

**National Institute of Forest Conservation and
Development, Protected Areas and Wildlife
(ICF)**

Partners: FUCSA, PROLANSATE, FUCAGUA

PROJECT

**CONSERVATION AND INTEGRAL MANAGEMENT OF
MANGROVE ECOSYSTEMS OF THREE PROTECTED AREAS IN
THE ATLANTIC COAST OF HONDURAS, CA**



HONDURAS, C.A
October, 2009

Pilot Project Concept Note Template

PROJECT

“CONSERVATION AND INTEGRAL MANAGEMENT OF MANGROVE ECOSYSTEMS OF THREE PROTECTED AREAS IN THE ATLANTIC COAST OF HONDURAS, C.A”

1. Description of the Project

Project Summary

- Project Name: Conservation and Integral Management Of Mangrove Ecosystems of Three Protected Areas in The Atlantic Coast Of Honduras, C.A.
- Project Location: In the Districts of Atlantida and Colon
- Project length and dates: Three years from the moment the project is been approved
- Contac Person: Arnulfo Jose Messen Fajardo (ICF), Justo Carcamo (FUCSA), Victor Archaga (TNC), Eduardo Zavala (PROLANSATE), Hector Avila (FUCAGUA)
- Statement of project goal: Protect, conserve and promote the sustainable use of the mangroves of three protected areas in the Atlantic Litoral of Honduras and support the stabilization of the economical conditions of the population highly depended on the natural resources of the coastal-marine zone.
- Names of project proponents and main project implement organization: ICF, FUCSA, PROLANSATE and FUCAGUA
- Total project cost: € 600,000.00
- Amount of funding being requested from DFN: € 600,000.00
- Amount of funding being provided from elsewhere (indicated whether it is already secured and under application): In the present time there is not any financial support which had been approved for this purpose
- counterpart executor: ICF, FUCSA,
- Counterpart partners: PROLANSATE and FUCAGUA

1) Details of the proponent

a) Contact Details

Name	Contact details	Role / responsibility
Arnulfo José Messen Fajardo. (ICF)	Telephone (504) 223-7387 Mobile: (504) 9985-3680 Email: damni_2002@yahoo.es www.icf.gob.hn	Political and co-implementing agence Deputy Minister, Deputy Director of Protected Areas and Wildlife.
Justo Carcamo (FUCSA)	Tephone (504) 443-0329 www.fucsa.org jcarcamo@fucsa.org justo.carcamo@gmail.com	Executor and coordinator of the project
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Eduardo Zavala (PROLANSATE)	Tel: (504) 448-2042 Mobile: (504)9898-6474 Email: fundacionprolansate@yahoo.com	Co-executor partner
Hector Avila (FUCAGUA)	Tel:(504)434-4294 Mobile: (504)9991-0821 Email: director@fucagua.org	Co-executor partner

b) Summary information on the organisation and organisation structure

On September 13, 2007 the National Congress approved the Forest law, Protected Areas and Wildlife, which was officialised on February 14, 2008 by the President of the Republic, according to the Decree N° 98-2007 and was published in the official Newspaper La Gaceta on February 26, 2008; which was active 20 days after its publication (March 17, 2008).

The Forest Law, Protected Areas and Wildlife carry out important changes: creates the Forest Sector, Protected Areas and Wildlife, which institutional frame is conformed by the National Institute of Forest Conservation and Development, Protected Areas and Wildlife (ICF). The institute is structured in **four sub-programs**: **1. Economical Forest Development**, oriented to develop the potentials of the productive forest (pine trees and rainforest). **2. Community Development Forestry**, focus in improving the social conditions of the rural families. **3. Environmental Services, Restoration of ecosystem and Climate changes**, oriented in developing the competitive of the country in environment validation of the natural resources. **4. Protected Areas and Biodiversity**, oriented to reinforce the SINAPH and to assure the ecological representation and conservation in situ and ex situ of the ecological biodiversity.

The main activities carried out by the three partners whom will participated in the project are: 1. Protection and management of the natural resources. 2. Public Use. 3. Community Development. 4. Applied Investigation

c) Overview of relevant expertise and experience

The institute (ICF) and the three partners have experience in conservation of protected areas. The institute has experience in mangrove restoration with other projects out of the region, such as one in the south of the country which was a project of management and conservation of the mangrove in the Gulf of Fonseca, and it was funded by the International Tropical Timber Organization (ITTO). It is also important to point out that within the region there is a botanical garden with a wide experience in reforestation projects and research. The institute has information related to mangrove restoration carried out by the National Forest Science School (ESNACIFOR). It is also important to mention that in all these projects peoples from the communities had been involved with the purpose of given them another job source and therefore an improvement of their life quality.

d) Short description of other project partners

The three NGO´s have their own legal status provided by the government to be the administrators of the protected areas, a job they been doing for almost twenty years. They function mainly with the support of the international cooperation. The ecotourism is the activities which allow them to auto generate little percentage of their budget. These NGO´s have their own local personnel for both administrative and field sectors. Foreign students come to the protected areas to work out their own professional practice. Also national and foreign volunteers come to work in a short or long term in different activities. The three NGO´s had developed different projects related to protection and management of the resources and to give support to the communities.

1) WHERE - Location of the wetland system

a) Type of wetland

In the three protected areas the type of wetland is estuarine with connexions with the open ocean. The main characteristics of this ecosystem are permanent low wetland which mangrove (*Rhizophora mangle*) is the dominant plant and present at edge of the rivers. Also abundant flora and fauna from which 197 species of birds are found. Indicate the type of wetland to be restored or conserved and describe the key biophysical characteristics.

b) Location and size

The Jeannette Kawas National Park (PNJK) has 37,996.48 hectares and its coordinates are 15° 42´ and 61° 00´ North latitude and 87° 23´ and 87° 52´ West longitude. The limits are as follow: In the north with the Caribbean Sea (approximately 3 miles from the coast line); At the south with the railroad from Tela to Puerto Cortes; at the east with the garifuna community of San Juan; at the west with the natural limit of Chamelecon River. The park has rocky and sandy beaches as well as coral reef. Also has Garifuna communities surrounding the park and a high biodiversity, especially birds. Has a visitor centre. The Cuero and Salado Wildlife Refuge (RVSCS) has 13,255.20 hectares. The coordinates are: 15° 50´00" north latitude, and 86°45´00" West longitude. The limits are as follow: in the north with the Caribbean Sea (approximately 1.5 mile from the coast line); in the west with the Punta Isopo National Park; in the south with Pico Bonito National Park; in the east with the community of El Porvenir.

This Refuge has a humid tropical forest and mangroves ecosystem. It has 197 species of birds and is the habitat of the manatee. Also has a visitor centre and an eco lodge. The Guaymoreto Lagoon Wildlife Refuge (RVSLG) has 8,018.73 hectares and its coordinates area: 15° 55´ and 16° 02´ north latitude and 85° 48´ and 86° 00´ west longitude. It has sites with beaches and mangroves and high biodiversity. The limits of the RVSLG are: in the south with the road of Trujillo-La Ceiba and the Capiro Calentura National Park (PNCC), in the west with Trujillo Bay and the city of Trujillo and in the east is the Aguan River.

c) Current legal status of wetland

The three protected areas are included in National System of Protected Areas (SINAP). These areas are been managed by co-management agreements between the ICF and the NGO´s which are in charge of the management. The boundaries are officially delineated and also registered in the system. The conflicts shown in these protected areas are because of lacking of alternatives of development. Therefore, within these mangroves areas members of the communities are performing pressure in the ecosystem and the same time changing the vegetation for agriculture and cattle raising activities.

d) Current management and use of wetland

Environmental NGO´s are the ones who are in charge of the management, including both de jure and de facto managers of the wetland areas. The NGO´s are legally conformed. The main activity is the one performed by fishermen whom fish as subsistence way of living. Inhabitants have been trained as fishermen guides and naturalist guides who lower down the pressure over the natural resources. Among the services offered in the area the ecotourism is the most important in which people from the communities are involved such as the naturalist guides. It is important to point out that these wetlands are natural incubators of a high number of species of fish and crustacean which when they grow represent an enormous source of commercial good. In this sense industrial fisheries get a lot of profit from the fish products in front of these protected areas. Even though this activity is prohibit and therefore, should not be taken place in the areas, but since the NGO´s do not have the funds to performed an appropriate control and protection of the zone the industrial fisheries take advantage of the situation.

e) Wetland stakeholders

Stakeholder group	Nature of relationship with wetland (also list goods and services)	Estimated number of stakeholders in this group
Local Fishermen	Through fishing they obtain food for their families and for selling. They also get bates for fishing in the open sea. They also offer sport fishing tours to the visitors.	Approximately 250 families.
Cattle managers	This group have been expanding their limits to increase their cattle individuals, but by doing this they are affecting negatively the wetland.	Approximately 120 families.
African Palm producers	The people involved in this activity are located in the buffer zone of the areas. Since this activity had turned very attractive, it is producing change in the vocation of the soil and the fact that chemicals are used and also the building drainage activity makes the residual to flow to the wetlands.	Approximately 60 families
Naturalist Guides	Members of the communities are been trained to guide the visitors. The income for guiding goes directly to them.	Approximately 12 guides
Tour operators	Some visitors come to areas through local, regional and national tour operators. They always used the local guides.	Approximately 9 tour operators
Crops planters	Some families cultivate crops in a small scale for subsistence.	Approximately 30 families
Groups of students	Students from primary, high school and Superior level comes to the areas as visitors to learn about wetlands, its ecology, flora and fauna. University students comes to develop their professional practices	Approximately 1000 students per year
Craft producers	Small groups of members of the communities are involve in making hand craft products	5 groups
Scientific researchers	Since there are agreements with a few universities researches comes to performed investigation on specific species	3 per year

3)WHY - Status of the wetland system

f) Historical status as a functioning wetland

Until fifty years ago these areas were pristine and with low disturbance due to a low amount of inhabitants. No sedimentation was flowed to the wetlands because the middle and upper shades were also in its natural state. The ecosystems were functioning in its normal standards. Flora and fauna were abundant and diverse. A few visitors used to come

through the transnational companies. When these companies arrived to the region and started working in production of bananas and coconuts degradation of the ecosystems arises. Since then degradation of the resources has taken place. In relation to VCS and CDM no activity has been done. Therefore, no anecdotal evidence or literature can be given, since no one had ever got involved in this matter.

g) Current degraded or threatened status of the wetland

Currently the three wetlands are resources of a great economical, cultural, scientific and recreational value. They are sources of food, regulates the hydrological regimens, repelled flooding, repelled sediments, serves as filters against pollution, its flora and fauna abundant and diverse y they are among the ecosystems most productive of the planet. In an irresponsible way these forests are been affected by different activities which are against the normal function of the ecosystems.

h) Direct and underlying threats and causes of degradation

The main direct threats to the wetlands are:

- Upstream changes in the hydrology. The middle and upper water shades are been deforested in a fast way due to the need of land for raising cattle and growing crops, besides the timber industry. The result of this activity is an increasing rate of sedimentation which flows down to the wetlands and elevates the level of the substrate of rivers and streams, and hence decreases the hydrological capacity of rivers and canals.
- The over-exploitation of the marine and rivers resources. This is due to indiscriminate fishing by using illegal equipment. The group of fishermen had been organized and more training in this sense is planned to develop with them. Therefore, is expected to reduce or eliminated little by little this threat.
- The African palm industry in region is growing dramatically, and these wetlands are been threat due to two main sources, one is the current function of an oil extractor factory in the buffer zone of the RVSCS and the other is the fact that people living in the buffer zone in the three wetlands are more interested in implementing plantations all around the influence zones. This situation implies an increasing use of agrochemicals. The companies that buy the fruit to the oil production sometimes stimulates the owners of properties to either buy more land or invest in palm plantations in the land they already have.
- The increasing agro-boundaries for different activities such as cattle raise and migratory agriculture. Since most of the time there is not a real control of this type of activities, what this group of people really looking for is to expand the limits of their lands.

Unless in the future there will be establish a reinforcement and appropriate application of the law with the support of the government this threat will continue happening.

i) Overview of any previous or on-going restoration initiatives, in addition to the planned project

Since no project of restoration in wetlands had ever been carried out in the protected areas of the Atlantic littoral, this present process can become a very especial pilot project for the region, which will allow exchange of experiences among the organizations involve.

4) WHAT - Expected project outcomes

- a) **General Objective:** Preserve and restore mangrove wetlands in order to help preserve and increase biodiversity, foster community development, and assure long term carbon sequestration.

Wetland aspects:

Wetland related aspects		
Goals	Objectives	Projected outcomes
Conservation of existing mangrove forests in three protected project areas	To maintain the maximum native biodiversity	Increase in the percentage representation of native biodiversity.
Restoration of damaged areas.	Restore degraded mangrove forest areas.	Increase in area of restored mangrove ecosystems.
Improve water quality.	To reduce the volume of pollutants reaching the target area.	Verifiable increase in the water quality of the target area.

Community aspects:

Community related aspects		
Goals	Objectives	Projected outcomes
Create mangrove conservation and reforestation information centre for community stakeholders and visitors	<ul style="list-style-type: none"> Attract biologists and researchers to conduct their field research in the three targeted areas 	<ul style="list-style-type: none"> The mangrove visitor centre at Cuero y Salado attracts visitors from Honduras, Central America, and elsewhere to study and live in the visitor centre # of visitors to Mangrove Restoration Centers
Develop participatory stakeholder decision making committee in each of the three target areas.	<ul style="list-style-type: none"> Encourage an inclusive support and participation for restoration and conservation activities Ensure more marginalized stakeholder group have input to decision making in protected areas. Ensure inclusion of women's groups and elders in decision making. 	<ul style="list-style-type: none"> The mobilization of farmers, fishermen, technicians, and stake holder groups in the surrounding communities to undertake the restoration work. # of stakeholders participating in community decision making forums.
Local people trained in mangrove restoration with the ability to develop a range of new income potential.	<ul style="list-style-type: none"> Fishermen and small farmers' conserving and restoring estuaries Income generated through training programs and throughout the supply chain: seed collection, nurseries, visitor centers, environmental services, 	<ul style="list-style-type: none"> Full inclusion of stakeholders in maintaining estuary for biological sustainability, social values and economic viability Increased knowledge and practice of mangrove restoration and exchange with other protected areas # and range of new income opportunities

	tourist centre, lodging and food, sales of plants and products	
Local people trained in mangrove restoration with the ability to develop a range of new income potential.	<ul style="list-style-type: none"> Fishermen and small farmers' conserving and restoring estuaries Income generated through training programs and throughout the supply chain: seed collection, nurseries, visitor centers, environmental services, tourist centre, lodging and food, sales of plants and products 	<ul style="list-style-type: none"> Full inclusion of stakeholders in maintaining estuary for biological sustainability, social values and economic viability Increased knowledge and practice of mangrove restoration and exchange with other protected areas # and range of new income opportunities
Develop opportunities for increased livelihood potential through the alternative use of mangrove and associated species in reforestation design.	<ul style="list-style-type: none"> Orient and support the associations in the commercialization of its products and sub products 	<ul style="list-style-type: none"> Increased # of sales of products sustainably harvested and developed in the restoration area. Increased # of visitors to ecotourism activities within the protected areas. # of mangrove seedlings being propagated and sold in restoration areas Diminished rates of deforestation as alternative livelihood opportunities become available. Ensure more marginalized stakeholder group have input to decision making in protected areas

Carbon aspects:

Carbon related aspects e.g. expected emission profiles in the baseline and the project case, quantities of carbon credits over the lifetime of the project and choice of standard (how will marketable carbon be delivered).

Carbon related aspects		
Goals	Objectives	Projected outcomes
Carbon credits quantified over the lifetime of the project	Incorporate baseline measurement and monitoring criteria to achieve carbon credits over the lifetime of the project.	X Carbon credits produced over the lifetime of the project.
Sequestered carbon held for the longest time period possible.	To achieve sequestration time as a value variable.	Carbon sequestered for X number of years.
Proficiency in the application of the FGP Platinum standard	To create awareness on the need for developing carbon "beyond offsetting"	Establishment of an extremely high value carbon baseload and increment.

Expected emission profiles: In order to determine carbon base loads, research must be done on the different serial stages of mangrove ecosystems. An evaluation will be performed using existing land use

and community emissions as the baseline. Baselines will be monitored in order to predict the sequestration and reduction of emissions through project management.

Quantities of carbon credits: Quantities of carbon credits over the lifetime of the project will be computed using increment of baseline and increment of biomass within the project area.

Standard: The standard chosen will be in conformity with or exceed the requirements of the VCS standard, gold standard and /or FGP Platinum standard. Marketable carbon will be delivered through established carbon brokers.

Explain how the project is expected to sequester carbon e.g. through the hydrological restoration and natural re-vegetation, planting of native species or preservation, and how the project will measure and monitoring the carbon sequestered over time.

The project is designed to sequester carbon through the restoration of the mangrove ecosystems in both anthropogenic and natural areas. This will include natural regeneration and the establishment of analogous vegetation.

The project will measure and monitor carbon sequestered over time by employing a third party carbon monitoring and auditing company.

Base load and incremental values will be established to measure and monitor carbon sequestered over time.

(Please see Annex 1 for more information)

Explain how the project activities will deliver marketable carbon; which standards are being pursued. Estimate the volume of carbon credits. Describe the pertinent legal framework- international, national and local for the project with respect to carbon credits, and how these credits will be generated. Also provide the names of the relevant designated national authorities for wetland carbon, if any.

Preliminary study will be done to determine the volume of carbon credits depending on the activities undertaken in the 13 000 hectares of wetland in Cuero and Salado Wildlife Refuge as a pilot area.

Carbon credits will be generated in accordance with international legal framework. The Project design will be prepared by Conservation Carbon Company who will comply to voluntary carbon standards (VCS), the gold standard, or the FGP Platinum standard.

b) Major assumptions, risks, and threats to achieving outcomes. Identify the key risks to achieving the expected outcomes.

Threats to achieving expected outcomes include leakage (when adjacent landowners cut down forest cover on adjoining land). Ongoing political instability may affect project outcomes. Climatic instability may also impact outcomes due to potential sea level rise and change in weather patterns.

5) HOW – Project description

a) Project summary matrix

Summarise the project, goal, outcomes, outputs and activities in a simple matrix, which shows the relationship between these different project components:

Project goal:			
Objectives	Outcomes	Activities	Deliverable outputs
Objective 1 of the project	What outcomes are associated with this objective	Which activities are required to deliver on these outcomes	What physical outputs and deliverables the activities will generate
Incorporate baseline measurement and monitoring criteria to achieve carbon credits over the lifetime of the project.	X Carbon credits produced over the lifetime of the project	<ul style="list-style-type: none"> • Measurement of base load of carbon • Measurement of increment of carbon 	<ul style="list-style-type: none"> • Certified base load • Certified increment
To achieve sequestration time as a value variable	Carbon sequestered for X number of years.	<ul style="list-style-type: none"> • Computation of sequestered lifetime of carbon 	<ul style="list-style-type: none"> • Sequestration time tables
To create awareness on the need for developing carbon “beyond offsetting”	To create awareness on the need for developing carbon “beyond offsetting”	<ul style="list-style-type: none"> • Link with Conservation Carbon Company to incorporate model and harmonize on awareness program 	<ul style="list-style-type: none"> • Media and information for public
To maintain the maximum native biodiversity	Increase in the percentage representation of native biodiversity.	<ul style="list-style-type: none"> • Create Analog Forestry implementation design 	<ul style="list-style-type: none"> • # of designs completed

Restoration of damaged areas.	Increase in area of restored mangrove ecosystems.	<ul style="list-style-type: none"> • Create nurseries to support the design. • Planting out of seedlings in targeted areas. 	<ul style="list-style-type: none"> • # of seeds planted • # of seedlings planted on degraded land
Improve water quality.	Verifiable increase in the water quality of the target area.	<ul style="list-style-type: none"> • Design of constructed wetlands • Planting of water filter species 	<ul style="list-style-type: none"> • Wetland design • Species list for implementation
Attract biologists and researchers to conduct their field research in the three targeted areas		<ul style="list-style-type: none"> • Exchange with local Universities (CURLA) and international (CATIE) to assist with field research 	<ul style="list-style-type: none"> • # of professors and students undertaking research • # of papers published in peer reviewed journals • # of guide books and information papers developed •
Encourage inclusive support and participation for restoration and conservation activities		<p>Community meetings held with small and larger landowners</p> <p>Meeting held with fishermen and associations</p> <p>Training programs held within the community and to include extension workers</p>	<p>#of community members participating in mangrove restoration</p> <p># of women and elders involved along the supply chain (seed collection, nurseries, sales, guides, visitor centre)</p>

<p>Ensure more marginalized stakeholder group have input to decision making in protected areas</p>	<ul style="list-style-type: none"> • The mobilization of farmers, fishermen, technicians, and stakeholder groups in the surrounding communities to undertake the restoration work. • # of stakeholders participating in community decision making forums. 		
<p>Ensure inclusion of women's groups and elders in decision making.</p> <p>Ensure local youth participation and information within the school system</p>		<p>Meetings held with women and elders concurrently with larger open meetings to ensure full participation</p> <p>Target schools within the area with information sharing and curriculum development</p>	<p>Women's perspectives incorporated into decision making. Elders opinions included. Whole community support.</p> <p>#of young people able to find employment in the targeted areas</p>
<p>Orient and support the associations in the commercialization of its products and sub products</p>	<ul style="list-style-type: none"> • Increased # of sales of products sustainably harvested and developed in the restoration area. # of mangrove seedlings being propagated and sold in restoration areas • Diminished rates of deforestation as alternative livelihood 		<p># of fisherman and small household farmers/squatters involved in restoration</p>

	<p>opportunities become available.</p> <ul style="list-style-type: none"> Increased population of estuarine food species such as crabs and other crustaceans. 		
<ul style="list-style-type: none"> The mangrove visitor centre at Cuero y Salado attracts visitors from Honduras, Central America, and elsewhere to study and live in the visitor centre 	<p># of visitors to Mangrove Restoration Centres</p> <ul style="list-style-type: none"> Increased # of visitors to ecotourism activities within the protected areas. 		<p>The Mangrove Visitor centre establishes itself as an important place to visit and learn about mangrove restoration</p>

b) Technical description of project activities and outputs

Explain the activities which are to be undertaken under the project, what outputs they will deliver, and how these will contribute to the expected outcomes.

Expected outcome: Stable mangrove communities, both natural and anthropogenic, maintain high potential for carbon sequestration and incrementation of sequestered carbon stocks.

Activity	Output
<p>Create model of intact mangrove area.</p> <p>Mapping of area with tidal maxima and minima which includes prediction with long term projection that incorporates effect of sea level rise in the system.</p>	<p>Baseline surveys</p>
<p>Determine socio-economic baseline</p>	<p>Asset mapping surveys</p>
<p>Conduct evaluation of sustainability of resource base (what people are living on). Looking at sustainability of resource base and data analyses of the information gathered.</p>	
<p>Conduct biodiversity evaluation of biological resources,</p>	<p>Biodiversity mapping, baseline,</p>

<p>both in natural and anthropogenic systems with a view to extending the natural mangrove biodiversity or adapt to the changing climatic conditions and designing the anthropogenic element so that the communities can achieve a more sustainable livelihood process.</p>	<p>creation and analysis of sustainability of the resource base.</p>
<p>Obtain necessary legal and political permits and political support to implement the project in the identified areas.</p>	<p>Permits and or letters of support.</p>
<p>Create a central nursery and outlying community nurseries and supply plant material for the planting up of and fulfillment of an analog forestry design for each project area.</p>	<p>List of species to be propagated. Identification of nursery areas. # of seedlings planted</p>
<p>Development of a monitoring system that will allow data collection at both community and project level, ongoing assessment of the performance work to be obtained.</p>	<p>Development of monitoring plan and methodology, project officers and community description of data analysis procedure.</p>

c) Methods and technologies to be used.

Describe the methods and technologies to be used to achieve the project outcomes. Particular mention should be made of the methods to be used to measure and monitor carbon sequestration, to assess community benefits and impacts, and to monitor changes in overall wetland ecosystem health.

Restoration activities will follow Analog Forestry methodology in conjunction with MAP Ecological Mangrove Restoration (EMR) Method.

- Landscape design will be based on native forest ecosystem dynamics, making use of analogous species to augment the design.

Measurement and monitoring of carbon sequestration: Use of calibrated instrumentation for physical/chemical parameters. (Please see fgp documents)

Monitoring of changes in overall wetland ecosystem health:

Use a remote mapping technique such as Google earth and/or aerial photography to confirm target and treatment areas.

Use a standard taxonomic procedure for the identification of biodiversity to species level.

Changes to overall ecosystem health will be monitored using indicator species such as will be selected from a biodiversity suite that encompasses both plant and animal species. Two types of indicators will be generated, one suite that signals salinity and the other suite that signals disturbance and degradation.

Assessment of community benefits and impacts: Social economic evaluation tool, baseline mapping, asset mapping which allows communities to ascertain the direction of their future.

d) Project schedule and milestones

Propose a timeline for the development and implementation of the project activities. This should include to the extent possible, time bound and measurable milestones with respect to the delivery of k

Activity	6 months	12 months	1 year	1.5 years	2 years	2.5 years	3 years	3+
Overall mapping of the area, train project team, methodology, chemical physical analysis and baselines	X							
Community team planning, management plans of natural areas, forest garden farm plans based on upon existing biodiversity and potential analogs.		X						
Begin planting (based on climate needs)		X	X	X	X	X	X	X
Build tools, revisit deliverables			X	X	X	X	X	X

Annex 1:

Supporting information for carbon sequestration monitoring

(as contained in *International Standards for Forest Garden Products (FGP) Dr. Ranil Senanayake 2008*)

Soil and Sequestered Carbon (Voluntary Standard)

The operator shall:

1. Measure the base load of soil carbon at initiation of program*.
2. Establish a monitoring program.
3. Identify indicator organisms of system maturity.
4. Establish a monitoring program for soil indicators.

5. Establish base load of terrestrial carbon.
6. Monitor the increment of sequestered carbon annually.

2. The output from growing trees in terms of sequestering carbon can be stated as Wt . W or the carbon sequestered +TLR where:

T = Timber, trunk and branch material over y cm in diameter,
 L = Leaves, bark and stems under y cm in diameter,
 R = Roots and all other underground parts.

In addition to producing the photosynthetic products listed above, a growing tree also contributes to the creation of soil organic matter. As a forest product, soil also has great value as a carbon sink. The process of the biochemical distillation of photosynthetic products can keep atmospheric carbon dioxide tied to or sequestered by the biological system for periods exceeding 4000 years. Approximately 16% of the long-lived fraction identified as 'old carbon' can have lifetimes from 5700 - 15,000 years. The role of soil in sequestering, or tying up, atmospheric carbon dioxide needs to be recognized. An evaluation of the sequestering potential of various forest ecosystems suggests that forest soils contain a large proportion of the carbon pool. These long-lived compounds are a product of the bio-chemical distillation of photosynthetic products and tie up about 20-30% of the organic matter that reaches the soil from the above-ground environment. This long-lived matter (LSc) component can be represented as a ratio of plant production.

Where the sum total of the plant production is its total biomass (Wt), the ratio LSc/Wt will vary according to the efficiency of a particular soil to sequester carbon into the long-lived pool and the end-use of the forest. In the case of tree crops, the contribution to the soil will only be from the roots, leaves and branches, such that $Wt = L+R$, as the timber is expected to be removed from site or used for an anthropocentric purpose.

The variable (T), representing timber, will have a sequestering value equal to the time of growth and biomass attained. At harvest, the value of the clear wood as a carbon sink will depend on its end use. Therefore, (T) must be described with a multiplying factor dependent on the durability and end use of the wood. For instance:

End use	Firewood	Pulpwood	Chipwood	Constr. Timber
Multiplier (z)	.05	1.0	1.75	2.5

The value Tz can then be added to LSc to give some approximation of the carbon that was sequestered into the long-term pools, so that:

$$Tz + LSc = p$$

Similar calculations can be made of the short and medium term pools.

a). To obtain the biomass density of a forest based on existing volume data.

Primary needs:

Access the Commercial Timber Volume (this is obtained from the company or state permit office). Work out the oven-dry biomass of the CTV by obtaining the oven-dry biomass of the species being taken and multiplying it by the inventoried volume.

Next, the site is visited; in a practical number of samples, at least over three per ecosystem, the VOB is measured. VOB means the inventoried volume over bark-free bole (bole is the trunk section from stump or buttress to Crown Point or first main branch). It is expressed in t/ha; thus a minimum of a Hectare must constitute a sample.

The inventoried volume in a VOB must include ALL trees whether presently commercial or not, with a minimum diameter of 10 cm at breast height or at buttress if this is higher.

Biomass density can now be calculated from the VOB/ha by first estimating the biomass of the inventoried volume and by applying a multiplier that takes into account the biomass of the other above-ground components.

Above-ground biomass density (t/ha) = VOB*WD *BEF

Here: WD = volume – weighted average wood density (t of oven-dry biomass per m³ green volume).

BEF = biomass expansion factor (ratio of above-ground oven-dry biomass of trees to oven-dry biomass of inventoried volume); this is the oven-dry biomass of all trees whether presently commercial or not, with a minimum diameter at 10 cm at breast height (DBH) or at buttress if this is higher.

WD = The volume-weighted average wood density. This is the oven-dry mass per unit of green volume (either in tond/m³ or grams/cm³).

Examples of application:

In a forest with a VOB = 300m³/ha and a WD of 0.65 t/m³

Step 1: Calculate biomass of VOB = 300m³/ha x 0.65 t/m³ = 194 t/ha

Step 2: Calculate the BEF = VOB/CTV (usually about 1.74 for CTV of over 190t/ha)

Step 3: Calculate above-ground biomass density = 194 x 1.74 = 338 t/ha

Step 4: Calculate total biomass (TB); accumulation assumed to be equal to 1.6 times stem wood accumulation = $338 * 1.6 = 540.8$ t/ha

Step 5: Calculate the total carbon content: $CT = TB/4$ or $540/4 = 135.2$ t Carbon

* VOB means the inventoried volume over bark free bole (bole is the trunk section from stump or buttress to Crown Point or first main branch). It is expressed in t/ha; thus a minimum of a hectare must constitute a sample. If the area is smaller than a hectare, the total area must be sampled. The inventoried volume in a VOB must include ALL trees whether presently commercial or not, with a minimum diameter of 10 cm at breast height or at buttress if this is higher.

b) To obtain the soil carbon level:

- 1) Design a sampling procedure based on the contours of the land.
- 2) Collect a minimum of twenty samples per hectare*.
- 3) Pool samples: into 1 pool if the slope is below 15%, 2 pools if the slope is above 15% (one for upper contour one for lower contour).
- 4) Draw a 150 cc sample from each pool.
- 5) Test for unit weight of carbon in 10 cc of each sample (CV).
- 6) Calculate using a formula $CV * 15 * 100,000$ to obtain weight per hectare.

* For measuring soil carbon take a sample of soil from the upper 15 cms of the land being tested from a 10cm area.

3. Soil carbon has been identified as a very significant sequestered pool of atmospheric carbon. Therefore the operator shall:

1. Measure the base load of soil carbon at initiation of program.
2. Establish a monitoring program.
3. Sample at the same points or design when monitoring.

When considering time as a value variable:

The total carbon content (CT) representing timber will have a sequestering value equal to the time of growth and biomass attained. At harvest, the value of the clear wood as a carbon sink will depend on its end use. Therefore (VOB) must be described with a multiplying factor dependent on the durability and end use of the wood. For instance:

End use	Firewood	Pulpwood	Chipwood	Constr. Timber
Multiplier (z)	.05	1.0	1.75	2.5

The value $VOB * z$ can give some approximation of the carbon that will be sequestered into the long-, short- and medium-term pools.

BUDGET FOR PROJECT PREPARATION PHASE

PROJECT PREPARATION ACTIVITIES:

1) Definition of conservation priorities, carbon related aspects and strategies in mangrove forest and surrounded wetlands.

The preparation phase will finance studies resulting in the identification of sites and components of this ecosystem with highest conservation priority and the initial definition of management requirements to ensure the maintenance of conservation and economic values. Specifically, the following activities will be funded: i) a detailed review of available information on biodiversity, highlighting values and priorities; ii) a characterization of the priority elements of this important remnants of mangrove forests, in terms of their ecological requirements and levels of tolerance of disturbance; iii) characterization of the threats that currently affect these priority elements of this kind of forests and the needs for restoration; iv) identification of degraded areas and their current status.

2) Identification of friendly economic options in mangrove forests in order to develop a range of new income for communities and local organizations and identify effective local participation mechanisms.

During the preparation phase, we will carry out studies related to: i) a review of the current status of management of mangrove forest, and the barriers to the application of sustainable management ii) the initial identification of alternative economics options to generate income; iii) feasibility studies of the productive options and modifications identified, focusing on markets, technical capacities, economic viability, social acceptability, regulation and impacts, compared to current practice; iv) development of recommendations of project strategies to support the productive options with greatest potential for contributing to the project objective and income generation for local communities; development of recommendations for effective community participation.

3) Definition of regulatory, planning, policy and institutional modifications required to bring about modifications in management practices and conservation of mangrove forests and wetlands in order to contribute to carbon sequestration and other carbon aspects.

This part will include: i) a review of existing norms, formats and information requirements of management plans stipulated by the Government; ii) preparation of proposals for modifications to management plan formats in order to improve their relevance for conservation issues; iii) an analysis of opportunities and willingness to address conservation and restoration issues among institutions and projects with remits related to management of mangrove forests; iv) analysis of the implications of public policies conservation in managed landscapes in mangrove forests; v) analysis of regulatory, planning and organizational conditions, at community, municipal and regional level, focusing particularly on existing mechanisms for planning, monitoring and regulation and their effectiveness; vi) an analysis of relevant Government institutions and NGOs

whose actions have implications for conservation of mangrove forests focusing on the relevance of their thematic approaches and their institutional capacities (in quantitative and qualitative terms).

4) Project scoping and definition

The preparatory phase will finance the definition of the details of practical and administrative aspects of project design, allowing the formulation of a Project Document, including: i) threats and barrier analyses, based on consultant reports and a multi-stakeholder participatory analysis; ii) a logical framework, based on a multi-stakeholder participatory analysis and the recommendations of consultancy studies, including indicators and quantified targets, together with baseline values supplied by thematic consultants; iii) a participation strategy, summarizing the recommendations of the study on participation mechanisms; iv) a detailed quantitative analysis of the programmatic baseline; v) a project budget and work plan; vi) a monitoring and evaluation strategy; vii) a learning and replication strategy and viii) text and supportive technical analyses detailing the justification and strategies of the project.

Project preparation activities	Budget (Euros)
Definition of conservation priorities, carbon related aspects and strategies in mangrove forest and surrounded wetlands.	15,000.00
Identification of friendly economic options in mangrove forests in order to develop a range of new income for communities and local organizations and identify effective local participation mechanisms.	12,000.00
Definition of regulatory, planning, policy and institutional modifications required to bring about modifications in management practices and conservation of mangrove forests and wetlands in order to contribute to carbon sequestration and other carbon aspects.	10,000.00
Project scoping and definition	10,000.00
Total project preparation financing	50,000.00

C. BUDGET

Cost Items	Budget (Euros)
Local consultants	15,000.00
International consultants	10,000.00
Travel	5,000.00
Administration and coordination	8,000.00
Consultations and workshops	7,000.00
Information and logistical support	5,000.00
Total Budget	50,000.00

Budget for Project Execution

Descriptions	Amount required	Total
1. Miscellaneous equipment	€ 70,000.00	€ 70,000.00
2. Materials and Supplies	€ 25,000.00	€ 25,000.00
3. Travel and transportation	€ 15,000.00	€ 15,000.00
4. Staff payment	€ 70,000.00	€ 70,000.00
5. Studies and Surveys	€ 50,000.00	€ 50,000.00
6. Local consultants	€ 20,000.00	€ 20,000.00
7. International consultants	€ 35,000.00	€ 35,000.00
8. Workshops and meetings	€ 35,000.00	€ 35,000.00
9. Training and Awareness	€ 20,000.00	€ 20,000.00
10. Management office	€ 20,000.00	€ 20,000.00
11. Mangrove Restoration	€ 120,000.00	€ 80,000.00
12. Community Development	€ 50,000.00	€ 50,000.00
13. Monitoring and Evaluation	€ 60,000.00	€ 60,000.00
Total project cost	€550,000.00	€550,000.00
Project preparation activities	€ 50,000.00	€ 50,000.00
Project Grand Total	€600,000.00	€600,000.00