

**Sustainable Forestry
in the
Sierra Gorda Biosphere Reserve, Mexico**

October, 2002



1. Project Summary

Project Category:	Land-Use Change and Forestry		
Delivery Mechanism:	Sequestration through natural regeneration		
Start Date:	2003		
Cumulative Amount:	Year	CO₂e (tonnes)	C (tonnes)
	2012	236,000	64,000
	2022	504,000	137,000
	2032	562,000	153,000
	2042	600,000	164,000
	2052	636,000	174,000
Investment Type:	Purchase		
Investment Amount:	US\$ 1,611,000 (C\$ 2,416,500)		
Cost / tonne CO₂e:	US\$ 2.53 (C\$ 3.80) – entire project US\$ 6.83 (C\$ 10.24) – Kyoto Period		
Location:	Sierra Gorda Biosphere Reserve, Mexico		
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2. Project Description

This initiative involves natural regeneration on 2,000 hectares of marginal agricultural lands. Suitable lands will be selected over 5 years (2003 to 2007). Preference will be given to land on steep slopes and land surrounded by existing forest. In so doing, soil protection from runoff and the accumulation of large forested areas, for biodiversity enhancement, will be maximized.

Landowners will be given incentives for seven years to allow marginal farmland to return to forest. After seven years the newly forming forest will be thinned giving the landowner some income from fuel wood. The landowner will also be allowed to harvest 25% of the land at 12, 17, 22 and 27 years. Each subsection of land will be subsequently harvest every 20 years. In doing so, the landowner will realize a continuous stream of income after the land has reverted to forest.

The advantages of natural regeneration are:

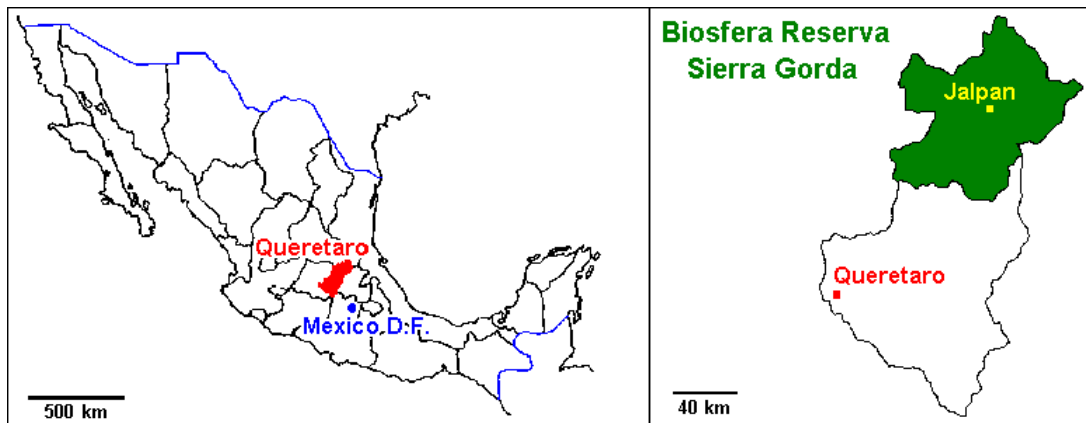
- It is less expensive than planting,
- It has a biodiversity benefit since and,
- In this area of Mexico, natural regeneration results in growth rates and maximum biomass accumulation that almost equals planted trees.

This initiative uses the Clean Development Mechanism to extend land protection efforts in Mexico's Sierra Gorda Biosphere Reserve.

The 383,000 hectare Sierra Gorda Biosphere Reserve was created in 1997. Located in the Sierra Madre Oriental, some 300 kilometers north of Mexico City, this magnificent area of deep canyons, pine and oak forests, green mountains, deserts and jungle is important because of its rivers and its rich mixture of birds, animals and plants. Many of these are, unfortunately, in danger of extinction.

The objective for the Sierra Gorda Biosphere Reserve is to preserve and rehabilitate the region's natural resources for future generations. Realization of this objective falls to the people of the Sierra Gorda -- Serranos -- and to the agency that is managing the Biosphere Reserve -- Grupo Ecológico Sierra Gorda.

Figure 1: Project Location



A detailed description of forest types and available lands is given in section 9(a). Maps of possible project locations and vegetation are given in section 9(e).

3. Greenhouse Gas Reductions

3.(a). *Delivery Method*

- Carbon dioxide is sequestered by natural regeneration on 2,000 hectares of degraded agricultural lands

Over the next five years, Grupo Ecológico Sierra Gorda will select 400 hectares annually as candidates for the natural regeneration support program. The selection will be based on fit with existing forest cover and steepness of slope. In this manner, biodiversity enhancement through the formation of contiguous large areas of forest cover, and soil protection will be maximized.

The biomass accumulation will be monitored every five years, after which greenhouse gas emission benefits will be transferred to the investor.

3.(b). Amount

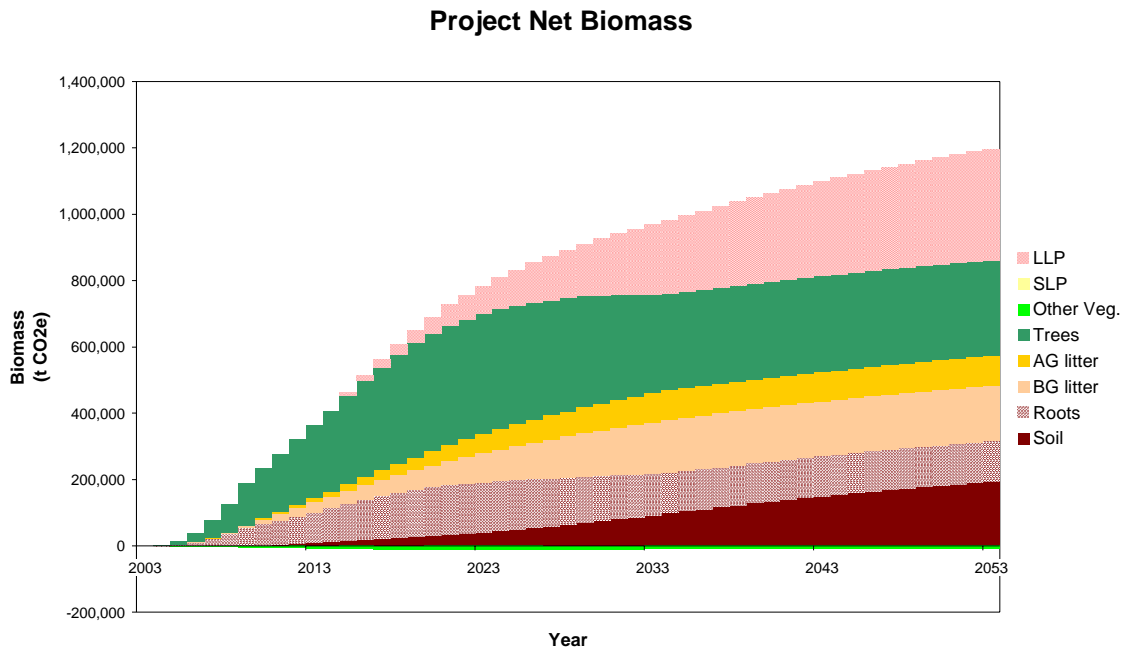
- 236,000 tonnes of CO₂e by 2012.
- 636,000 tonnes of CO₂e by 2052.

Carbon sequestration has been modelled by Woodrising Consulting Inc. using a proprietary version of GORCAM¹, an algorithm that tracks the flows of carbon in a forest system including wood products. Parameters for the model have been chosen from published material and are discussed in the appendices.

The estimate does not include temporary storage in wood products since the methodology to track storage in wood products has not been agreed to in international negotiations. They are presented here to demonstrate that wood products are a significant stock.

Only 75% of the modelled sequestration are offered for sale at this time.

Figure 2: Modeled Cumulative GHG Reductions



Note: AG litter = above-ground litter, BG = below-ground litter, SLP = short-lived wood products (paper), LLP = long-lived wood products (lumber).

3.(c). Repeatability

Repeating this project locally may result in leakage and is not recommended. The concept may be repeated in other locations throughout Mexico and the world.

4. Finances

4.(a). Costs

Capital (fencing)	US\$ 133,000	C\$ 199,500
Landowner Incentives	US\$ 1,261,000	C\$ 1,891,500
Monitoring	US\$ 494,000	C\$ 741,000
Project Development, Management and Insurance	US\$ 568,000	C\$ 852,000
CDM Charge	US\$ 32,000	C\$ 48,000
Total Costs	US\$ 2,487,000	C\$ 3,730,500
Investment Required (NPV _{10%})	US\$ 1,611,000	C\$ 2,416,500
\$ per tonne CO ₂ e (Kyoto Period)	US\$ 6.83	C\$ 10.24
\$ per tonne CO ₂ e (lifetime)	US\$ 2.53	C\$ 3.80

4.(b). Earnings

The landowners will gain income from the harvest of 25% of the land after 12, 17, 22, and 27 years. The lands will be harvested for a second time 20 years later (i.e. years 32, 37, 42, 47).

5. Risks

5.(a). Deliverability

risk moderate

There is a risk that the trees may grow less rapidly than expected. The sequestration estimate has been reduced by 25% to cover. As well, insurance will be purchased to cover other shortfall.

5.(b). Permanency

risk moderate

There is a risk that after harvest the landowner will wish to farm the lands once again. This risk will be minimized through legal contracts.

5.(c). Additionality

risk negligible

Without the GHG investment these lands would continue being farmed.

5.(d). Leakage

risk moderate

Leakage may occur if the actions (both afforestation and protection) cause other mature forest lands to be deforested.

5.(e). Technology

not applicable

5.(f). Credit Ownership

risk low

Only lands registered to a landowner will qualify.

6. Monitoring and Verification

Monitoring of the Trees and Roots pools will be performed every five years to coincide with the transfer of GHG reductions.

7. Other Benefits

7.(a). Public Exposure

For companies actively, or planning to be involved in Mexico, this project has substantial public relations potential.

7.(b). Environmental

The land reforested as a result of this initiative will help increase forest cover within the Biosphere Reserve. In this way, this initiative will have a positive effect on local and global biodiversity. Furthermore, expansion of forested areas will contribute to a more robust water supply, reduce soil erosion and help ecotourism efforts.

7.(c). Social / Educational

As a result of this initiative, landowners will actively learn sustainable forest management practices under the supervision of Grupo Ecológico Sierra Gorda.

8. Project Participants

8.(a). Grupo Ecológico Sierra Gorda (Grupo Ecológico)

Grupo Ecológico will provide the administrative support to this initiative. It will also select the land, make the purchases and afforest or protect the land as required. It will manage the lands over the duration of the initiative.

Over the last ten years, Grupo Ecológico has planted over 3-million trees on plantations that average 1.5 hectares in size. Its environmental programs reach some 16,000 students in 167 schools. Over 500 dry composting latrines and more than 1,500 efficient cookstoves have been installed. Grupo Ecológico is responsible for the erection of greater than 1,500 signs bearing environmental messages and some 50 murals have been painted on buildings.

More recently, Grupo Ecológico has extended its work to include social as well as environmental programs. Micro-enterprises, many of which use local products and resources, are under development and ecotourism opportunities are being organized. These initiatives will help Serranos and Grupo Ecológico become more self-sustaining while adhering to ecological principles.

Although the majority of Grupo Ecológico's revenue has historically come from government sources within Mexico, it has also received support from the W.K. Kellogg Foundation; the World Bank; the United Nations Development Programme; the U.S. Fish & Wildlife Service; the USDA Forest Service; and the Canada Fund. In 1996 it was selected by The Nature Conservancy as an Ecological Leader and in 1997 the Sierra Gorda was given Mexico's highest designation as a Biosphere Reserve. Grupo's status changed from a Sociedad Civil to an Institución de Asistencia Privada in 1997 and Ms. Martha Isabel Ruíz Corzo, manager of the Biosphere Reserve and co-founder of Grupo Ecológico, received a fellowship from Ashoka. Operating on a budget of as much as US\$1-million per year, Grupo Ecológico has the financial and administrative processes in place to undertake this initiative.

For more information on Grupo Ecológico please see visit <http://www.changemakers.net/>

8.(b). Woodrising Consulting Inc.

Canada-based Woodrising Consulting Inc. has worked in conjunction with Grupo Ecológico to develop this initiative. Woodrising will oversee the monitoring and verification aspects of this initiative. Woodrising has arranged to have monitoring and verification services undertaken by El Colegio de la Frontera Sur (Ecosur) -- a Mexican agency that is a leader in this discipline.

Woodrising Consulting Inc. has specialized in climate change project development and other aspects of global warming since 1994. Climate change initiatives have been undertaken in Australia, Canada, Chile, Mexico, Peru and Zimbabwe. Clients include Australia's Greenhouse Challenge Office; Canada's National Climate Change Process, the Canadian International Development Agency; Enbridge Consumers Gas, Enbridge Pipelines Inc., Enbridge Pipelines (Saskatchewan) Inc.; the Global Environment Facility in Washington, D.C.; the Government of Argentina; TransAlta Corporation; and the University of Calgary.

9. Appendices

9.(a). Modeling Details

9.(a).1.Natural Regeneration

The carbon sequestered through natural regeneration is modeled using GORCAM¹, an algorithm developed by Schlamadinger and Marland for tracking carbon storage in various pools of a forest stand.

Biomass estimates are based on field measurement on existing plantations of *Pinus patula* by forestry engineers employed by Grupo Ecológico Sierra Gorda. Naturally regenerating species also include *Liquidambar styraciflua* (sweetgum), but we were not able to find any published growth and yield curves for Mexico.

At this time, we do not have any measurements on land that is naturally regenerating. We have assumed that natural regeneration extends the rotation period by 20%. These values are typical of Canadian forests.

Important Parameters

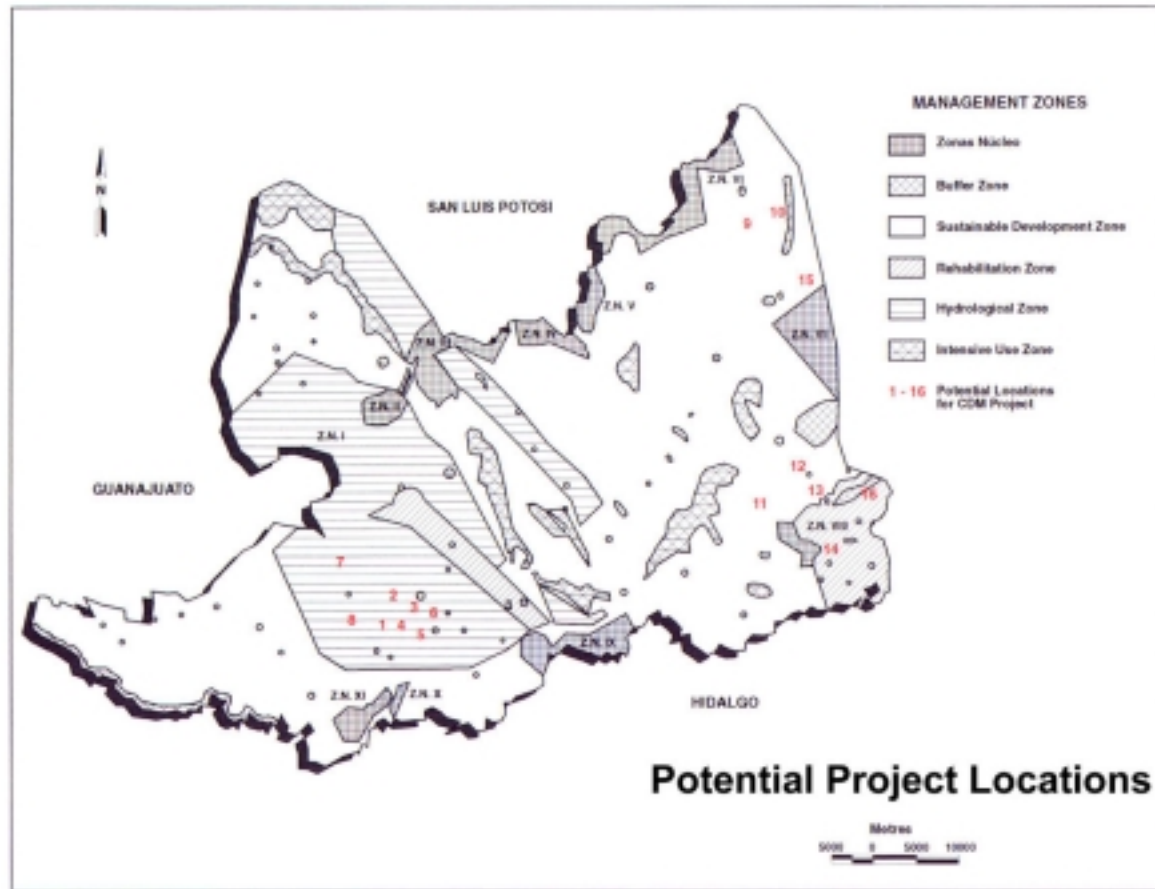
Initial above ground biomass	10.0 t / ha
Mean average increment (trees) at 10 years	10.4 t / ha / yr (17.2 m ³ / ha / yr)
Mean average increment (trees) at 20 years	9.4 t / ha / yr (15.5 m ³ / ha / yr)
Maximum biomass (trees) ²³	300 t / ha
Roots / Tree ⁴	0.42

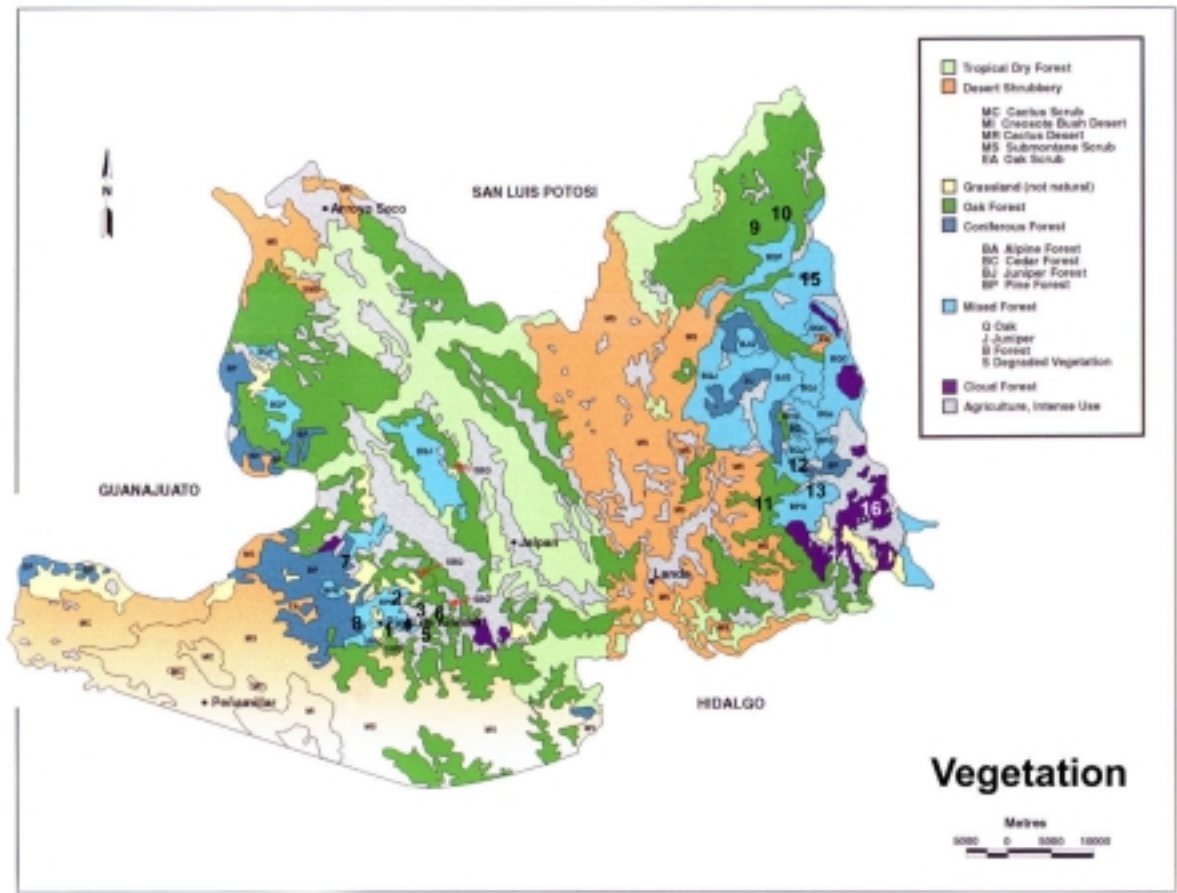
A detailed list of all parameters is available upon request (nbird@woodrising.com).

Maximum Biomass per Hectare

The IPCC estimates that in North American, temperate, coniferous forests a maximum biomass of 295 t/ha is attainable.

9.(b). *Maps of the Sierra Gorda Biosphere Reserve*





References

- ¹ Schlamadinger B and Marland G. 1996. The role of forest and bioenergy strategies in the global carbon cycle, *Biomass and Bioenergy* 10: 275-300.
- ² Gillespie, A. 1992. *Pinus patula* Schiede and Deppe. Patula pine. SO-ITF-SM-54. U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. <http://www.fs.fed.us/global/iitf/Pinuspatula.pdf>
- ³ Aguirre-Bravo C. and Smith F. 1986. Site index and volume equations for *Pinus patula* in Mexico. *Commonw. For. Rev.* 65(1): 51-60.
- ⁴ Castellanos J., Maass M. and Kummerow J. 1990. Root biomass of a dry deciduous tropical forest in Mexico. *Plant and Soil* 141: 225 – 228.