and services within the communities. A 2007 analysis of the

social return on investment of the Sierra Gorda programs, including the carbon capture project, utilized a multiplier of 1.8 pesos going into the community for each peso earned (Galimidi and Olsen, 2007, p. 20). The multiplier effect utilized was based upon a survey of multiplier effects conducted for the Sierra Gorda by agricultural and resource economist Jim Whitestone (Whitestone, 2007). Applying this multiplier effect to the projection of $9.8 million MXN ($817,000 USD) of new income through 2042 from carbon capture payments to project participants results in a multiplier effect of $17.6 million MXN ($1.5 million USD) and a total project impact of $27.4 million USD ($2.3 million USD). In communities with the socioeconomic indicators presented in Tables 2 and 3, located in municipalities with the levels of poverty presented in Table 19, this total economic impact constitutes a substantial benefit for all members of the communities.

3. Demonstrate that any barriers or risks that might prevent benefits going to poorer households have been identified and addressed in order to increase the probable flow of benefits to poorer households.

The project has been specifically designed to involve the poorest households, going well beyond the Clean Development Mechanism and Mexican government programs in its efforts to involve poorer groups in efforts to combat climate change. In particular, the following project design elements are designed to overcome important barriers to the participation of poorer households:

Acceptance of small reforestations
Due to their possession of small parcels and their involvement in subsistence agricultural and livestock activities, the poorer households are those least able to dedicate large areas to reforestation. In order to maximize their participation, the project has therefore established a minimum reforestation requirement of just .5 hectare, well below the minimum requirement of 1.0 hectare for a CDM reforestation project in Mexico as well as by programs of government support for the development of carbon capture projects.

Acceptance of certificates of legitimate land possession
The poorest of households often do not hold title to the property in their own name. In many cases title is in the name of a deceased relative, and although possession is not in dispute, legal costs and exorbitant notary fees prevent the landholders from updating the titles. In these cases, the project accepts participants who obtain a record of possession from the local municipal authority.

Implementation of project in remote rural areas
The poorest households often live in the most remote rural areas, in the most marginalized conditions, making their participation in a carbon program extremely difficult. This project involves literally hundreds of poor landholders scattered throughout the mountains. These participants often lack telephone service and are in locations accessible only by hours of driving on rough, unpaved roads, dramatically increasing the per-unit costs of carbon sequestration.

4. Demonstrate that measures have been taken to identify any poorer and more vulnerable households and individuals whose well-being or poverty may be negatively affected by the project, and that the project design includes measures to avoid any such impacts. Where negative impacts are unavoidable, demonstrate that they will be effectively mitigated.

The project will not negatively affect the well-being or poverty of any households or individuals. All conversion of agricultural and livestock activities to reforestation are voluntary and involve compensation.

5. Demonstrate that community impact monitoring will be able to identify positive and negative impacts on poorer and more vulnerable groups. The social impact monitoring must take a differentiated approach that can identify positive and negative impacts on poorer households and individuals and other disadvantaged groups, including women.

Due to high levels of migration of men to other parts of Mexico or the United States, the largest, poorest and most disadvantaged groups are generally women, who often have sole responsibility for the management of households for long periods of time and in some cases are abandoned and who have less access to local economic opportunities. There will be informative meetings that will involve women, providing them educational materials and information regarding the ecosystem services of the SGBR and in particular the services provided by reforestations. Women will be included in the surveys regarding the impacts of the project upon quality of life and their responses will be differentiated to confirm that they are receiving project benefits. If necessary, project strategies will be adjusted based upon survey results to ensure project benefits are reaching this more vulnerable group.

GL3. Exceptional Biodiversity Benefits

Concept

All projects conforming to the Standards must demonstrate net positive impacts on biodiversity within their project zone. This Gold Level Exceptional Biodiversity Benefits criterion identifies projects that conserve biodiversity at sites of global significance for biodiversity conservation. Sites meeting this optional criterion must be based on the Key Biodiversity Area (KBA) framework of vulnerability and irreplaceability. These criteria are defined in terms of species and population threat levels, since these are the most clearly defined elements of biodiversity. These scientifically based criteria are drawn from existing best practices that have been used, to date, to identify important sites for biodiversity in over 173 countries.

Indicators

Project proponents must demonstrate that the project zone includes a site of high biodiversity conservation priority by meeting either the vulnerability *or* irreplaceability criteria defined below:

1. Vulnerability

Regular occurrence of a globally threatened species (according to the IUCN Red List) at the site:

1.1. Critically Endangered (CR) and Endangered (EN) species - presence of at least a single individual;

The Red-crowned Parrot *(Amazona viridigenalis)* (Endangered according to the IUCN Red List) has populations in the northeast of the SGBR, found in sub-deciduous and oak forests in relatively well-conserved areas and now in many cases under schemes of conservation or private natural reserves such as Las Arenitas. Las Arenitas is an area of 500 hectares of tropical oak forests that shelters various trees that serve as nesting sites, because of which it is an important area for the conservation of this threatened species. Although the SGBR is marginal to this species' area of distribution, it has excellent habitat for this species, a good part of which is protected in core-protected areas, private reserves or properties under schemes of payments for environmental services, because of which the Sierra Gorda's

function as a refuge for this species should not be under-estimated. Additional information can be found at:

http://www.iucnredlist.org/details/142697/0

(Please see section 8.1.b for additional information regarding Critically Endangered Species and Endangered Species.)

or

1.2. Vulnerable species (VU) - presence of at least 30 individuals or 10 pairs.

The Bearded Wood-Partridge *(Dendrortyx barbatus)*, a bird endemic to the cloud forests of a small sector of the Eastern Sierra Madre, has in the Sierra Gorda its most important long-term refuge, with a forest mass still intact, in contrast to surrounding areas in the state of San Luis Potosí as well as in Hidalgo, Puebla and Veracruz, that have been deforested and fragmented, putting the species at the edge of extinction according to a recent study (Eitniear et al 2000). In the SGBR, sites that shelter critical habitat for this species are protected as private natural reserves by the non-governmental organizations of the Sierra Gorda Alliance, protecting about 3,000 hectares of refuge for this bird. According to the IUCN Red List, the Bearded Wood-Partridge is Vulnerable, because of which all forestry, agriculture or livestock use that significantly alters its habitat should be restricted within this small area of refuge for this notable Mexican bird. Before documenting the populations in the SGBR, it was listed in danger of extinction. The populations of the Sierra Gorda are calculated at more than 3,000 birds, constituting 55% of its worldwide population, and without doubt those that have the greatest possibility of conservation in the long term. Additional information can be found at:

http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=312&m=0

(Please see section 8.1.b for additional information regarding Vulnerable Species.)

Or,

2. Irreplaceability

A minimum proportion of a species' global population present at the site at any stage of the species' lifecycle according to the following thresholds:

These criteria were not evaluated, due to meeting the Vulnerability indicator.

2.1. Restricted-range species - species with a global range less than 50,000 km2 *and* 5% of global population at the site; or

2.2. Species with large but clumped distributions - 5% of the global population at the site; or

2.3. Globally significant congregations - 1% of the global population seasonally at the site; or

2.4. Globally significant source populations - 1% of the global population at the site;

Annex 1

Curricula vitae of project proponent, key partners and staff

CURRICULUM VITAE

BOSQUE SUSTENTABLE A.C.

Background

For 22 years, the Grupo Ecológico Sierra Gorda, I.A.P. has strived for the conservation of natural resources accompanied by a social strategy of development. This strategy, not only of protection but also of sustainable use, has generated a series of demands that requires accompaniment, technical assistance and proposals for the management of forestry resources. In order to cover these demands and be able to offer options of ecological and productive diversification, a new organization emerged capable of responding to the enormous needs for technical assistance.

In 2001, the organization Bosque Sustentable, A.C. was born, inheriting from the Grupo Ecológico Sierra Gorda its broad knowledge of the region and its people and multiple contacts established with communities, institutions and the private sector, which make possible the carrying out of numerous activities of restoration and forestry management. This valuable legacy has enabled Bosque Sustentable to achieve growing social participation and stimulate community organization, basic conditions for the implementation of its work.

In addition, Bosque Sustentable was established with the objective of covering in an integrated manner the requirements of the project of Biodiversity Conservation in the Sierra Gorda Biosphere Reserve, including the project's components of forest restoration, conservation, management and sustainable use, as well as the protection of soils and the search for sustainable productive alternatives.

Mission of Bosque Sustentable

The mission of Bosque Sustentable is to conserve the biodiversity and promote the sustainable development of the Sierra Gorda through a social strategy of protection and sustainable use of the natural resources, in particular the forestry resources, through the uniting of citizen and institutional efforts.

General objective of Bosque Sustentable

To strengthen and propel forestry development, ecological restoration and promotion of sustainable agriculture and livestock alternatives in the Sierra Gorda Biosphere Reserve, in its buffer areas and zones of influence, in search of ecological, social and economic benefits for the region.

Projects and programs

Projects and programs that Bosque Sustentable A.C. has implemented from 2001 to 2009 include the following:

- Annual programs for the establishment of reforestations in buffer zones of the Reserve and activities related to reforestation such as the collection of germplasm, management of tree nurseries, etc.
- Annual programs of silvicultural management in natural regenerations and reforestations.
- Annual programs for the prevention and combating of forest fires.
- Project of restoration of the watersheds of the Escanela River and the Chuveje Arroyo with soil conservation works.
- Inventories of the carbon stored in the ecosystems of the Reserve.
- Pilot project for the sale of the environmental service of carbon sequestration in reforestations.
- Development of management programs for sustainable forestry, including the cultivation of commercial non-wood species and commercial plantations.
- Monitoring and continuation of carbon capture projects.
- Enrollment and follow-up with property owners in programs of payments for hydrological and biodiversity ecosystem services of the National Forestry Commission and the Gonzalo Río Arronte Foundation.
- Participation in the presentation of Sierra Gorda Earth Center workshops regarding ecosystem services.

Recent Achievements

- 2007 Energy Globe Award in Sustainability. Bosque Sustentable was named the national winner in the category "Earth" for the project of "Development of Ecosystem Products."
- 2008 Development Marketplace Award for the project of "Reducing the Impact of Cattle Ranching on Biodiversity."
- The completion of 14 transactions involving 28,427 tons of CO_2e in the voluntary carbon market.

Sources of financing for forestry activities (direct or via Grupo Ecológico Sierra Gorda)

- National Forestry Commission
- United Nations Development Program
- Gonzalo Río Arronte Foundation
- United Nations Foundation
- Utah State University
- TBLI
- Live Climate
- Schwab Foundation

- World Land Trust
- LGT Venture Philanthropy
- Fundación Ecología y Desarrollo
- Acciónatura
- Instituto Internacional de Facilitadores y Cambio, S.C.

Personnel

Bosque Sustentable A.C. has a work team with excellent work standards, technical knowledge, and knowledge of the region, who have gained appreciation and acceptance of its programs by the inhabitants of the Reserve.

DIRECTOR
Gabriel Domínguez Cabrera
ASSISTANT DIRECTOR
Mario Pedraza Ruiz
FORESTRY ENGINEER
Marco Antonio Miguel Martínez
MANAGEMENT ASSISTANT
Magdalena Ramírez Rubio
SUPERVISOR
J. Leonor Jiménez Sánchez
REFORESTATION PROMOTER 1
Maximilano Martínez Ramírez
REFORESTATION PROMOTER 2
Quirino Sánchez Hernández
REFORESTATION PROMOTER 3
Francisco Sarabia Sánchez
REFORESTATION PROMOTER 4
José Manuel Soria Reséndiz
REFORESTATION PROMOTER 5
J. Jesús Castillo Ríos
SOILS PROMOTER 1
José Martín Granadero Alvarado
SOILS PROMOTER 2
Ángel Martínez Contreras
INVENTORIES ASSISTANT
Hugo Antonio Jiménez Reyes

TECHNICAL DIRECTOR OF BOSQUE SUSTENTABLE

GABRIEL DOMÍNGUEZ CABRERA	**PERSONAL DATA**
Domicilio. Avenida la Presa s/n Barrio el Panteón Jalpan de Serra Querétaro. gabdoca@hotmail.com Cel. +52 (441) 100 90 70	RFC. DOCG741002 CURP. DOCG741002HTCMBB04 Date of birth: October 2, 1974 Birthplace: Tenosique, Tabasco

Academic Formation

Master's in Management of Natural Resources
Autonomous University of Nuevo León
2003 – 2005

Forestry Engineer
Antonio Narro Autonomous Agrarian University
1997 – 2001

Master's Thesis
Evaluation of carbon content in forests of southern Nuevo León

Professional thesis
Evaluation of the damage caused by *Retinia arizonensis* Miller (Lepidoptera-Tortricidae) in a plantation of *Pinus cembroides* Zucc in Ejido Carneros, Saltillo, Coahuila.

Professional Experience

2006-2009

Director of Bosque Sustentable, A.C.

- Supervision of carbon sequestration program
- Implementation of carbon monitoring protocol
- Inventory of carbon in the Sierra Gorda Biosphere Reserve
- Dissemination of the importance of forestry and fire regulations
- Elaboration of management programs for commercial forest plantations
- Elaboration of management programs for non-wood products
- Elaboration of proposals regarding biodiversity and hydrologic services for presentation to CONAFOR
- Technical assistance to producers of non-wood products, reforestations and commercial plantations
- Response to outbreaks of forest pests and diseases in the Sierra Gorda

• Formation and coordination of voluntary fire brigades in conjunction with municipal presidents
2004-2005
Evaluator of the program for development of commercial forest plantations in Mexico for CONAFOR in the states of Campeche, Tabasco, Veracruz and Chiapas Elaboration of management programs for sustainable forestry

Development of Productive Projects

- Semi-intensive production of tilapia in Matehuala, San Luis Potosí, 2004.
- Ecotourism in Rancho El Ancla in Hualahuises, Nuevo León, 2004.
- Collaborator in an independent association of service providers for rural development, Nuevo León, 2004.
- Social service in the project of "Rural development and improvement of family nutrition," Ejido Buñuelos in the municipality of Saltillo, Coahuila, 2000.

Publications

"Estimación de biomasa y contenido de carbono de *Pinus cooperi* en Pueblo Nuevo, Durango". Madera y Bosque 13(1) 2007.

"Evaluación del contenido de carbono en bosques del sur de Nuevo León". Memorias del VIII Simposio Internacional de Agricultura Sostenible. Noviembre de 2005.

"Biomasa área y factores de expansión de especies características en bosques del sur de Nuevo León". En proceso.

Sierra Gorda Ecological Group I.A.P.
Curriculum Vitae

Official name: Grupo Ecológico Sierra Gorda, I. A. P.

Acronym: GESGIAP

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+52-442 212 47 77

Email: gesgiap@prodigy.net.mx

Web page: www.sierragordamexico.org

General Director: Martha Isabel Ruiz Corzo

Number of staff: 21

Number of volunteers: 6,500 volunteers in Sierra Gorda Biosphere Reserve and its areas of influence and 4 affiliated organizations, with 37 people voluntarily cooperating with GESGIAP.

Founded: The Sierra Gorda Ecological Group initiated its work in 1987 and was legally registered as a civil association on May 12, 1989. In 1996, the status was upgraded to a Private Assistance Institution in order to improve financial transparency.

Mission: To conserve the natural resources and promote the sustainable development of the Sierra Gorda through the uniting of citizen and institutional efforts.

Vision: We are a model of effective social and institutional co-management with local recognition and ownership that guarantees the conservation of biodiversity in the Sierra Gorda. We are a dynamic self-sufficient organization with our own revenue sources to solve the operative expenses of the conservation programs *in situ* and sufficient human and material resources to carry out development actions oriented towards sustainability. Our actions are legitimized by social participation.

Background & Setting
Sierra Gorda Ecological Group leads and coordinates the Alliance for the Conservation of the Sierra Gorda Biosphere Reserve, joined with sister organizations that have shared the objective of executing the different tasks and together have achieved the development of numerous environmental activities, forging higher levels of networks of work among all social levels, and in this way defending the ecosystems and species of the Reserve that faced many threats. Twenty-five years ago a grassroots movement for conservation began, and since then

the activities have continued to involve many levels of stakeholders. The movement was the Sierra Gorda Ecological Group (GESGIAP), and in 1997, after actively seeking the protection of the Sierra Gorda, a presidential decree was achieved to create the Sierra Gorda Biosphere Reserve as a federally protected area based on the consensus of local communities.

The decree initiated a unique case of co-management in which the local initiative is responsible for the administration and the orientation of the region toward sustainability, while the application of norms is carried out through the National Commission of Natural Protected Areas (CONANP) of SEMARNAT. After years of responding to local problems and applying environmental laws and regulations in the area, we have detained unregulated land-use change and stabilized the forest-agricultural border. Today, the Sierra Gorda Alliance has achieved the regeneration of 23,000 hectares of forests, the acceptance of the Reserve's management and conservation program, and the support of a local society in which the inhabitants share pride for living in a federal protected area.

This unique case of co-management between the local initiative and the federal government is one in which the Alliance has realized successful and concrete results and in which the civil society with its roots and knowledge of the region takes responsibility for its administration.

Generated with scientific rigor and social participation, waves of community work have been organized continuously in a way that has given us key knowledge in relation to sustainability, as a living experience of conservation in which achievements are shared and replicated so that now 32% of the state of Querétaro practices conservation management.

Drawing together the objectives of conservation of nature and the participation and development of the local communities under this vision, our Reserve has generated a new paradigm, having qualified as the Natural Protected Area with the largest social management on the Planet. We now offer specific strategies in 5 areas of work through 165 activities carried out by the different organizations of the Alliance for Conservation.

In order to further extend its outreach and impact, GESGIAP has fostered the creation of additional organizations that provide parallel support to programs of conservation and productive diversification.

- **Sierra Gorda Products and Services (Productos y Servicios Sierra Gorda, S.A. de C.V.)** - Founded in 2008 along with Sierra Gorda Ecotours, this is a conservation business aggregator for the products and services of small local businesses. This conservation business is made up of two departments: Sierra Gorda Products and Sierra Gorda Ecotours. Upon generating revenue these activities offer financing for strengthening and replicating the microenterprises. This project capitalizes on the natural abilities of community members, creating new economic opportunities, providing training, improving infrastructure and equipment, and accompanying local community members every step of the way in producing goods and services.

- **Sustainable Forest (Bosque Sustentable A.C.)** - Founded in 2002, BSAC is an independent civil association born of fifteen years of community partnership and networking built by GESGIAP, to restore and reforest ecosystems and watersheds, diversify small scale enterprise, and build a regional economy based on conservation. It's an institution with the capacity and the ethic to attend to local needs, principally providing free technical studies to justify the management of forest diseases, as well as the organization of voluntary firefighting brigades. Creation of technical documents and the registration of management programs with CONAFOR also fall under this organization's responsibilities. We expect that with the sale of its technical services, Bosque Sustentable will be able to finance the operating costs of its own programs. Bosque Sustentable is also responsible for having registered 32,000 hectares in payments for hydrological services of the National Forestry Commission, as well as the development of products for ecosystem markets.

- **Joya Del Hielo A.C.** was established in 1996 as an initiative by GESGIAP staff and conservationists on a national level to purchase lands for strict conservation, in order to protect unique biodiversity sites. Cloud and temperate forests with diverse species of flora and fauna are protected under this system of private natural reserves. A total of 3,406 hectares of lands with a value of $9,149,600 pesos have been acquired and 14,777 hectares rented for $1,402,500 pesos. These lands are located in priority conservation zones of rich biodiversity, and the program generates income for the landowners in exchange for its protection.

- **Sierra Gorda Earth Center** is a replication strategy of the Sierra Gorda Ecological Group, and is a training center and hub of the environmental education strategy, synthesizing the knowledge and know-how of more than 22 years of experience, developing and contributing to projects of conservation including solid waste management, ecological restoration, conservation strategies, community environmental education, productive livelihood diversification, ecotourism, and the management of financial resources, among others, in an enriching process unprecedented in the natural protected areas of the country. The Earth Center offers courses directed to local, national, and international colleagues and collaborators, who have extensive portfolios of experience, and uses trainers and facilitators from a broad network of partners from successful projects, including international experts and the best presenters among those with national knowledge. The Earth Center also offers educational courses and workshops onsite as well as online, with a virtual campus diploma course based on a Sierra Gorda adaptation of a UNESCO curriculum entitled, "Learning and Teaching for a Sustainable Future," available nationally and soon in Latin America.

Sierra Gorda Biosphere Reserve is home to a large variety of species considered to be of global importance. It is situated in the convergence of two Bioregions: the Nearctic and the Neotropical. The Reserve contains 15 types of vegetation varying from semi-arid scrub to three variants of tropical forests that sustain 2,308 species of vascular plants, 131 mammals, 71 reptiles, 23 amphibians, 327 birds, 127 fungi, and 650 species of butterflies, making it the Natural Protected Area that is one of the most diverse and with the greatest ecosystem diversity in Mexico. According to the data available, the Reserve´s total population is 95,755 people (INEGI, 2005), which represents 5.9% of the state population. This Sierra Gorda population is distributed in 638 localities (defined by INEGI as any place with one or more inhabited houses), indicating a high dispersion in the territory.

The local organizations also have dedicated themselves to raising the funds necessary to operate on a high-impact scale, and in 2001 a full-size project was funded by the Global Environment Facility (GEF) and managed by a steering committee consisting of the United Nations Development Program (UNDP), the National Commission of Natural Protected Areas (CONANP), and the Sierra Gorda Ecological Group (GESGIAP).

Sierra Gorda Ecological Group now is known as the conservation project with the highest concentration of ongoing activities included in its "social strategy for conservation." Of 165 activities, it has obtained the direct participation of more than 43,202 residents every year, which has made possible the restoration of vegetation and wildlife in the Sierra Gorda, as well as numerous actions in the continuous march to combat poverty and improve the quality of life in ways that are compatible with nature and that now offer economic development to their communities with innovative activities that promote conservation of natural resources through preserving sources of water and productivity of the soil, good management of their solid wastes, or the sanitation of their rivers and streams.

Also, the formation of a sustainable culture has been reinforced through extensive social participation. For 22 years, we have implemented a successful program of community environmental education with multiple actions that promote a culture of respect and care for the environment and for natural resources. This program reaches 18,000 students and 22,500 adults inside the Biosphere Reserve each year. After 21 years of arduous work, the community environmental education program is in the process of transferring primary responsibility to regional schools and communities, involving 720 volunteer teachers in 237 communities that are committed to carrying forward this theme with the total support of the Sierra Gorda project.

Recent projects and principal sources of funding:

Biodiversity Conservation in the Sierra Gorda Biosphere Reserve	**No. 1**
Verania Chao verania.chao@undp.org Oficial de Programas de energía y medio ambiente - PNUD México Presidente Masaryk 29, piso 8, Colonia Polanco 11570, México, D.F. Tel. +52(55) 5263 9600 Fax. +52(55) 5255 0095	

Institutional Development of the Sierra Gorda Earth Center	**No. 2**
Daniel Montes donativos@montepiedad.com.mx Monte de Piedad # 7, primer piso Col. Centro, Delegación Cuauhtémoc CP 06000, México, D.F. 5552781800 ext. 1320	

Community Projects and Training Program for Sustainable Regional Development 2006-2008	**No. 3**
Ing. Guillermo Ramírez Filippini gfilipin@conanp.gob.mx Director Regional Centro-Eje Neovolcánico CONANP Camino al Ajusco No. 200, Col. Jardines en la Montaña Delegación Tlalpan. C.P. 14210, México D.F. Tel. 5449 · 7000	

The Integral Restoration of Watersheds in the Sierra Gorda Biosphere Reserve	**No. 4**
Ramón Pérez Gil, Director del Programa Agua programaagua@yahoo.com.mx Ignacio Ramírez No. 20, 4° Piso Colonia Tabaqualera, Delegación Cuauhtémoc México, D. F. 06030 Tel. 55666233	

Protection of Neotropical Migratory Birds and Enhancement of their Winter Habitat in the Sierra Gorda Biosphere Reserve	**No. 5**
Doug Ryan or Andrea Grosse NMBCA Program Coordinators Division of Bird Habitat Conservation U.S. Fish & Wildlife Service 703-358-1784 neotropical@fws.gov	

Management of Reserves by Multiple Stakeholders: Training in the Sierra Gorda Earth Center	**No. 6**
Melida Tajbakhsh Chief, Mexico Branch Division of International Conservation U.S. Fish & Wildlife Service 4401 N. Fairfax Dr. Suite 100	

Arlington, VA 22203 (703) 358-1766 melida_tajbakhsh@fws.gov http://www.fws.gov/international/

Sierra Gorda Earth Center: Development and Implementation of Virtual Campus and Didactic Strategies	**No. 7**
Tracy Austin tracy.austin@mitsubishicorp.com Executive Director Mitsubishi Corporation Foundation for the Americas 655 Third Avenue New York, NY 10017	

Restoration of hydrological watersheds, establishment of forest plantations and development of productive projects in the Sierra Gorda Biosphere Reserve	**No. 8**
Pascal Labelle pascal.labelle@aero.bombardier.com Production Unit Manager Bombardier Aerospace México	

Reducing impacts of ranching on biodiversity through payments for environmental services and intensive livestock management	**No. 9**
Kia Rassekh Operations and Financial Analyst The World Bank, 1818 H Street, NW Washington DC 20433 tel: (202) 458-4977	

Prizes, Awards and Acknowledgements

2008	• Development Marketplace Award, a Competitive Fund of the World Bank, received by BSAC for the project of "Reducing the Impact of Cattle Ranching on Biodiversity." • Río Tinto Prize for Sustainability recognized GEGSIAP as a finalist. • Mexico´s Ministry of Environment and Natural Resources (SEMARNAT) and the Confederation of Employers of the Mexican Republic (COPARMEX) presented award to GESGIAP for the efficient management of solid wastes. • The Global Agenda Council named Martha Ruiz Corzo, coordinator of the Sierra Gorda Alliance for Conservation, as the coordinator of the Biodiversity and Degraded Ecosystems Project of the World Economic Forum.
2007	• BBVA Foundation (of the First Bank of Spain, Banco Bilbao Vizcaya Argentaria) presented award to GESGIAP for Performance in Conservation of the Biodiversity of Latin America. • Partners in Flight Stewardship Award of the American Birding Association for outstanding contributions in the conservation of birds to Martha Ruiz Corzo. • Energy Globe Award in Sustainability. BSAC named the national winner in the category "Earth" for the project "Development of Ecosystem Products."
2006	• Energy Globe Award in Sustainability. GESGIAP named the national winner in the category "Youth" for the project "Environmental Education in the Sierra

	Gorda Biosphere Reserve." • Finalist, Japanese Prize for Most Innovative Development Project, Global Development Network • Winner of the Tourism for Tomorrow Award in the category of Destinations. World Travel & Tourism Council
2005	• Visionaris Award for Social Entrepreneurship, from UBS and Ashoka: Innovators for the Public to GESGIAP as a finalist. • Chosen for its experience, together with another NGO in Huatulco, Oaxaca as a case study for "Capacity 21" of the United Nations Development Program publication "Road to Sustainability."
2004	• The International Union for the Conservation of Nature (IUCN) named GESGIAP Member 1000. • "Reason for Being Award," Merced Foundation • GESGIAP achieved acknowledgement for the Sierra Gorda as an "Area of Importance for Bird Conservation in Mexico," through CIPAMEX and Bird Life International.
2003	• The Society for Conservation Biology presented award to Martha Ruiz Corzo for distinguished service • GESGIAP became a distinguished partner of Forest Trends • The Ramsar Convention for wetlands of global importance recognized the Jalpan Reservoir in the Sierra Gorda Biosphere Reserve. • Green Apple Award, United Kingdom, to GESGIAP • FORD-INDESOL selection for the "Systemization and projection of contributions by the civil society towards local development." GESGIAP was selected along with 19 other organizations.
2002	• The Rolex Prize for Enterprise elected Martha Isabel Ruiz Corzo as an Associate Laureate • Schwab Foundation recognized Martha Isabel Ruiz Corzo as an "Outstanding Social Entrepreneur"
2001	• GESGIAP, in coordination with SEMARNAT – CONANP, leadership of the Reserve and the local representation of PNUD, achieved approval for the full-scale project, "Protection of the Biodiversity of the Sierra Gorda Biosphere Reserve," with funds from GEF for a total of $6.7 million USD over an eight-year period. • As the starting strategy for GESGIAP, the then-president was selected by the Ashoka Foundation as a Fellow for her skill as a social entrepreneur. • As a consequence of this initial step by the Ashoka Foundation and the recognition of its strategy of conservation, the experience of GESGIAP was included by the Schwab Foundation in a small group of projects of social entrepreneurs that participated in a work meeting in Geneva, Switzerland, and also selected to participate this year in the World Economic Forum held in New York, USA as part of the social voice in Davos
2000	• "The Management Plan for the Sierra Gorda Biosphere Reserve" authored by GESGIAP, was presented by President Ernesto Zedillo. • "First Prize in Conservation," awarded by the FORD Motor Company • Recognized by Pfizer Global Manufacturing for labors in favor of future generations
1998	• "Prize of Ecological Merit," awarded by SEMARNAP in the category of "Social Sector"
1996	• Martha Isabel Ruiz Corzo named as an Ashoka Fellow • "The Eugenio Garza Sada Prize" awarded by the Technological Institute for

	Advanced Studies of Monterrey
1995	• Honorable Mention for the "Prize of Ecological Merit," awarded by the Ministry of Environment, Natural Resources and Fisheries (SEMARNAP)
1993	• State Ecology Prize, awarded by the Governor of the state of Querétaro

Martha Isabel Ruiz Corzo

Date of Birth	January 17, 1953
Birthplace	Mexico City
Position	General Director of the Grupo Ecológico Sierra Gorda
E-mail	gesgiap@prodigy.net.mx
Address	Av. La Presa S/N, Barrio el Panteón Jalpan de Serra, Qro, C.P. 76340 Tel. +52 (442) 212 32 67, 212 47 77

Work Experience

Year	Position
2010-	General Director of the Grupo Ecológico Sierra Gorda
2004 – 2009	Member, Board of Directors - Forest Trends, Washington D.C. and Member, Board of Directors - Katoomba Group
2001-2009	Regional and general coordinator of the project of "Biodiversity Conservation in the Sierra Gorda Biosphere Reserve," financed by the Global Environment Facility, administrated by the United Nations Development Program, operated by the National Commission of Natural Protected Areas and executed by the Grupo Ecológico Sierra Gorda, I. A. P. and Bosque Sustentable, A.C.
2000 – 2004	Member of the Board of Directors of the Mexican Fund for the Conservation of Nature (FMCN)
1997 – 2010	Director- Sierra Gorda of Queretaro Biosphere Reserve, National Commission of Natural Protected Areas
1997 – 1998	Coordinator for the preparation of the Management Program of the Sierra Gorda Biosphere Reserve, involving institutions and the civil society with more than 250 meetings of consensus-building carried out by the Grupo Ecológico Sierra Gorda.
1987-1997	Coordinator of the program of community environmental education, Grupo Ecológico Sierra Gorda
1987 – 1997	Co-founder and director of the Grupo Ecológico Sierra Gorda, I.A.P.
1984 – 1987	Followed a life of self-sufficiency, returning to the nature of the Sierra Gorda and with her family, initiated her work on behalf of the environment
1970 – 1982	Soloist - Polyphonic Choir, Autonomous University of Queretaro
1969 – 1984	Professor of artistic activities, John F. Kennedy School, Queretaro
1968 – 1982	First Violin, Chamber Orchestra of the City of Queretaro

Personal Activities and Achievements

Year	Activity
1997-2009	Participates in the federal administration of a Natural Protected Area, applying environmental laws and regulations and carrying out inter-institutional coordination Coordinates the Alliance of Conservation of the Reserve, implementing the Management Program, and overseeing the preparation and validation of a new,

	updated Management Program Coordinates multiple actors from the grassroots for the organization of activities of sanitation, education, conservation, productivity and restoration Participates in national and international forums with experience in the development of Ecosystem Products and a social strategy for conservation involving civil action in the Bioregion Acts as a spokesperson on behalf of communities in extreme poverty, promoting viable options of conservation through economic valuation of the natural infrastructure of the forests Carries out fund raising, public relations and defense of the territory at local, national and international levels in order to obtain economic and human resources for the execution of integrated activities for sustainable development within the Reserve and in the areas of conservation of the Sierra Gorda Coordinates the Earth Center, training of multiple actors, on-site and on-line education workshops, and the UNESCO – Sierra Gorda diploma course of "Learning and Teaching for a Sustainable Future" directed to teachers and conservation staff and forming part of the national catalogue of teacher improvement of the Ministry of Public Education, as part of a strategy of replication and dissemination Concluded the implementation of a GEF-UNDP Project, having capitalized the region with new productive activities, as well as with infrastructure and equipment for the operation of innovative alternatives of economic development Contracted the final external evaluation of the GEF-UNDP project, obtaining high marks for the execution of the activities and for the strategies implemented, as well as for exceeding the large commitments of co-financing Achieved the recuperation of 51,041 hectares of forests and the protection of wildlife, thanks to innovative programs of payments for ecosystem services, and renting and purchase of lands Initiated the operation of the Sierra Gorda Earth Center, offering training with the theme of "community and conservation focused on multiple actors in a reserve" with broad participation of other Biosphere Reserves in Mexico Consolidated the transference of the programs of community environmental education with a network of connections with 538 teachers in 110 communities, with 117 schools, 17,377 students and 6,510 adults, and the formation of 22 Ecoclubs comprised of children and youth of diverse ages committed to working on behalf of the Sierra Gorda Achieved the operation of 105 community recycling centers with voluntary participation of groups of women in the region who carry out the collection, separation and storing of solid wastes such as glass, cardboard, paper, PET plastic and metal materials (169 tons of solid wastes delivered to the regional recycling center and 147 tons delivered to processing plants) in 5 municipalities of the Sierra Gorda Biosphere Reserve, with 11,546 direct beneficiaries of 115 communities,

	and the partial transference of the program to local buyers of recyclable materials Established the monitoring of erosion with hydroclimatic stations, as well as inventories of the carbon stored in the forests, developing a methodology and giving value to the ecosystems, in order to offer different products to the global market Achieved an increase of 6,500 hectares and a 24.9% reduction in the fragmentation of the vegetation in and around the core protected areas of the Reserve, and an increase of 19,592 hectares in the forest in the areas of influence of those core protected areas Established commercial plantations in the Huasteca Potosina and restoration works in 42 micro-watersheds, ensuring the protection and recuperation of regional water sources, as well as the construction of 28 water storage tanks so that local communities can pass through dry seasons without water scarcity Integrated and promoted a package of 25 productive projects, with training, infrastructure and equipment, for the provision of ecotourism services, production of honey, women embroidering for nature, ceramics, carpentry, a hunting ranch, food processing, certified oregano, sale of ecosystem services and other products and services, involving 330 direct beneficiaries and 1,320 indirect beneficiaries. Integrated advanced tools into the project that open doors to innovative strategies to link the global economy to the vital services of nature Implemented global mechanisms that give value and markets to ecosystem products produced by communities in extreme poverty, constructing bridges between the two worlds Coordinated monitoring activities with academic institutions with the goal of developing methodologies for the economic valuation of ecosystem services

Publications/Reports

- Programa de manejo Reserva de la Biosfera Sierra Gorda, México, Instituto Nacional de Ecología, SEMARNAP, 1999
- Avances a la Sustentabilidad, Agenda 21, Informe a los 8 años del proyecto 2001-2008, Conservación de la Biodiversidad en la Reserva de la Biosfera Sierra Gorda, Sierra Gorda Querétaro, Reserva de la Biosfera Mundial, 2009
- Diplomado “Aprendiendo y Enseñando para un Futuro Sustentable” UNESCO-Sierra Gorda, 2007

Case Studies

- Social Return on Investment in the Sierra Gorda Biosphere Reserve
- Establishment of baselines for carbon products
- Community Environmental Education, a Strategy of Conservation

CO-FOUNDER AND LEGAL REPRESENTATIVE OF GRUPO ECOLÓGICO SIERRA GORDA

ROBERTO ANTONIO PEDRAZA MUÑOZ	**PERSONAL DATA**
Avenida la presa s/n Barrio el Panteón Jalpan de Serra Querétaro.	RFC. PEMR-500607QA5 Date of Birth: June 7, 1950 Birthplace: Agua del Maíz, Pinal de Amoles, Qro

Studies:

1956 - 1961	Melchor Ocampo Primary School, Jalpan de Serra, Qro.
1962 - 1964	Federal Secondary School, Querétaro, Qro.
1965 - 1966	High School – University of Querétaro
1967 - 1971	Public Accounting- University of Querétaro

Professional Practice:

1972 - 1974	Ministry of Finance and Public Credit - Auditor
1974 - 1987	Tax consultancy and accounting - Pedraza and Associates - Director, Querétaro, Qro.
1987 – 1888	Responsible for the Reforestation Program in the Sierra Gorda
1989 - 1997	Grupo Ecológico Sierra Gorda, I.A.P., Jalpan de Serra, Qro. • President of the Directive Committee. • Administrator • Coordinator of programs for the protection and restoration of natural resources and wildlife. • Legal Representative
1994 - 1997	Deputy Chairman of State Advisory Council for the Protection of Wild Flora and Fauna.
1998 – 2010	Director of Grupo Ecológico Sierra Gorda IAP • Responsible for the Program of Land Conservation and Environmental Services • Legal Representative
2010-	Legal Representative of Grupo Ecológico Sierra Gorda IAP • Responsible for the Program of Land Conservation and Environmental Services

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