GOVERNMENT OF COSTA RICA

Readiness Preparation Proposal (R-PP)

Costa Rica R-PP

Presented to: Forest Carbon Partnership Facility (FCPF)

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List of Acronyms

Acicafoc	Indigenous and Peasant Coordinating Association of Central American Community Agroforestry
Acomuita	Association of Bribri Indigenous Women of Talamanca
Adiboruca	Association of Indigenous Development of Boruca
Adicabagra	Association of Indigenous Development of Cabagra
Adiconte	Association of Indigenous Development of Conte Burica
ADII	Association of Comprehensive Indigenous Development
Aditibri	Association of Comprehensive Development of the Indigenous Territory of Bribri of Talamanca
AFE	Forest Administration of the State
Aradikes	Regional Indigenous Association of the Dikes
Asada	Aqueduct Association Manager
Asana	Friends of Nature Association of Central and South Pacific
Asirea	Association of the Sustainable Development of the Atlantic Region
Asoprola	Producers Association of Friendship
ASP	Protected Wild Areas
BID	Inter-American Development Bank
BM	World Bank
BNCR	Banco Nacional de Costa Rica
CAC	Cantonal Agricultural Center
CAF	Forest Credit Certificate
CATIE	Tropical Agricultural and Higher Education Center
CBTC	Talamanca Caribbean Biological Corridor
CCAD	American Council on Environment and Development
CCF	Costa Rican Forest Chamber
CCT	Tropical Scientific Center
Cedarena	Center for Environmental Law and Natural Resources
Cedin	Center for Indigenous Development
CENAT	National Center for High Technology
CER	Certified Emission Reductions
CGR	General Comptroller of the Republic
CI	Conservation International
CIAgro	Association of Agricultural Engineers

CICA	Central American Indigenous Council
CMNUCC	Nations Framework Convention on Climate Change
CNE	National Emergency Commission
CNFL	National Power and Light
Codeforsa	Commission for Forest Development of San Carlos
COECO-CEIBA	Amigos de la Tierra
Conagebio	National Commission for the Management of Biodiversity
CONAI	National Commission on Indigenous Matters
Conare	National Council of Vice-Chancellors
Coneléctrica	Consorcio Nacional de Empresas de Electrificación de Costa Rica R.L.
CRUSA	Cooperación Costa Rica Estados Unidos
CSA	Certificate of Environmental Services
Dinadeco	National Directorate of Community Development
EARTH	Agricultural School of the Humid Tropic Region
ECAG	Central School of Livestock
ECTI	Strategy control of illegal logging
EIA	Environmental Impact Assessment
ENMF	National Strategy for Fire Management 2006-2010
ESPH	Empresa de Servicios Públicos de Heredia
FAO	Food and Agriculture Organization of the United Nations
FC	Carbon Fraction
FCPF	Forest Carbon Partnership Facility
Fecon	Ecologist Federation
Fonafifo	National Fund for Forest Financing
Fundecor	Foundation for the Development of the Central Volcanic Range
GEF	Global Environment Facility
GEI	Greenhouse Gases
GFA	GFA Consulting Group
GTZ	German Development Cooperation
ICAA	Costa Rican Institute of Aqueducts and Sewers
Icafé	Costa Rican Coffee Institute
ICE	Instituto Costarricense de Electricidad
ICER	Costa Rican Institute of Education by Radio
ICT	Instituto Costarricense de Turismo
IDA	Instituto de Desarrollo Agrario

IDH	Human development index
IDS	Social development index
IICA	American Institute of Agricultural Sciences
IMN	National Weather Institute
INA	National Training Institute
INBio	National Biodiversity Institute
INCAE	INCAE Business School
Incopesca	Costa Rican Institute of Fishing and Aquaculture
INEC	National Institute of Statistics and Censuses
Infocoop	National Institute of Cooperative Promotion
INTA	Institute of Agricultural Transfer
IPCC	Intergovernmental Panel on Climate Change
ITCO	Institute of Land and Colonization
ITCR	Technological Institute of Costa Rica
JD	Board of Directors
Junaforca	National Peasant Forest Board
KfW	Kreditanstalt für Wiederaufbau
LT	Transmission lines
MAG	Ministry of Agriculture and Livestock
MDL	Clean Development Mechanism
Mideplan	Ministry of Planning
MIE	Integrated Ecosystem Management Project World Bank
Minaet	Ministry of the Environment, Energy, and Telecommunications (before Minae)
MML	Logical Framework Matrix
MNCR	National Museum of Costa Rica
MOPT	Ministry of Public Works and Transport
MRV	Measuring, Reporting, and Verification
OET	Organization of Tropical Studies
OIT	International Labor Organization
ONF	National Forest Office
ONG	Nongovernmental organization
PAP	National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves
PIR	Relevant Interested Parties
PN	National Park
PNUD	United Nations Development Programme

PPM	Permanent Monitoring Parcels
PSA	Program for the Payment of Environmental Services
RB	Biological Reserves
RBA	Biosphere Reserve La Amistad
Recope	Costa Rican Petroleum Refinery
REDD+	Emission reductions due to deforestation and the degradation of forests
RI	Indigenous Reserves
SEDER	Society for the Study of Rural Development
Semec	Continuous Improvement System
Senara	National Irrigation and Drainage
Sepsa	Department of Planning Land Use
SESA	Social and Environmental Assessment System
Setena	Technical Environmental Secretariat
Sinac	National System of Conservation Areas
Sirefor	Information System of the Forest Resources of Costa Rica
TNC	The Nature Conservancy
Ucaep	Union of Business Chambers
UCR	University of Costa Rica
UICN	International Union for Conservation of Nature
UNA	Universidad Nacional Autónoma de Costa Rica
UNED	Universidad Estatal a Distancia
Unesco	Organization of the United Nations Educational, Scientific and Cultural Organization
Upanacional	Union of Small Farmers

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Executive Summary

The REDD+ strategy represents the third generation of policy actions aimed at reducing deforestation in Costa Rica. REDD+ follows the Forest Credit Certificate scheme, implemented from 1976 to 1996 and the Payment for Environmental Services Program (PPSA) that started it 1997 and continues to date. These policy instruments have allowed the country to develop a legal framework, institutions, social capital, and an improved governance scheme.

The PPSA will act as a basis of Costa Rica's REDD+ Strategy. The PPSA has been implemented by the National Forestry Financing Fund (FONAFIFO) and created a Local Market of Environmental Services (water, biodiversity, scenic beauty, and carbon) accounted for in avoided deforestation as well as maintenance and increase of carbon stocks. Within the context of the current PPSA, there are multiple actors who have joined efforts in different ways and with different purposes; as well as a broad representation of different institutions local, regional, national, and international interests. A total of 96 Relevant Interested Parties (RIPs) were identified; at least 50 of them must necessarily be part of the consultation process that will take place to support the development of a REDD+ Strategy. Three main groups of interested parties that must be engaged throughout the entire consultation and design process of the REDD+ Strategy: a. The Government through the Ministry of the Environment, Energy, and Telecommunications (MINAET) and the Ministry of Agriculture and Livestock (MAG) will represent the government; b. the National Forest Office (ONF), which includes a broad representation of all entities whose main line of business or social purpose relates to forests and forestry, and c. The Associations of Indigenous Development (ADI) of Costa Rica that will represent indigenous peoples who are also supported by international organizations.

As the coordinating entity, FONAFIFO has a Board of Directors (JD) that is composed of representatives of Relevant Interested Parties. For the purposes of REDD+ two more seats would be added and the Board of Directors of REDD+ would be created. The additional seats are: one for the Indigenous ADI, for which the indigenous people shall create an umbrella organization and appoint a representative; and a second seat that will be appointed from rural land owners, environmental NGOs, or organizations that represent the civil society (to be determined).

The REDD+ Board of Directors will draft policies and make decisions regarding the REDD+ Strategy to be discussed with FONAFIO that will act as coordinating organization. The REDD+ Board of Directors will be supported by a REDD+ Secretariat that will carry out executive functions, liaison, and coordination tasks and will be hosted by FONAFIFO. The REDD+ Board of Directors meets the characteristics suggested by the FCPF for a REDD Working Group (transsectoral, participation of PIRs, representation of governmental agencies, link to political processes).

The consultation for the preparation of REDD+ implied the participation of the Relevant Interest Parties that need to be involved in REDD+ to reflect a shared vision, a country strategy. Among the main results of the consultation for the preparation of the R-PP was that the Indigenous Groups and an interested party of the conservationist group, requested that the REDD+ Strategy would not exclusively target global carbon markets for the reward of avoided deforestation and enhancement in forest carbon stocks, but that it would also include compensation mechanisms for supporting the conservation of forests in Protected Wilderness Areas. However, the majority of the RIPs agree that the compensation for the reduction of emissions or improvement of stocks in privately owned forests is more viable through local and global market mechanisms. This is consistent with the position the country has defended

under the Framework Convention of the United Nations on Climate Change (UNFCCC) related to financing mechanisms, the Bali Action Plan and the last REDD+ text from Copenhagen.

The consultation process for REDD+ will be implemented on the basis of an improved network of previously established relationships. The plan will reflect this need and open new and better communication channels, more consolidated relationship nodes, and especially an expanded social foundation. Of the 96 RIPs identified, 50 must necessarily be part of the consultation process that will occur as the REDD+ Strategy in Costa Rica is developed.

An important result of the evaluation of land use shows that the perception that there is no deforestation in Costa Rica is wrong. Despite the fact that in Costa Rica forest coverage is being recovered (net deforestation[1] is negative), forests are still being lost (there is gross deforestation[2]). During the five-year period 2000-2005, the country lost between 144,398 and 224,406 ha, and between 207,983 and 288,886 ha have been regenerated, which implies a positive balance in recovery of forest cover of between 63,585 and 64,479 ha. Of the hectares lost, 42% corresponds to early regeneration, 32% is medium-aged regeneration and the remaining 27% is old growth forests. Considering the limitations of this evaluation, we estimate that for said period the carbon enhancement was 55,808 Gg CO_2.

The carbon storage in the five Uniform Strata of land use differs according to different socio-economic and legal realities: Public Wilderness Areas and Private Wilderness Areas, Private Reserves and Forests. In this last stratum, the area of Guanacaste (North Pacific area of the country) is identified as an area that shows dynamics of land-use characteristic of a socio-economic reality different to that of the rest of the country, possibly due to the impact of tourism, as well as to the decrease in cattle activity, very characteristic of the area.

Within this group of strata there is a statistically important gradient of deforestation positively correlated to the revenue from the land; and within the private property stratums, there is a statistically important gradient of deforestation that is positively related to the revenue of the land and negatively related to the penetration of the program of payment for environmental services. There is also a gradient of deforestation linked to the age of the forest: The highest rate of deforestation can be found in Early Regeneration stage forests, followed by the forests of Mid Regeneration, and finally the older Forests or Late Regeneration stage.

In Costa Rica deforestation is the result of the policies of economic development focused on agriculture and cattle ranching, with agricultural expansion not as relevant as livestock expansion. These policies have a direct impact on land revenue, having a positive or negative effect on the dynamic changes of the use of the land in Costa Rica. Land use dynamics in Costa Rica are currently affected by:

In Protected Wilderness Areas, by the restriction of access to the PPSA for landowners without formal property rights in.

In privately owned forests, the prohibition to land-use changes, Payments for Environmental Services; excessive regulation and administrative ban on sustainable forest management of primary and secondary natural forests, restriction of access to the PPSA of owners and holders of natural forests under forest management; lack of competitiveness of the forest use in

[1] Net deforestation: is the loss of coverage in a period, after considering the regeneration. The coverage recovered is added to the forest area that remains until the end of the period.

[2] Gross deforestation: is the loss of coverage during a period. Regeneration is not considered. It is correlated with the loss of quality of the forest coverage.

comparison with alternative uses, and weakness of the State in the implementation and enforcement of measures against illegal logging.

In Indigenous Reserves, by the low income from the forest for the residents of indigenous territories; and inability of the State to avoid squatters from illegally titling lands within indigenous territories.

In National Parks and Biological Reserves: weakness of the State in the surveillance of natural wealth when threatened by squatters, illegal logging, hunters, and miners.

According to the aforementioned and considering the opportunities and obstacles identified for the implementation of a REDD+ Strategy in Costa Rica, the Strategy should address the following lines of action:

To decrease deforestation rates:

- **Maintain and expand the coverage of the Program of Payment for Environmental Services**: FONAFIFO should increase the programs coverage up to 2005 (around 212,000 ha) in order to maintain and further reduce the current level of deforestation. In addition, FONAFIFO aims at increasing the coverage of the PPSA so it will cover old-growth 113,000 ha forests. Said increase must be adjusted every five years in order to maintain an adequate level of coverage and decrease deforestation. FONAFIFO must guarantee that the PSA program maintains annually at least 256,000has by 2030.
- **Implement positive incentives to maintain regeneration and improve management of secondary forests**: FONAFIFO should establish annual incentives available to the owners of regenerated areas of 20,000 ha in size in addition to the current effort in the PPSA program, to achieve a total of 40,000 has within the 2011-2030 period.
- **Strengthen the role of National System of Conservation Areas SINAC in the control of illegal logging**: SINAC should develop a digital system that allows a fast verification in the field for control of illegal logging, carry out procedures in the custody chain, and prepare task reports.
- **Strengthen the Supervising Task of the CIAgro:** A sustainable financial scheme should be established that guarantees an adequate supervision of the forest activity by the CIAgros and the CIAgro must immediately respond to delays in its supervision obligations, which could be affecting the control of the illegal activity.
- **Promote sustainable production and consumption of wood from primary and secondary natural forests and reforestation**: The consumption of wood from sustainable sources should increase. In this sense, the REDD+ Strategy should finance a program led by the ONF to eliminate cultural, legal, technological, and educational barriers that discourage the generalized use of wood.

To maintain stocks and increase carbon sequestration:

- **Integrate the carbon capture from National Parks and Biological Reserves in the REDD+ strategy:** FONAFIFO must integrate in the REDD+ Strategy projects that determine carbon quantities, such as the PAP (National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves), to partially supply SINAC with the budget required for trading carbon rights produced in National Parks and Biological Reserves

- **Implement positive incentives to promote regeneration and reforestation**: FONAFIFO must put additional positive incentives at the disposal of owners of properties of non-forest land that can be converted to forests. The aim is to create incentives for the afforestation of about 8,500 ha per year beyond those of the current PPSA to promote regeneration and forest plantations,for the 2011-2030 period.
- **Promote sustainable production and consumption of wood from primary and secondary natural forests and reforestation**: Considering a successful implementation of the REDD+ Strategy, it is necessary to be prepared to place sustainably produced wood in local markets. To that end, the consumption of wood must be promoted, leading to co-benefits for the country. On one hand it would increase the storage of carbon in buildings and real estate and on the other it would reduce the consumption of materials with large carbon footprints, such as cement, steel, or aluminum.

The leakage risk related to the implementation of the REDD+ Strategy is expected to be low due to: a) the REDD+ Strategy has a national scope, b) the PPSA program does not consider the purchase of lands, c) the owners are voluntarily recruited in the PPSA program, and d) the PPSA program would discourage illegal logging through the promotion of the production and consumption of sustainable wood from natural primary and secondary forests and reforestation.

These lines of action require securing new, predictable and long-term funds to finance the implementation of the REDD+ Strategy. 19 million USD per year are required in order to maintain the current PPSA, and an additional 5.1 million USD per year are needed to promote the recovery of forest cover through natural regeneration and reforestation, 2.7 million USD per year to maintain the natural regeneration, and 7.9 million USD per year to expand the coverage of the PPSA program in old growth forests.

The current institutional, economic, legal and governance implementation framework is basic but functional. Incompatibilities between the proposed implementation framework and the possible obligations under a possible REDD+ mechanism of the UNFCCC are not foreseen. Major governance refers are not needed. However, the creation of a Fraud Control Unit and a Registry of Environmental Service Rights is recommended to guarantee transparency, information and equity. As emission reduction transactions from enhanced stocks and avoided deforestation are expected to be approved, the actors will be encouraged to commit to the REDD+ implementation framework with solid monitoring, evaluation, independent verification mechanisms.

Costa Rica is in the position of developing its REDD+ reference scenario building on existing information at a satisfactory level of detail (tier 1 and 2). Two approaches can be used: a) On the basis of historical trends in carbon stocks; and b) On the basis of using a reference year to measure carbon stocks. In order to avoid creating perverse incentives, no prior legal or policy action for the control of deforestation or promotion of sustainable forest management will be considered in the definition of the baseline scenario; in other words, the reference scenario will be built under the hypothetical assumption that no such legal or policy actions exist at the moment of deploying the REDD strategy. The starting date proposed for the REDD+ strategy and for establishing the emission reductions derived, is the approval date of of the Bali Action Plan (decision 2/CP.13 of Dec.13, 2007).

The monitoring, reporting and verification scheme would require three data series: a) a map of forest cover updated at the time of measuring the emission reductions, b) biomass intensity of forest types as per the map of forest cover and c) the fraction of carbon per biomass unit (CF). Two options have been identified for monitoring changes in carbon stocks (carbon stock change method): 1) Continuing forest inventory of fixed parcels and area, and 2) Continuing forest inventory of variable area. The reference scenario to be decided for Costa Rica will be national. The agency implementing the REDD+ Strategy (FONAFIFO) will not be same as the one responsible for the MRV system.

The implementation of the REDD+ Strategy requires an investment of USD 4 million during the 2011-2014 period in addition to yearly investment by the Government of Costa Rica in the SINAC budget for the Control and Management of Forests and the FONAFIFO budget for the Program for the Payment of Environmental Services. Of the total USD4 million required, the Government of Costa Rica will provide USD0.155 million through its national budget and the Ecomarkets II project will provide another USD0.220 million. From other allies we hope to finance 0.220 thousand USD. We expect to cover the other USD3.4 million by the FCPF. The implementation budget for the Strategic Options (component 2b) represents 41% of the total budget.

Component 1: Organize and Consult

1a. National Readiness Management Arrangements

Management Arrangements for National Readiness:

Since 1997 Costa Rica has implemented a Program of Payment of Environmental Services (PPSA) that addresses 4 areas: protection of the water resource, scenic beauty and biodiversity, as well as the reduction of greenhouse gas emissions. The program has been implemented by the National Forestry Financing Fund (FONAFIFO). Up to 2005, around 212,000 hectares of land were included in FONAFIFO's PPSA, the majority of them under contracts for the protection of natural forests (86%). The program has yielded important local, national, and global benefits, including poverty reduction, protection of water quality, carbon capture and removal, conservation of biodiversity, public health, and improvement of infrastructure (Hartshorn et al, 2005).

The PPSA resulted in *Local Market of Environmental Services* (water, biodiversity, scenic beauty, and carbon) associated with *avoided deforestation, maintenance and increase of forest carbon stocks*. The PPSA is the fundamental element of the REDD+ Strategy. The agents and institutions (including their hierarchy and function) that participate in the implementation of the PPSA (and the resulting market) are the following:

- ***Providers of Environmental Services***: This group includes individuals or companies that own natural forests, planted forests or uncovered lands, as well as organizations that advise in or design avoided deforestation projects to sell the environmental services to the different markets. Examples include indigenous people, forest owners, the Foundation for the Development of the Central Volcanic Range (FUNDECOR), Network of Private Reserves.
- ***Buyers of Environmental Services***: Motivated mainly by the attractive return, buyers of environmental services include Florida Ice and Farm, Empresa de Servicios Públicos de Heredia (ESPH), Nature Air, and several Hydroelectrical Projects, Impatto Zero and Dole.
- ***Coordinating Organization of the PPSA and REDD+ strategy***: FONAFIFO is a governmental institution that was established by Forest Law 7575 to finance the forest sector and manage the payment and sale of environmental services (PSA and CSA). The law grants FONAFIFO responsibilities and powers in the area of environmental services and the implementation of avoided deforestation projects. FONAFIFO is the organization in charge of linking all actors in the implementation of initiatives for the reduction of emissions from land use. This includes forest owners, the forest sector, PSA implementers, Government agencies, financial institutions, indigenous people, national and international Non-Governmental Organizations and national and international donor organizations.
- ***PSA Implementers***: Individuals or corporations dedicated to the identification and recruitment of forest owners interested in engaging the PSA. Their main duties relate to the provision of technical, administrative, and supervisory support to landowners in order to qualify for the PPSA. Examples: FUNDECOR, Association for the Sustainable

Development of the Atlantic Region (ASIREA), Forest Development Commission of San Carlos (CODEFORSA), Independent Forestry Regents.

- ***Financial Organizations***: Between 1997 and 2009 the Ministry of Finance has provided the majority of public financing for the PPSA, with a total of USD132.9 million. The external financing required (USD54.7 million) was provided by the Ecomarkets I and II projects of the Global Environment Facility (GEF) (part in a loan and part in a non-reimbursable grant) and by non-reimbursable funds of the Kreditanstalt für Wiederaufbau (KfW).
- ***Government Agencies***: Specifically relevant are those organizations responsible for the administration, protection, and control of the illegal logging in private and public forests. The agencies directly related with the PPSA are the National System of Conservation Areas (SINAC), the Ministry of the Environment, Energy, and Telecommunications (MINAET), and the Association of Agricultural Engineers (CIAgro). The Government has partially delegated the control and protection of forest management plans to CIAgro that is the institution in charge of supervising the appropriate professional actions of the PSA Implementers. The Ministry of the Finance and the Planning Ministry are government entities responsible for maintaining the coordination and financing of the national development programs, among them the PPSA.

Relevant Interested Parties **(RIP)**: Relevant Interested Parties that are organized in different ways and with different purposes (ethical, economic, social, cultural, political, or a combination of these) and with local, regional, national, and international interests stand at the core of a future REDD+ Strategy. In Costa Rica, the ***relevance of the interested parties*** is determined mainly by three elements:

- ***Institutional interests related to the forests*****,** meaning institutions with a primary business or social interest in the conservation and protection of natural resources, biodiversity, and businesses based on the forests.
- ***Relative weight of the institutional interests***, assigning *relevance to the interested parties*, in order to avoid giving equal weight to organizations whose actions are limited to local purposes and to organizations that operate both at local and regional, or even national, level. For example, in Costa Rica there are *interested parties* that have offices in the United States, in Central America, and projects in many communities, whose relevance is not the same as that of a small coffee union that participates in the PSA and that has only local operations (at district level).
- ***Dependence on the forests*** of individuals, as happens with the indigenous people, producers of environmental goods and services, business chambers of the private sector, forest owners (including the State), or those responsible for vertical development of the forest. All owners of forests that have participated or are participating in FONAFIFO's PPSA program must be especially considered as a RIP.

According to the criteria above, a total of 96 ***RIPs*** were identified, of which at least 50 should be engaged in the consultation process to be carried out in the REDD+ readiness process (See Table 1 of Annex 1a). Three large groups of interested parties that need to be fully involved in the entire consultation and design process of the REDD+ Strategy include: a. ***The Government*** represented through MINAET and the MAG ; b. ***The National Forest Office*** (ONF) representing private interested parties, and c. ***The NETWORK of Associations of Indigenous Development (ADII) of COSTA RICA*****,** representing the interests of the indigenous peoples supported by international organizations. Likewise, the government representatives will coordinate with the Minister of Planning and the Minister of Finance through the weekly meeting of the cabinet.

Indigenous People: Out of the 24 ADIIs, 18 have contractual PPSA relationships with FONAFIFO, 8 are organized under the NETWORK of ADIIs of the Caribbean and represent the bribri-cabécar ethnic group in the Talamanca region. In the South Pacific, ARADIKES collaborated with 12 ADIIs, but only 9 ADIIs have been effectively integrated into the REDD+ process. The Caribbean and the Pacific initiatives appointed 12 delegates to the process, including the two women's organizations, but they made clear that they only represent their own ADIIs (17 in total) and that they are not yet authorized by their community assemblies to fully form part of REDD+.

Board of Directors of REDD+: As the coordinating organization, FONAFIFO has a Board of Directors (JD) that by law includes representation of RIPs. This group will constitute the Board of Directors of REDD+ by adding two seats: one for the ADIIs, for which the indigenous groups must organize themselves and create an umbrella organization[3]. During the implementation of the R-PP the definition of the type of representation they wish to have in the work group will be legally and technically defined. A second seat will be assigned to either other land owners, environmental NGOs, or organizations that represent the civil society.

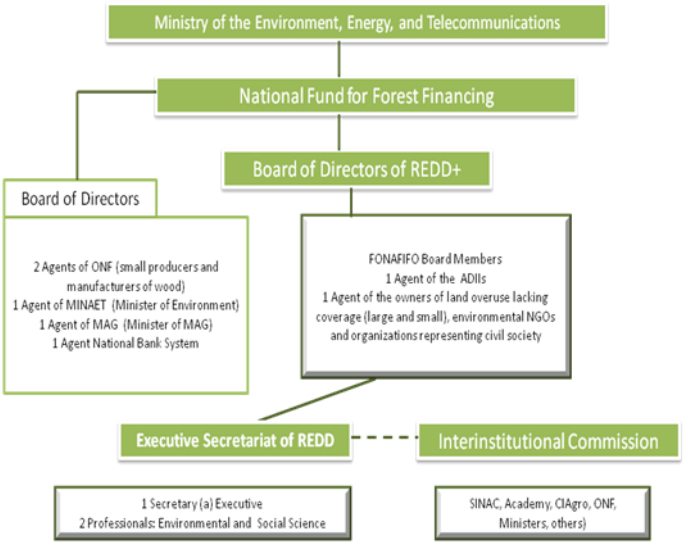

Figure 1. Structure Operational Readiness Management

The Board of Directors of REDD+ will issue policies and make decisions regarding the REDD+ Strategy, to be discussed in the Coordinating Organization, that is FONAFIFO. The REDD+ Board of Directors will be supported by a REDD+ Secretariat hosted by FONAFIFO that will carry out executive functions, liaison, and coordination tasks. This Board of Directors of REDD+ complies, in great extent, with the requirements established by the FCPF for a REDD Work Group:

- ***Cross-sectoral***: The private forest sector includes 45 organizations[4] that are represented with the two members appointed by the National Forestry Office (ONF) in the JD of FONAFIFO. Additionally, the sectors responsible for the majority of the greenhouse gases emissions (GHG) are represented by the appointments made by the National Bank System, the Ministry of Agriculture and Livestock (MAG), and the Ministry of the Environment, Energy, and Telecommunications (MINAET). *The transportation sector and, in a direct manner, the private energy and agriculture*

[3] Fifteenth Agreement, Article 12 of Session 01-2010 of January 18, 2010 ARTICLE Nº 12: PROPOSAL FOR THE HANDLING OF THE REDD STRATEGY: We take note of the progress of the REDD Strategy and we agree that the work group for the REDD Strategy will be the Board of Directors of FONAFIFO, expanded with the indigenous participation, for which the indigenous must create their corresponding organization.

[4] According to the Forest Law 7575, the ONF is composed by 6 subsectors from the forest sector: wood industry, organizations of small forest producers, organizations of wood product retailers, furniture producers and artisans, other producer associations and environmental groups.

players lack representation. The communication with these sectors will be coordinated at the cabinet level. The cabinet meets every week and includes all Ministers. They decide the agenda to be discussed in each Meeting of the Cabinet, thus the Ministers of the MINAET and the MAG are responsible for raising matters relating to REDD+ with other Ministries.

- ***Participation of Relevant Interested Parties***: RIPs are included in FONAFIFO's JD. Two of the members of the JD belong to the National Forest Office, an organization made up of RIP that depend on the forests. *The expanded JD also foresees a spot for indigenous people. New legal and political arrangements that make this integration possible will be necessary.*
- ***Representation of Government Agencies***: Three of the positions within the JD of FONAFIFO are appointed by the government. One by the MAG, another by the MINAET, and the last one is filled by a representative of the National Bank System.
- ***Link with the political processes***: The inclusion of two Executive appointed positions (of the 5 total) guarantees political linkages. Currently the two representatives are the Minister of MINAET and the Vice-Minister of the MAG.

To appoint the indigenous representative, the ADIIs must be provided with the necessary logistic resources so they may discuss and formalize their nomination. They will need to establish an umbrella organization that ensures the fair and even representation of the ADIIs. This legal entity may be created only between territories that have indigenous groups with clear land title (8 ADIIs from the Caribbean, 4 ADIIs from Buenos Aires, and 3 from OSA).

Mechanisms to handle the possible disagreements between the members of the work group: conflicts must be solved within the Board of Directors of REDD+, through agreements made by the majority (for this reason the Board of Directors must have an uneven number of members). Additionally, there are alternative options such as mediation, advisors, and expert opinions, among others.

Executive Secretariat of REDD: *Within the Coordinating Organization an Executive Secretariat will be established*; The Secretariat must operate as a support unit for the Board of Directors of REDD+ (Expanded JD of FONAFIFO), to facilitate its operation. It will execute agreements and the work group's communication strategy. This Secretariat must have sufficient budgetary support to comply with its tasks. It will be in charge of the inter-institutional coordination of the implementation of the REDD+ Strategy, for which an **Interinstitutional Commission** must be established.

The Executive Secretariat will be made up of a Secretary and two assistants who will be professionals in environmental sciences. The Secretary must be a professional with ample experience in forest conservation, and with knowledge of sustainable forest management, the conservation of biodiversity, protection of the water resources, and knowledge of the public sector. S/He must be able to carry out intersectorial coordination.

The Interinstitutional Commission will be made up of the liaison officials from organizations where the different strategic options are implemented (Academy, SINAC, IMN, CIAgro, ONF, MAG, and Indigenous People). This commission ensures interinstitutional execution of the REDD+ Strategy. The institutional liaisons will have the task of guaranteeing the institutionalization of the REDD Strategy, and must report on the execution of the R-PP implementation tasks each institutions is responsible for.

Communication Strategy of the Work Group: Even though climate change is among the country's highest political concerns (Ugalde et al, 2009) and PPSA avoided deforestation focus is a comprehensive part of the Government's National Strategy of Climate Change, the establishment of the forest agenda as a State Policy must be promoted through a REDD+ Communication Strategy in the National Strategy's Mitigation (INCAE, 2010) and Adaptation (GFA-FUNDECOR, 2010) axes. Holding workshops with high government officials is required to maintain high visibility within the government's agenda at the highest level possible.

The REDD+ Secretariat must ensure the *construction of an exclusive virtual information gateway for REDD+* within FONAFIFO with links to the gateways of the Center for Indigenous Development (CEDIN) and the Association of Comprehensive Development of the Bribri Indigenous Territory of Talamanca (ADITIBRI) (indigenous), the Information System of Costa Rica's Forest Resources (SIREFOR), the ONF, and the MINAET, in order to keep the 96 RIP informed permanently of the development of the REDD+ Strategy. This is especially important for the indigenous people because the use of digital communication increases everyday as the means to have a better communication and break information barriers. The Secretariat will also prepare a quarterly newsletter presenting the most recent events of the REDD+ Strategy, and place it on the FONAFIFO website.

Table 1.1 Institutions, functions, and members necessary for the management of National "Readiness" in Costa Rica.

Functions	Institution	Members
Within the context of the REDD+ Strategy: • Issue policies • Decision making • Resolution of conflicts	Board of Directors REDD+	• Two representatives of the National Forestry Office (ONF) • A representative of the Association of Comprehensive Indigenous Development • A representative of the Ministry of Agriculture and Livestock (MAG) • A representative of the Ministry of the Environment, Energy, and Telecommunications • A Representative of the National Banking System • A representative to be defined by the owners of unvegetated properties (large and small), environmental NGOs, or organizations that represent the civil society
• Manage and coordinate the REDD+ Strategy. • Execute the R-Plan	FONAFIFO- REDD Secretariat	• Executive Director FONAFIFO
• Interinstitutional Coordination • Execution of agreements of the Board of Directors of REDD+ • Execution of the Communication Strategy	Executive Secretariat	• Secretary • Two professional officers
• Interinstitutional execution of the REDD+ strategy	Interinstitutional Commission	Made up by liaison officials from: • Academy • SINAC

		• National Weather Institute (IMN) • Association of Agricultural Engineers (CIAgro) • National Forestry Office (ONF) • Associations of Comprehensive Indigenous Development (ADIIs) • Ministry of Agriculture and Livestock

Table 1.2: Summary of the Activities and the Budget of the Arrangements for the National Handling

Main Activity	Sub-Activity	Estimated Cost (in thousands of US$)				
		2011	2012	2013	2014	Total
Management of the REDD Work Group	Travel expenses of the indigenous representation in the Work Group and other bodies of REDD+.	$7,50	$7,50	$7,50	$7,50	**$30,00**
	Financing of the legal and political process for the union of 24 ADIIs and creation of the Indigenous Organizations with representation in the expanded Board of Directors of FONAFIFO.	$15,00	$15,00			**$30,00**
Execution of agreements of the Work Group and Implementation of the REDD+ Communication strategy	Establishment and Operation of the Secretariat of REDD+	$124,71	$144,00	$158,40	$174,24	**$601,35**
	Legal Advice for the execution of agreements	$10,00	$10,00	$10,00	$10,00	**$40,00**
	Construction, updating, and maintenance of the website section related to the REDD+ strategy	$10,00	$10,00	$10,00	$10,00	**$40,00**
	Elaboration, publication, and distribution of the REDD+ Strategy newsletter	$5,00	$5,00	$5,00	$5,00	**$20,00**
	Hiring of a public relations agency for public opinion outreach	$10,00	$10,00	$10,00	$10,00	**$40,00**
	Realization of workshops with high government officials to maintain the REDD+ agenda at the highest level	$2,00	$2,00	$2,00	$2,00	**$8,00**
Total		**$184,21**	**$203,50**	**$202,90**	**$218,74**	**$809,35**
National Government		$15,00	$15,00	$15,00	$15,00	$60,00
FCPF		**$169,21**	**$188,50**	**$187,90**	**$203,74**	**$749,35**

1b. Stakeholder Consultation and Participation

Consultations during the development of the R-PP: The consultation for the preparation of the development of a REDD+ R-PP will involve the ***Relevant Interested Parties*** without whose participation it would be difficult to develop a shared vision and country strategy for REDD+ in Costa Rica. Of the 96 Relevant Interested Parties identified, 50 must necessarily be part of the consultation process that will generate the REDD+ Strategy in Costa Rica. The consultation for the preparation of the REDD+ R-PP so far consisted of following these steps:

a. Identification and registration of the PIRs and the institutions in which they are organized and that they represent. This identification consists in the collection of identification cards that state the social actor's name, his location, and occupation (see table 1, Annex 1a). A general RIP directory was already created as well as a specific one for ADIIs and indigenous leaders. Both are managed by FONAFIFO and have been used to organize the different workshops and forums.
b. Elaboration of a map of actors that defines the sectoral affiliation as Governmental-NGOs-Local Organizations. The institutions within each sector have been identified, as well as the actor's links within the sector and to other sectors. This map of actors allowed the definition of the most relevant interested parties of the social network for REDD+ in Costa Rica (see figure 1, Annex 1b-1).
c. Subsequently we determined the most relevant and interested parties with regard to the design of a REDD+ Strategy. For this we identified the roles of the RIPs regarding REDD+, the development of the REDD+ Strategy and interests they have in its implementation. Social actors and interested parties are differentiated because a social actor may no longer be an interested party.
d. Once the PIRs, their interests and past participation in the PPSA have been defined, their probable participation and level of resources has been identified, together with gauging their political commitment, and the role they see for themselves within the REDD+ implementation.

e. Based on the preparation described above, a process of REDD+ consultations has been designed to be implemented during the REDD+ readiness phase. A REDD+ Strategy must be consulted with the parties, it must be politically viable and financially feasible, it must be consistent and in accordance with the REDD+ requirements.

During the consultation for the preparation of the R-PP, the following activities were carried out:

- Creation of a REDD+ specific section on the FONAFIFO Website that include information on REDD+ in Costa Rica, the strategy and implementation design and preparation process.
- Work meeting with RIP (2008) in which several institutions promised to provide information for the elaboration of the baseline and the analysis of existing land use.
- Presentation of the work plan for the preparation of the R-PP (2009) to more than 80 civil and governmental institutions, including a wide indigenous delegation from Talamanca (12 high level indigenous leaders).
- Meeting of the REDD+ Board of Directors of FONAFIFO in order to inform the board of the progress in the preparation of the R-PP.

- Visit to Talamanca to speak with the executive board of ADITIBRI and with ACOMUITA regarding REDD+ and the opportunities for participation; meeting with 4 Presidents from ADIIs of the Caribbean to coordinate a future meeting on REDD+. These were face-to-face meetings and they led to progress in the forthcoming processes.

- Telephone and e-mail conversations with ARADIKES, ADICONTE, ADICABAGRA, and ADIBORUCA to explain to them the process and plan a meeting in Buenos Aires with ADIIs from the South part of the country. Subsequent visit to ARADIKES to explain the importance of their participation in the R-PP.
- Mailing and delivery of informative folders on REDD+ to 20 ADIIs and several indigenous leaders.
- Delivery of information on REDD+ to indigenous leaders in a digital format.
- Delivery of information on REDD+ to FONAFIFO officials and forest regents related to indigenous PPSA engagement.
- Holding of a preparatory meeting for the consultation with the Network of ADIIs of the Caribbean on January 8, 2010. 40 bribri-cabécar indigenous leaders from eight development associations attended. Here they were educated on climate change, REDD+, and the participation process required by the FCPF.
- Holding of a preparatory meeting of consultation with 12 ADIIs of the South on January 15, 2010 (all invited), 30 bribri-cabécar, ngöbe-bugle, boruca, and terraba indigenous leaders from eight development associations attended. They appointed a high-level commission to start conversations regarding REDD+ with FONAFIFO.
- Holding of a FONAFIFO meeting with both delegations of the ADIIs on February 12, 2010 to define its representation in REDD+, regarding the consultations plan and other matters.
- Meeting of the Network of ADIIs from the Caribbean to make political agreements regarding REDD+.
- Workshop for the delegations of the ADIIs prior to the national meeting.
- Realization of a national meeting of the P.I.R. to present and discuss the R-PP in February 2010.
- Delivery of information on the R-PP in the following relationship nodes: ONF, JUNAFORCA, ACICAFOC, CCF, FECON, ARADIQUES, MESA INDÍGENA, COORDINADORA ADII'S CARIBE, SINAC, CONAGEBIO, MAG, CONAI, PAZ CON LA NATURALEZA, CONARE, CONELECTRICA, LIGA DE LA CAÑA, UICN, ASSOCIATION OF AGRONOMISTS, NETWORK OF PRIVATE RESERVES, AND INFOCOOP.

- The directors of the following organizations were invited to a meeting: ONF, JUNAFORCA, ACICAFOC, CFC, FECON, and the indigenous delegation so they could reach strategic agreements regarding the offer of environmental services and REDD+.

- A working session was held on REDD+ with UCR, UNA, ITCR, UNED, CATIE, CCT, OET, INBIO, EARTH, and FUNDECOR regarding the scientific support required by the REDD+.
- The indigenous delegation formed a technical group to present its participation plan from this date up to July 2010. FONAFIFO has supported this entire process.
- National Consultation Workshop for the Draft of the "Proposal for the Readiness Preparation (R-PP)" held on February 24, 2010, at the Aurola Holiday Inn Hotel.
- The indigenous pre-consultation process is continuous and during the months of April, May, and June of 2010 they will be holding workshops to which they will gather the indigenous peoples of each of the territories that make up the PIR, in order to define the guidelines for the full REDD+ readiness consultations.
- Meetings with actors from non-indigenous sector, such as private sector actors from the forestry, agriculture, water or energy sectors.

Main observations of the REDD+ preparation consultation: Indigenous groups and one of the interested parties from the conservation sector specifically requested that the REDD+ Strategy would not focus exclusively on the global carbon markets, but that REDD+ Policies would include incentives for conservation in public Protected Wilderness Areas. Most interested parties supported the idea of compensation for the reducing emissions or improvement of carbon stocks from private forests through local and global market mechanisms. This is consistent with the position the country has maintained in the negotiations under the Framework Convention on Climate Change regarding financing mechanisms, with the Bali Action Plan and the last REDD+ text prepared in Copenhagen.

Indigenous Peoples: The Network of ADIIs of the Caribbean mentioned their desire to participate in the R-PP discussions to position their offer of more than 200,000 hectares of forest. It is evident that they are in good position to negotiate based on their forest area in the "La Amistad International Park" and in their political influence based on the fact that the eight ADIIs trust each other and operate as a historic Talamanca federation. They mentioned their willingness to contribute to a national REDD+ vision. Additionally, they have stated that they do not want to become part of the ONF because their interests would be made invisible and they wish that the ADIIs have a representative in FONAFIFO's Board of Directors. Their main concern regarding REDD+ is that they wish to be part of the process under recognition of their legally and socially legitimate role. FONAFIFO and the indigenous delegates will revise and update the written Indigenous Action Plan for the Ecomarkets II project, in order to finally have an Indigenous PSA Plan, as the ADIIs have desired. The ADIIs expressed their doubts regarding REDD+ based on what they hear within the international arena and at indigenous events, but they are aware that their situation is different because they have been actively participate in PSA, one of the REDD+ mechanisms, for more than 12 years (see Table 1.3).

Table 1.3: Historical PSA placement (hectares) of Forest Protection in indigenous territories (1997-2009)

ASSOCIATION OF COMPREHENSIVE DEVELOPMENT IN INDIGENOUS RESERVES	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Cabecar Talamanca	300				402		600		600		600	1,000	600	4,102
Ujarras Buenos Aires	25	188	94		267				600				500	1,674
Conte burica corredores	420		600	600	600		600	600	600		600	1,000		5,620
Bribri talamanca		150		400	600	740	600							2,490
Guaymi coto brus		170	421	600	600	50	600		600		600	1,000		4,641
Salitre buenos aires			121	100	130		544				556	1,000	1,000	3,450
Cabecar nairi awari pacuarito siquirres				600	600	600	600	600	600					3,600
San rafael cabagra buenos aires puntarenas				100				600	600	500	600	1,000		3,400
Telire cabecar					400	300								700
Cabecar taymi limon						300	600	600	600	600	600	1,000	1,000	5,300
Alto laguna guaymi sierpe osa puntarenas							600	600						1,200
Cabecar telire limon							600	600	600	600	600		1,000	4,000
Cocles talamanca							600	600						1,200
Boruca buenos aires							571	600	600		600	721	835	3,927
Curre boruca rey curre							373	600			600	1,000		2,573
Terraba buenos aires							600							600
Cabecar chirripo								414		400	600	975	1,000	3,389
Cabecar bajo chirripo		200		400					600					1,200
Quitirrisi mora												179		179
Nairi awari pacuarito siquirres										200	600	706		1,506
Talamanca											600	1,000	1,000	2,600
Cabecar bajo chirripo matina					600	600	600	600	600			1,000		4,000
Nairi awari pacuarito													995	995
Grand Total	745	708	1,236	2,800	4,199	2,590	8,088	6,414	6,600	2,300	7,156	11,580	7,930	62,346

Consultations Plan and Participation:

Costa Rica is entering the third generation of positive incentives to stop deforestation: first there were the CAFs from 1976 to 1996, then the PSA from 1997 up to the present. A new phase will start with the implementation of the REDD+ Strategy. Costa Rica's long-standing experience has created legal and institutional capacities, social and human capital, and a solid but still improvable governance scheme. Thus, the REDD+ consultation process will be based on existing channels of communication as well as on a network of previously established relationships. The Consultation will be based on the experiences to date and open new avenues, better communication bridges, more consolidated relationship nodes, and help expand social capital further.

REDD+ consultations will take into account the following issues:

a. Design a consultation process that allows of the building of social capital based on the current network of inter and intra-institutional relationships (governmental and non-governmental, including the private and indigenous sectors).
b. Design a consultation process that improves governance by involving RIPs in the decision-making processes of the REDD+ Strategy (indigenous, forest companies, electrical companies, environmentalists, NGOs).
c. Design a consultation process that allows Costa Rica to present a REDD+ Strategy backed by a shared vision from all interested parties, with a single mission and a single country strategy in this field.

The Consultation Plan will be designed to ensure:

- The construction of a national consensus in REDD+ and the meaningful inclusion of RIPs.
- That the design takes into account the expectations and interests of the RIPs.
- Strong support among the RIPs for the design and implementation of REDD+ policies.
- That the results be equal and fair, guaranteeing that forest owners – including indigenous people – receive a direct benefit.
- The reliability of the technical and scientific information.
- Effective impact evaluation and continuous monitoring of the goals.
- The creation of inclusive, transparent working groups based on trust between the parties.
- Communication and adequate, timely and appropriate information to be delivered to all the RIPs.

Considerations for the invitations: 50 RIPs that are highly relevant must be invited correctly, expressly, and effectively to all the REDD+ discussion events. It is necessary to supervise the invitations through the previously established directory and that the postal and electronic addresses and telephone numbers be updated permanently. Good consultation events depend on an effective invitation process. The technical secretariat cannot spare efforts in summoning to consultations. The communication mechanism will be the one used up to now by the Technical Secretariat at FONAFIFO, supported by the use of new technologies such as the Internet. It is important to pay special attention to achieve attendance of the Ministry of Finance as well as the Planning Ministry; there have been difficulties in achieving their presence throughout this preliminary process.

Annex 1b-2 presents the logical framework for the consultation process of the relevant interested parties to design the REDD+ Strategy for Costa Rica (Table 2). The Action Plan for the Consultation (Table 1.4), which results from the logical framework, is also presented

below indicating the lines to be followed within the established timeframe. Below are the budget and a summary of the Logical Framework of the Consultation and Participation.

Table 1.4: Summary of the Logical Framework of the Consultation and Participation

(See Annex 1b-2 for complete Logframe for consultation)

OBJECTIVES OF THE CONSULTATION	RESULTS	ACTIVITIES
A. Design a consultation process that allows the accumulation of more social capital based on the current network of institutional relationships, including the private and indigenous sectors.	The ADIIs have a seat in the REDD+ Work Group	Economic sustainability of the indigenous representation in the Work Group and other bodies of REDD
	All the sectors of the forest realm are represented in REDD+ Board of Directors and the Interinstitutional Commission.	National RIP Workshops for the strategic planning of REDD (includes information and publications)
	The RIPs are informed about REDD+ and include REDD+ in their strategic planning	Organization of national, regional, and sectorial workshops and meetings to define the effective and operative support of RIPs for REDD+
B. That the consultation process improves governance by favoring the representation of the RIPs in the decision making processes of the REDD+.	The ONF becomes an organization with greater legal and political strength	Support for National ONF Workshop to consolidate its participation in REDD+
	The ADIIs create an umbrella body that will represent them	Financing of the legal and political process for the joining of 24 ADIIs and their legal sustainability
	Those that demand environmental services achieve multilateral agreements to increase the acquisition power of CSA	Multilateral meetings with those that demand CSA
	Consultation meetings with Indigenous People and the ADIIs in order to achieve agreement regarding REDD+ and an Indigenous PSA Plan in REDD+	Execution of the Indigenous Action Plan defined by the ADIIs.
	The CCF is able to represent all private business with interests in REDD+	CCF events and meetings to participate in REDD+

Table 1.5: Summary of the Activities and the Budget of the Consultations and Participation

Main Activity	Sub-Activity	Estimated Cost (in thousands of US$)				
		2011	2012	2013	2014	Total
Consultation on and planning of the REDD+ Strategy	Consultation workshops and national, regional, and sectoral meetings for REDD+ (15 workshops).	$25.00	$50.00	$25.00		**$100.00**
	National Planning Workshops to prepare the REDD+ Strategy (2 workshops, includes information and publications).	$15.00	$45.00			**$60.00**
Support for securing an active role of the most important RIPs in the implementation of the REDD+ Strategy	Implementation of the Indigenous Action Plan	$75.00	$75.00	$30.00		**$180.00**
	Events and Meetings of the CCF that include REDD+ as a topic.	$15.00	$15.00			**$30.00**
	Support for the ONF National Workshop	$10.00	$10.00			**$20.00**
	Multilateral meetings with applicants for Certificates of Environmental Services (CSA).	$10.00	$10.00			**$20.00**
Total		**$150.00**	**$205.00**	**$55.00**	**$0.00**	**$410.00**
Ecomarkets		$75.00	$75.00			**$150.00**
FCPF		**$75.00**	**$130.00**	**$55.00**	**$0.00**	**$260.00**

Component 2: Prepare the REDD Strategy

2a. Assessment of Land Use, Forest Policy and Governance

Evaluation of the use of land, forest policy and governance

Deforestation and Regeneration: During the period 1980-2005, the deforestation and regeneration was determined for different stages of forest succession (early, medium, and late regeneration and old-growth forests). A set of forest cover maps at a national level provided by the National Weather Institute (IMN), for the years of 1980 and 1990, and by the FONAFIFO for the years 2000 and 2005, were used. The analysis was carried out independently for four uniform strata of dynamic use of the land, with different socio-economic and legal realities: a. National Parks and Biological Reserves, b. Protected Wilderness Areas, c. Indigenous Reserves, and d. Private Forests (see Figure 1 and Figure 2). Said strata were analyzed independently for the province of Guanacaste (see Figure 1) since the forest in Guanacaste presents a recovery dynamic that corresponds to a socio-economic reality different to that of the rest of the country, most likely related to the impact of tourism, the real-estate boom, and the decrease of the cattle activity, once very characteristic of the area (see Annex 2a).

This approach offers a better description of the structure of the forest coverage (age of the forest) than traditional deforestation analysis, and it allows the determination of the balance between the deforestation and the regeneration observed for the period of each of the land use dynamic stratum. This approach captures also the dynamics of the land-use change experienced by the country **in a manner that goes beyond a negative rate of deforestation and indicates also the recovering coverage.**

The scope of this evaluation of the use of the land does not analyze degradation of the forests due to lack of information. To date we have not identified studies that measure the anthropogenic degradation of the biomass stock in Costa Rican forests.

Carbon Sequestration capacity: The country's capacity to sequester carbon has been also evaluated for each uniform stratum of land use dynamic. The sequestration estimate was made in thousands of tons of CO_2 for each five-year period, considering only above-ground biomass. This estimate is based on the stack changes between periods. The estimate of the carbon stock for each year was calculated considering that a secondary forest site reaches total vegetative coverage in 35 years and that for both forests in Guanacaste as well as the rest of the country, the average biomass of mature forests is 60 and 100 tons per hectare of carbon, respectively. For each cohort of regeneration (early, mid, and late) the stock was estimated based on the proportion of the middle age over the total time necessary to reach the total reforestation of the site (age/35 years) multiplied by the carbon in total occupation of the stratum. An age of 22 years was considered for the early regeneration and 27 years was considered for mid regeneration forests. Late regeneration was considered as total occupation of the site, meaning with an age above 35 years.

Relationship between land revenue and deforestation in Costa Rica: The average revenue of the land for each uniform stratum of dynamics of the use of the land (R_a), was approximated through an index based on the path density determined with an empirical model based on the concept developed by von Thünen. The model determined an index that is an indicator of the relationship between the opportunity cost of the land and the distance to the markets.[5] Essentially, it was assumed that the revenue of the land decreases exponentially as the distance to the closest road increases, reaching an opportunity cost close to zero at a distance equal to or greater than a kilometer.

Each uniform stratum was subdivided in pixels of 100 x 100 meters, and a one-kilometer buffer zone was established around all the country's roads (paved or gravel). The land rental index i, where $0 \leq i \leq 1$, is estimated for each pixel using the following equation:

Equation 1: $$i = e^{d/100}$$

Where d is the distance to the closest road. The expected revenue for each pixel can be estimated according to the determined index. The different revenue estimates for each pixel were later averaged for each Uniform Stratum of dynamics of the use of the land in order to determine the average revenue (R_a):

Equation 2: $$R_a = \frac{\sum \text{Rent Index}}{\text{total pixels}}$$

Considering the Walker model (2004), the probability that a parcel is deforested is directly related to the land revenue. This hypothesis was evaluated using the deforestation rates observed during the 2000-2005 period (see Tables 6, 7, 8, 9, 10, 11, and 12 in Annex 2a) and the average rent for each stratum estimated as previously described (Table 2.).

[5] The development of this model is explained in detail by Leclerc and Rodríguez (1998).

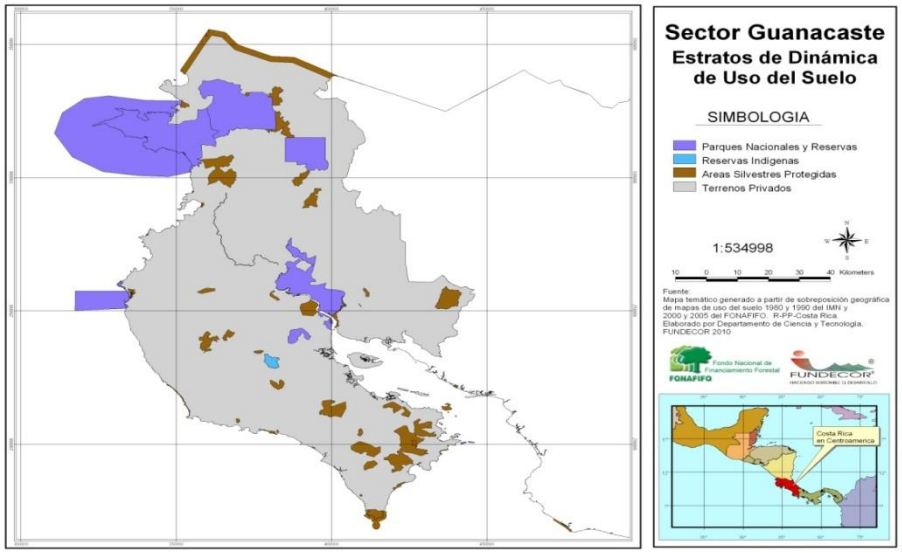

Figure 1: Stratum of dynamics of the use of the land Guanacaste Sector

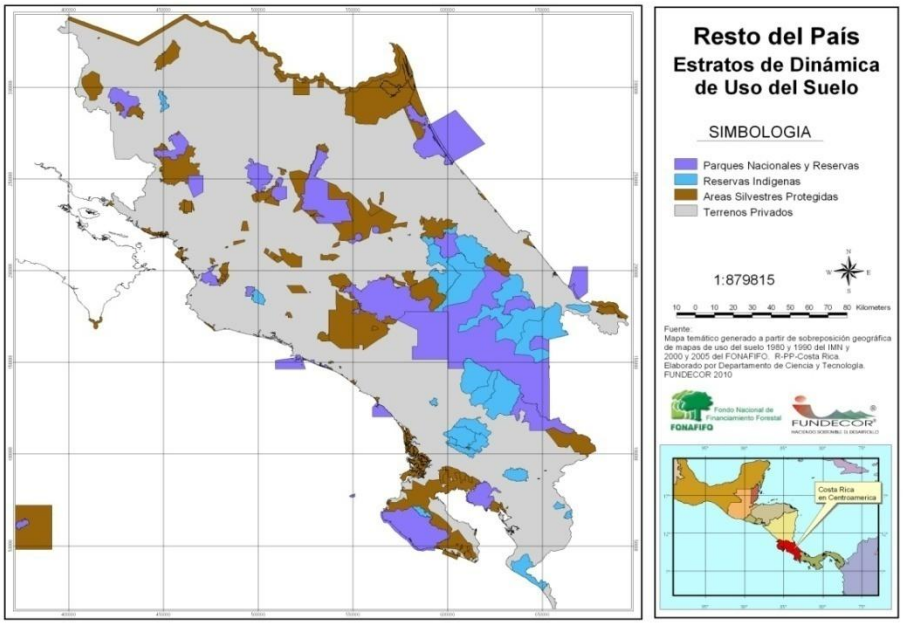

Figure 2: Stratum of dynamics of the use of the land Rest of the Country

Results of the Evaluation of the use of the land

The perception that there is no deforestation in Costa Rica is wrong. Despite the fact that in Costa Rica forests are being recovered (net deforestation[6] is negative), forests are still being lost (there is gross deforestation[7]). During the five-year period 2000-2005, the country lost between 144,398 and 224,406 ha of forest and between 207,983 and 288,886 ha have been regenerated, which implies a positive balance in recovery of forest cover of between 63,585 and 64,479 ha. Of the hectares lost, 42% corresponds to early regeneration, 32% medium-aged regeneration and the remaining 27% to old growth forests (see Figure 3 and Figure 4).

This ample range of estimates results from using extrapolated data on the whole national territory (71% of the territory was-available for study with the information and 29% was covered with clouds, shadows or had no data), as well as to differences obtained between the process and the review. In addition, while the preset objectives and standards were met in each study and the same sensor was used in all cases, the different classification methodology and categories of land use were applied to the analysis of all images. Therefore the estimates made must be improved by developing a detailed study in which the classification method, categories of use and pre and post processing treatments are uniform (see Table 2a). Additionally, the official definition of gross deforestation and net deforestation to be used in the context of this REDD+ Strategy must be established.

Taking into account the limitations of this evaluation, it is estimated that for the period (2000-2005) carbon sequestration was 55,808 Gg CO_2. Said carbon sequestration occurs differently in the five standard strata of dynamic land use. This is due to the fact that within this set of strata there is a statistically significant deforestation gradient, positively related to land revenues. Within said gradient of deforestation, deforestation is arranged from least to greatest in National Parks and Biological Reserves (deforestation is probably of a natural origin), Protected Wilderness Areas, Indigenous Reserves, and finally privately owned forests (see Figure 5). According to Walker (2004), the National Parks and the Protected Wilderness Areas are deforested less because their land revenue is lower than that of private forests.

The country also has a deforestation gradient linked to the forest age. The highest deforestation rate is found in early regeneration forests, followed by medium regeneration forests, and finally the old growth or late regeneration forests see Figure 5).

The aforementioned suggests, among other things, that: a) the low deforestation observed in all strata in the late regeneration and old-growth forests, is evidence of a preference towards its conservation over regenerated forests, and b) the drivers of deforestation relate to legal and economic incentives that encourage the removal of the regenerated coverage, especially the early age coverage.

[6] Net deforestation: is the loss of coverage in a period, after considering the regeneration. The coverage recovered is added to the forest area that remains until the end of the period.

[7] Gross deforestation: is the loss of coverage during a period. Regeneration is not considered. It is correlated with the loss of quality of the forest coverage.

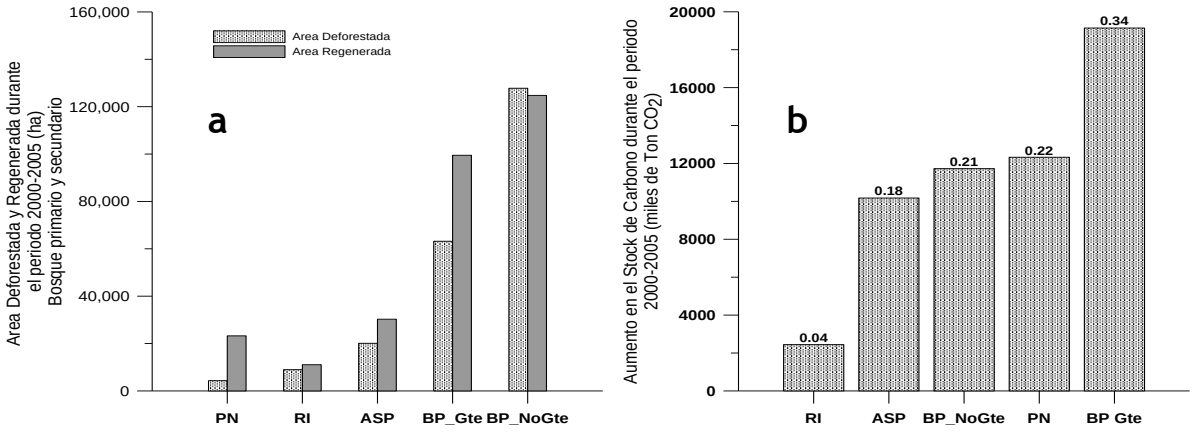

Figure 3: Deforested and regenerated area in hectares (a) and increase in the carbon stock in thousands of tons of CO_2 (b) during the 2000-2005 period in National Parks (PN), Indigenous Reserves (RI), Protected Wild Areas (ASP), and Private Forests throughout the country (BP), in Guanacaste (BP Gte) and outside of Guanacaste (BP NoGte).

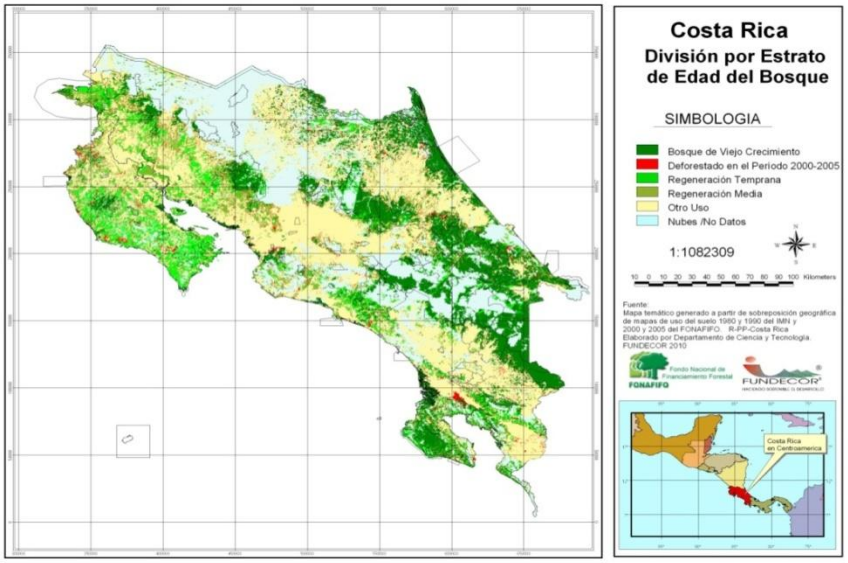

Figure 4: Distribution of Costa Rica's forest coverage per Age Strata

Land use dynamics in national parks and biological reserves: Costa Rica has protected its resources through an ambitious national parks and biological reserves system created in the 1970s. Covering more than 11%of the country, these lands are in the public domain and are under the category of absolute protection. Part of the land in national parks has not yet been paid to the owners by the government Likewise, the system is inadequately funded, insufficiently controlled and is threatened by squatters, hunters, illegal loggers and miners. The size of this system is not sufficient to ensure the preservation of some species, including those most valued for Costa Rican society. As a result, the conservation of the biodiversity of this system depends on the conservation of buffer areas, which are mainly on private land. At the same time, this national park system has been the keystone in promotion of eco-tourism, resulting in its becoming one of the main income generating activities of the country (Brockett and Gottfried, 2002).

By 2005, 22% of the forest cover is under this category of land ownership. This stratum presents low land revenues and therefore low deforestation. Absence of people living in [and the proximity of] the parks and reserves suggests that the observed deforestation is exclusively product of natural events (landslides, earthquakes, or forest fires). This stratum has the least amount of land use conflict (sub or over use); it is currently in forest cover recovery process especially in Guanacaste, and captured 22% of the total carbon during the period 2000-2005 (see Table 2.).

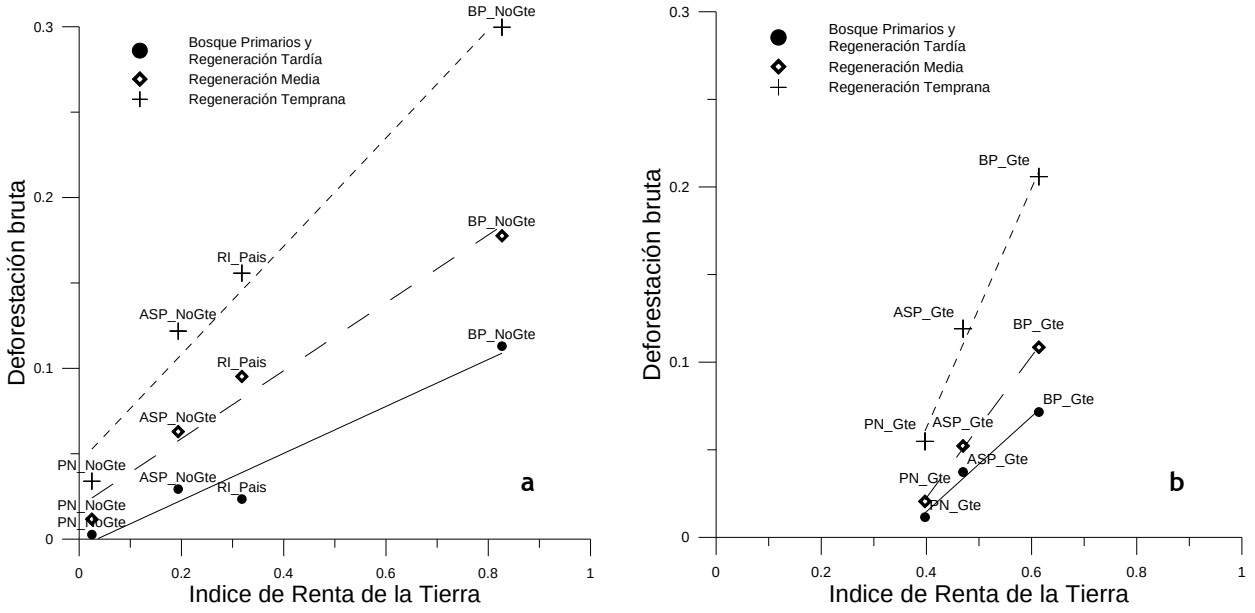

Figure 5 Gross deforestation for the different cohorts of regeneration arranged by the index of land revenue of the Uniform Stratum of dynamics of use of the land in Guanacaste (b) and outside of Guanacaste (a). National Parks (PN), Protected Wild Areas (ASP), Indigenous Reserves (RI), and Privately Owned Forests (BP).

Given the public nature of these lands, the lack of financial self-sufficiency, limits on land purchase and protection are useful to retain this pool of increasing carbon stock. Market strategies such as PSA applied to the buffer areas would support the maintenance of the integrity of the national parks as a co-benefit, holding back the advance of the agricultural frontier.

Land use dynamics in protected Private Wilderness Areas: 14% of the country is regulated under different categories of protection or Protected Wilderness Areas, especially forest reserves and wildlife refuges. Most of these protected areas are found in private domain lands. Within private Forest Reserves, legislation requires the holder to demonstrate possession for at least ten years before the establishment of the reserve, which is in many cases impossible to achieve (Brockett and Gottfried, 2002). Land titling is a time-consuming and costly process and difficult to achieve.

By 2005, 19% of the country forest cover was qualified as Private Wilderness Areas. Just like National Parks, this stratum presents low land revenues, especially outside of Guanacaste, which also indicates why deforestation is low. Forest coverage in this stratum is stable (less than 4% of the stratum was deforested and more than 7% was regenerated during the five-year period 2000-2005). In National Parks and protected Private Wilderness Areas is regeneration less ephemeral, reflected in high rates of retention of secondary growth forests. The proportion of land in conflict is low and this stratum captured 18% of the total carbon (see Table 2.).

The ownership regime in this stratum (public-private) coupled with low rates of land revenues makes forest cover relatively more competitive and therefore the relative impact of the PSA and Natural Forest Management is much greater. Eventually a PSA together with a policy of promoting sustainable forest management and its productive links can maintain and improve the stock of carbon in this stratum.

Land use dynamics in private forests: Private property forests in Costa Rica went through a process of intervention during the 1970s and 1980s followed by a process of reform of the forestry sector during the 1990s in which those supporting market-based solutions to reduce deforestation prevailed over those who supported greater government intervention in the sector.

This process influenced the creation of the current 7575 forest law that regulates these forests. This new law established participatory mechanisms for third parties interested in the creation of forest policies and the distribution of incentives for preservation of forest cover. It also prohibits land-use change in private forested lands (article 2) even if this conversion was meant to establish a forest plantation (article 19). The law promotes sustainable forest management by simplifying the requirements for forest management plans (sustainable forest management), including the figure of the General Plan and Operational Plans and eliminating seasonal restrictions on the implementation of those plans (articles 20 and 21), which had counterproductive results. The law also established the National Forestry Office (ONF), comprised of representatives of forest producers, industrial wood producers, trade sector and environmental organizations, which acts as political advisor to the Ministry of Environment (article 7-11). On the other hand this law did not include regulations on harvesting, transportation, industrialization and export of wood from plantations (article 28). Finally, the law created the payment for environmental services to forest owners (articles 22-27) and the National Forestry Financing Fund (FONAFIFO) to financially support the forestry activities of small and medium producers (articles 46-51) (Brockett and Gottfried, 2002).

However, during the early stages of implementation of the program of payment for environmental services by FONAFIFO (1997-2003), deforestation associated with the illegal logging increased (Contraloría General de la República, 2008). Such a situation arose, ironically and in parallel, as a result of three factors: i) the over-regulation of natural forest management promoted in the new forest act, ii) the implementation of a non-legally based policy by MINAE (Ministry of Environment and Energy) whereby it established an administrative ban for Natural Forest Management, iii) the elimination of PSA to forests under the category of Natural Forest Management. The ban on Natural Forest Management followed the opinion of the country's conservation advocates, which unjustifiably identified this activity as responsible for the deforestation and degradation of forests in the country.

Until the mid 1990s natural forests supplied most wood demand for industrial activity. Subsequent restrictive policies for Natural Forest Management quickly increased the use of plantations on (agricultural) lands where a relevant portion of this land came from degraded forest and deforestation. As of 2002, the MINAE defined a strategy to control illegal logging, establishing tighter requirements for obtaining clearing permits. From this time, the exploitation of forest plantations increased exponentially and is still today the main source of raw material for the forestry industry, but without adequate replanting schemes, creating a situation of a stock shortage scenario (from De Camino, 2007), which could have severe environmental and economic impacts (Contraloría General de la República, 2008). Due to this sequence of events, the structure of wood supply changed dramatically, to where now two-thirds of the consumption of wood is provided by forest plantations and the remaining third comes from forestland and agricultural land.

To correct this situation, the State Forest Administration[8] took the following legal, political and institutional measures to promote legal and sustainable timber production, and to avoid deforestation and degradation of forests from illegal logging:

a. Implementation of Forest inventory control on agricultural lands by checking the no-change in use and installing global positioning system signal receiving units (Decree No. 31332-MINAE-MP, FAO 2005).
b. The simplifying of the principles, criteria and indicators of sustainability for the Natural Forest Management , creating new procedures and a code of practice aimed at promoting the sustainable management of natural forest (Decree No. 34559-MINAE).
c. Promoting the management of natural forest through the development of capabilities and institutional arrangements in the Costa Rican forest sector, to mainly involve small forest producers in sustainable forest management and to ensure the sustainability of the provision of forest goods (wood) and services for the society. This is part of a strategic plan developed by the AFE (2007 MINAE) and supported by the technical cooperation of FAO (FAO 2008).
d. Increase in payment for environmental services for establishment of forest plantations from 819 USD to 980 USD, and increase in the PSA contribution for reforestation (Decree No. 35133-MP).
e. Reactivation of the PSA for Natural Forest Management (currently under discussion).

By 2005 about 212,000[9] hectares of land were included in the payment for environmental services program in FONAFIFO, most of these under contracts for the protection of natural

[8] The State Forest Administration is responsible for the National Conservation Areas System (SINAC), institution in charge of controlling, regulating, and promoting the adequate use of the country' forestry resources. FONAFIFO is also part of the State Forest Administration.

[9] By 2010 504,000 Ha have been recruited into the PSA program.

forest (86%). The program has been associated with significant benefits in all local, national and global levels, including the reduction of poverty, protection of the quality of water, carbon sequestration, conservation of biodiversity, health and infrastructure improvement (Hartshorn et al., 2005).

According to Tattenbach et al (2007), 64% of the total PSA in 2005 was directed to forests of high land values, and 65% of PSA funds were placed in forests of high biological diversity conservation value. It is important to mention that this bias in the spatial distribution is not due to the distribution of forests in the different strata. Coverage of 30% of PSA was achieved in forests with high land revenues, 24% in average land revenues and 13% in low land revenues, achieving a greater success in forests where recruiting is theoretically more difficult. Also, production of environmental services was conducted under the logic of spatial distribution concentrated in forests with high revenue rates (higher risk of deforestation) and high biodiversity conservation value. The PSA program 1999-2005 estimated avoided deforestation of 108,000 ha, of which 72,000 ha (67%) had a high conservation value for biodiversity while approximately 37,000 ha (34%) were of high value for water conservation. Overall, the PSA program increased protection of forest environmental services relative to the level that would have been protected without the program at 10% for carbon, 11% for biodiversity, 13% for drinking water and 12% for water for hydroelectric use.

As a result of the above mentionate , by 2005, 50% of the forest cover in the country was under private ownership. Unlike National Parks and Protected Wilderness Areas, land in this stratum present the highest revenues, and therefore has the highest deforestation at all ages of coverage (regeneration and old growth forests). This is the only stratum that presents a net loss of coverage (see Figure 3). However, while during the five-year period 2000-2005, 127,790 ha were cut down and only 124,773 ha were regenerated, this stratum is responsible for 55% of the period's carbon sequestration. This was possible since the secondary forest growth exceeded the decline of stock by deforestation. It is notable that this stratum concentrated 80 per cent of land use conflicts (see Table 2.). It is estimated that there are more than 650,000 ha currently under agricultural use with forest use capabilities.

Increased land revenues in this stratum, the inability of the Government to enforce environmental legislation, and policies that reduce competitiveness of forest activity compared to their alternate use, all encourage agricultural use over forest use, even if land use capacity does not support it. The PSA capacity on this stratum is limited and cannot compete with very high revenue land uses such as pineapple or banana crop. A series of restrictive policy changes are required in forest use together with the establishment of mechanisms to prevent illegal coverage removal processes to take advantage of co-benefits via finance for land recovery initiatives where soil is over-used.

Land use Dynamics in Indigenous Reserves: by 2005 10% of the forest cover in the country was under this domain of communal ownership. The land revenues index is not as low as in the national parks and protected wildlife areas, and it presents an intermediate deforestation rate in all strata. Land use conflict is low and the area contributes 4% of the country's carbon sequestration. This trend of improvement in carbon stock can be maintained as long as the PSA is adjusted to: i) the reality of communal ownership, ii) enabling Natural Forest Management in the indigenous reserves, iii) the problem of invaders illegally entitling land and problems linked to population growth. However reality in this stratum can be the same as that in the protected wild areas, or ASP, since forest ownership is clearer in the RI than in the ASP.

Causes of deforestation in Costa Rica

As described above, the probability that a forest in Costa Rica is converted to another use depends mostly on the revenue from the alternate use compared to the forest's revenue (Figure 5). Other factors such as family income, availability of labor, spiritual values associated with forest, educational level can also influence the decision. However, their impact has so far been only marginal.

It can be expected that since deforestation is closely related to the profit of the alternate land use, the processes of forest loss in Costa Rica mainly results from fundamental socioeconomic processes (for example agricultural development policies) that improve the revenue of alternate activities in comparison with the revenue of the lands covered with forests.[10]

Due to this, Costa Rican deforestation is mainly attributed to the establishment of agriculture and livestock (Wyels, 2003; De Camino et al, 2000; Lutz and Daly, 1991; Myers, 1981). According to Ortiz (2010), it is a result of economic development policies, mainly agricultural development. These policies were predominantly implemented by subsidized loans. For example, the deforestation that occurred between 1959 and 1960 was the result of the promotion of commercial crops such as coffee and sugar cane, as well as rural settlement policies promoted by institutions such as the Institute of Lands and Colonization (ITCO), later renamed Agrarian Development Institute (IDA).

However, agricultural expansion has not been as relevant in the deforestation process as livestock expansion (Bush et al, 2000). With the opening of the meat markets in the United States, the Government of Costa Rica established lending policies to promote this activity and promote the agro-exporter development model more generally, which had a side effect of eliminating forests due to expansion of agricultural land. Thus conversion to pastures became the main cause of deforestation.

In conclusion, macroeconomic, especially political, demographic or technological elements are what directly influence or control deforestation upon altering the forest's revenue. Currently the following forces operate in these areas:

- In Protected Wilderness Areas: Restriction of access to the PPSA to forest owners with problems of property entitlement rights.
- In Privately Owned Forests: Prohibition of the land-use change; Payment for Environmental Services; over-regulations and administrative ban of sustainable forest management of natural primary and secondary forests; restriction of the access of PPSA to owners and holders of natural forests under forest management regimes; lack of competitiveness of forest use in comparison with alternate uses; and weak enforcement of laws controlling illegal logging.
- In Indigenous Reserves: Low revenue of the forest for the residents of indigenous territories; and weakness of the state to sanction the irregular titling of land by squatters in indigenous territories.

[10] As acknowledged in the land revenue theory, in equal legal and agricultural conditions, the land's revenue depends on the cost of transportation to the market. In Costa Rica with a non-existing water transport system the cost of transport is dictated by distance to roads, so more profitable agricultural lands are those within greater road density areas.

- In National Parks and Biological Reserves: Weakness of the state in the supervision of the natural wealth with regard to the threat presented by squatters, illegal logging, hunters, and miners.

Some of these elements have begun to be addressed with the implementation of the Eco-markets II project.

The effect of PSA on deforestation:

Ferraro (2001) notes in his study on the performance of conservation payments that "at the most fundamental level, the profitability of agriculture, no matter how marginal, induces the habitat conversion. Therefore, only the profitability of conservation can stop it". Theoretically, if there were a political or other instrument destined to increase the value of the land with forest cover over those with the best alternate land use, land revenues for forest covered lands would equal those of agricultural lands (which means, $R_{al} = R_{fl}$), and there would not be outstanding profit for agricultural conversion. Deforestation would be then less probable.

The PSA program in Costa Rica is a political instrument designed to reward the opportunity cost of land use alternatives. Through payment to land owners who preserve or maintain their land under forest cover, the PSA can effectively increase the value of the land with forest cover to become close to the value of deforested land. The PSA is unable to compete with the significantly productive land value, but it has been estimated that since 1966, around two-thirds of the deforested lands of Costa Rica are not suitable for anything other than forest cover (Kishor and Constantine, 1993; Zbinden and Lee, 2004). This is why the PSA in Costa Rica has focused on less productive land owners.

Tattenbach et al (sf) derived an econometric model from the previously described model by Walker (2004), to explain the effects a PSA program could have on profit from the forest, and therefore on the propensity to deforest. According to this model, there are two types of forests: the ones being protected by PSA (c), and those that aren't (s). In a given region, it is possible to have both types of forest, therefore the sum of these two types of forests (h) ratio is 1 ($h_s + h_c = 1$). Assuming random effects counter each other ($\varepsilon_{al} - \varepsilon_{fl} = 0$), and that as a result of restrictive forest use policies, forest lands without PSA add no value ($R_{fl}(p, w) = 0$), then the probability of deforestation occurring can be expressed as:

Equation 3: $$\text{Prob}\left[deforestación\right] = \text{Prob}\left[\left(\ln R_{al}(p,w) - \ln R_{fl}(p,w)\right)(h_s + h_c) > 0\right]$$

Equation 4: $$\text{Prob}\left[deforestación\right] = \text{Prob}\left[R_{al}(p,w) - R_{fl}(p,w)h_c > 0\right]$$

In Costa Rica's PSA Price for Environmental Services stays the same ($R_{fl}(p,w)=k$), the probability of deforestation (d) in a given region (r) can be expressed as:

Equation 5: $d_r = R_{ar} - kh_{cr}$

where R_a is the average alternative land revenue in a given region and h_c is the forest ratio under PSA.

Using a geo-referenced data base from FONAFIFO, and using the area that was paid by environmental services during 1997-2005 period, the extent of the participation in the PPSA system for each of the Strata and coverage populations was determined. Through a regression analysis the close relationship between deforestation and the land revenue index is statistically proven (0.75 R^2, p-value: < 0.0001 for revenue index rate).

The Tattenbach et al (sf) model also includes the depth in participation in PSA as an independent variable, and statistically explains 92% of the variability of deforestation in all strata and populations except for National Parks in and out of Guanacaste and Protected Wild Areas outside of Guanacaste. Coefficients for the land revenue index and the depth of the PSA are significant and have the correct sign (0.40 p-value: 0.0001 and - 1.55 p-value: 0.0089, respectively).

Equation 6: $d_r = 0.4R_{ar} - 1.55h_{cr}$

These results are consistent with those obtained by Tattenbach et al (sf); Sesnie (2006), and Tattenbach (2007), but they contrast with those of Ortiz et al, 2003; Pfaff et al., 2008; and Arriagada, 2008, which have found that the actual effectiveness of the PPSA is less than 27%.

The correct implementation of the present REDD+ Strategy relies on securing the resources necessary to continue with the investigation efforts to explain the differences in the results of the evaluation of the PPSA as a mechanism to control deforestation. Other critical gaps include: Identification of more efficient PSA schemes for deforestation and degradation; understanding of the opportunity cost of the land under different conditions; how justifiable it is to increase the PSA amount to maintain or induce regeneration; and knowledge of the dynamics and causes of degradation and regeneration.

Table 2.1 Land use Dynamics for the 2000-2005 period, by land ownership regime, for two different socio-economic regions in Costa Rica

Region	Stratum	Forest Coverage		Agricultural Use in forest category		Forest Use in Agricultural category		Deforestation		Regeneration		Carbon Capture		Carbon Stock		Carbon Density	Land Revenue Index
		Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Gg CO_2	%	Gg CO_2	%	Gg CO_2/ha	
Country	Indigenous Reserves	239,016	10%	67,600	7%	24,300	4%	8,971	4%	11,054	4%	2,439	4%	85,495	11%	0.358	0.32
Rest of the Country	National Parks and Biological Reserves	442,041	18%	9,500	1%	1,900	0.3%	2,083	1%	4,256	1%	5,209	9%	160,308	21%	0.363	0.02
	Protected Wild Areas	410,173	17%	60,600	6%	44,500	8%	17,484	8%	23,795	8%	6,734	12%	144,345	19%	0.352	0.19
	Private Property	718,830	29%	599,200	64%	301,300	55%	127,790	57%	124,773	43%	11,722	21%	235,840	31%	0.328	0.83
Guanacaste	National Parks and Biological Reserves	97,008	4%	36,000	4%	400	0.1%	2,247	1%	19,006	7%	7,116	13%	30,981	4%	0.319	0.40
	Protected Wild Areas	48,293	2%	11,800	1%	6,300	1%	2,634	1%	6,511	2%	3,443	6%	16,339	2%	0.338	0.47
	Private Property	509,046	21%	152,300	16%	167,300	31%	63,198	28%	99,490	34%	19,144	34%	98,004	13%	0.193	0.61
Total		2,464,407	100%	937,000	100%	546,000	100 %	224,406	100 %	288,886	100%	55,808	100%	771,313	100%	0.313	

Table 2.2: Summary of Activities and Budget for Land Use Evaluation, Forest Policy and Governance (Needed Follow-up activities)						
		Cost Estimate (in thousands of US$)				
Main activity	Sub. Activity	2011	2012	2013	2014	Total
Standardization and methodological improvements for the determination of deforestation	Detailed Study where the classification methodology uses uniform categories and pre and post process treatments	$100.00				**$100.00**
	Meeting to establish the official definition of gross deforestation and deforestation to be used in REDD+ Strategy context.	$5.00				**$5.00**
Evaluation of the PPSA as a mechanism for the control of deforestation	Identify the most efficient PSA schemes on deforestation and degradation	$10.00				**$10.00**
	Evaluation of the cost of opportunity of the land under different conditions	$10.00				**$10.00**
	Determine the dynamics and causes of degradation and regeneration	$10.00				**$10.00**
	Determine the financial and environmental viability of agroforestry systems.	$10.00				$10.00
	Total	**$145.00**	**$0.00**	**$0.00**	**$0.00**	**$145.00**
Other to be identified		$10.00				$10.00
FCPF		**$135.00**	**$0.00**	**$0.00**	**$0.00**	**$135.00**

2b. REDD Strategy Options

Strategic options for REDD

The purpose of the REDD+ Strategy is to develop a set of policies and programs to address drivers of deforestation and/or forest degradation as identified in component 2a, in order to reduce the emissions caused by deforestation and forest degradation, promote conservation, sustainable management and enhancement of forest carbon stocks within the context and in support of national sustainable development strategies.

Costa Rica has accumulated more than 15 years of experience in the successful implementation of positive incentives to avoid deforestation and enhance carbon stocks. However, the country has not been able to obtain proper and fair reward for its early, current and future mitigation efforts. Consequently, the expectations of the country relating to the potential benefits from REDD+ are quite high. Not all efforts are related with this strategy. The maturity of the PPSA program commands that Costa Rica does not only focus on the reduction of deforestation, but also the locking in of past successes, namely the conservation of existing forest carbon stock. The reduction of gross deforestation could become very costly where forestry activities are competing with highly profitable alternative land uses. To increase the attractiveness of forest activities and conservation, Costa Rica seeks to establish incentives for environmental services, tourism and sustainable production of goods.

To achieve effective conservation, it is essential to reward services of the standing forest, such as those related to high biodiversity and social value forests (e.g. in indigenous reserves). This would neutralize incentives to clear the forest and Costa Rica could be a front-runner in establishing an expanded PES program.

Costa Rica operates a Program to Establish (and Maintain) a Land Registry to improve legal certainty on land rights. The Registry aims at encouraging public and prívate investments in Costa Rica. The Program is made of three components, the second of which supports the implementation of actions to identify, prevent and resolve conflicts in the ownership and use of lands in special lands. This component currently operates in 15 of Costa Rica's indigenous territories, collecting information relating ot land tenure and land use.

To date, there are (1) pictures at a scale of 1:5000 of the majority of territories; (2) cartographic restorations at a scale of 1:5000; and (3) preliminary cadastral mosaics and identification of occupants and non-indigenous owners. *(DEBERIA ENUMERAR CADA UNO)*

In addition, the Program will analyze registries to support development associations *(WOULD BE CAPITALIZED IF LEGAL ENTITIES)* **in the process of recuperating and reassigning lands in cases where inscriptions are declared void.**

Given the opportunities and obstacles identified for the implementation of the REDD+ strategy in Costa Rica (See Tabla 18 in Annex 2b), the REDD+ Strategy sets out the following 7 lines of action. Following the descriptions, these actions are analyzed in tables 6 and 7 according to how they address drivers of deforestation and the opportunity they offer to improve carbon stock or conservation.

1. Increase funding for National Parks and Biological Reserves in the REDD+ Strategy. National parks and biological reserves are currently recovering forest cover, especially in Guanacaste, a region which helped capture 22% (12,325 Gg of CO_2) of the total carbon sequestered by the PPSA between 2000-2005. However some expropriated owners of private lands that have been included into national parks have not yet been compensated. The system is inadequately funded, barely guarded and is threatened by squatters, hunters, illegal loggers and miners.

To ensure that this recovery of forestry in National Parks continues, the SINAC must improve surveillance capacities, border controls and prevent forest fires. Compensating land owners is also important. The budget is estimated at 18 USD million per year between 2010 and 2030, which according to GFAP-FUNDECOR (2010), is particularly high since it includes funding for compensation and new acquisition of land.

FONAFIFO must integrate carbon sequestration projects in the REDD+ strategy. Projects such as the PAP (National Proposal for territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves)[11] can partially fund SINAC to create capacities for generating and selling of carbon credits generated in National Parks and Biological Reserves.

2. Continue reducing the rate of deforestation in regenerated and old growth or ancient forests. If the rate of deforestation observed during the period 2000-2005 in old growth and secondary forests were reduced by half, the natural regeneration in the private forest outside of Guanacaste would double and triple in indigenous reservations. It is estimated that the country would be able to capture an additional 139,125 Gg of CO_2 for the 2010-2030 period. To achieve this, the REDD Strategy will pursue the following approaches:

- ***Maintain the coverage of the payment for environmental services program:*** The success of policies, laws and programs is not absolute, however at the current rate, if existing policies were maintained (particularly the extent of participation in the current payment for environmental services program), it is estimated that the country would be able to capture an additional 61,924 Gg of CO_2 during 2010-2030 (see Figura 11 in Annex 2b).
- ***Extend the coverage of the PSA***: According to preliminary estimates made using the econometric model mentioned in component 2a (Equation 5), in order to reduce the deforestation rate in old-growth forests to half of the 2000-2005 period, FONAFIFO must increase the coverage of the PPSA to 113,000 ha of old growth forests. This increase should be adjusted every five years to keep the appropriate level of coverage to reduce deforestation (see table 13 in Annex 2b). FONAFIFO must focus its program coverage on both the consolidation of the Network of Private Reserves and on high profit areas, such as those suitable for timber production forests. In this regard, FONAFIFO will need to expand the coverage of the PPSA to forests under **Sustainable Management of Natural Forests (MFSB)** (polycyclic management). This would avoid the current tension between the systems promoted by PSA directed at forest protection and the programs addressing the deficit of wood in the national market,

[11] The "National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves" is a project registered as Activities Implemented Jointly under the Pilot Phase in the UNFCCC. This project will provide protection for about 600,000 hectares (ha) within National Parks already established by Law. The objective is the financial and territorial consolidation of the National Parks and Biological Reserves in Costa Rica. The acronym for this project is PAP, which stands for Protected Area Project

which has led to cutting plantations at a faster pace than the wood technically available. It also encourages forest degradation and tree felling in pastures.

- ***PPSA to maintain regeneration and management of secondary forests:*** Retention of natural regeneration can be improved through positive incentives such as PSA or combinations of PSA and management of secondary forest for wood production, especially in those areas of high land profitability. Costa Rica has nearly 220 thousand hectares of secondary forest of an average age of 15 years located on private lands (FAO, 2008). Most of these forests are owned by small landowners who usually live in rural areas. According to preliminary estimates made using the econometric model mentioned in component 2a (Equation 5), to reduce the deforestation rate in regenerated forests to half of th observed in the 2000-2005 period, in addition to the current effort in the PPSA program, FONAFIFO must offer positive incentives to the owners of at least 20,000 haof regenerated areas. SINAC should also develop clear guidelines for **Sustainable Management of Secondary Forests** by land owners, and FONAFIFO should establish the positive incentives needed to support the responsible management and minimization of risk of land-use change in areas that have regained forest cover.

3. Increase carbon sequestration through inducing regeneration, establishing forest plantations, and promoting wood consumption.

- ***PPSA for regeneration and reforestation:*** It is estimated that 724,000 ha of the 937,000 ha that are used for agriculture but are designated as forest category land could be regenerated or reforested. Over 650,000 ha with forest capabilities are currently under agricultural use in private lands. Promoting regeneration and reforestation is possible through positive incentives such as the PPSA. FONAFIFO should make available additional incentives above the current level in the PPSA for a total of 8,500 ha per year for the private owners of this lands, to induce the regeneration and establishment of forest plantations. Both the regeneration and retention must be focused on land whose opportunity cost implies that the PSA is more cost effective than the alternative land use (e.g. lands that are suitable for afforestation, Indigenous Territories and Protected Wilderness Areas of Private Domain.

  Even though **Agroforestry Systems** have significant capacity to improve carbon stocks and agricultural activity is the second largest emitter of GHG in the country, it is necessary to evaluate how appropriate it is to include these systems in the REDD+ strategy. This because the monitoring of the enhancement of stocks in the agroforestry systems is more complex and expensive than the monitoring of enhanced forest carbon stocks. The financial and environmental profitability of the agroforestry systems must be determined prior to their inclusion in the REDD+ strategy.

- ***Promotion of the production and consumption of sustainable wood from natural primary and secondary forests and reforestation:*** Forest activities that favor the improvement and conservation of carbon stock include forest plantations and management of primary and secondary forests. SINAC has improved the technical aspects of natural forest management through the implementation of a digital and web-based system for the Registry of is Registry of Management Unites /Registry of Environmental Services Rights . With research funds from the state of 175 million colones over three years starting in January 2010, the academy Universidad Nacional (UNA) and the Technological Institute of Costa Rica (ITCR), are establishing reference

values per forest type for the polycyclic management of natural forests. A network of permanent parcels is being designated for monitoring the management of natural forests including the increase of carbon stocks and impacts on biological diversity. Staff of SINAC has yet to use the new system of Registry of Management Units, management plan guidelines and practice code.

The ONF should start a program to promote commercial reforestation and sustainable management of natural forests (primary and secondary) mainly targeting small owners and community managed forests in indigenous territories. It should also improve access to green markets in order to increase the income of producers of natural forest and plantation timber, via price premiums obtained for sustainably harvested timber. Likewise, it is recommended to promote programs for the improvement of productivity of the forest plantations through genetic improvement. SINAC should also eliminate administrative, technical, and legal barriers that limit the revenue obtained from the management of natural forests and forest plantations.

Alongside successful promotion of sustainable timber production, it is necessary to access local markets. To that effect, the promotion of timber use is required. Co-benefits of this policy include the increase in the storage of carbon in buildings and real estate, and a reduction in the consumption of materials with large ecologic footprints such as cement, steel, or aluminum. These construction materials consume 40% of the natural resources extracted from the planet in mining products, 17% of the world's fresh water, 40% of global energy, 50% of fossil fuels, and they generate up to 20% of solid waste. They contribute 20% of the planet's CO2 through the use of fossil fuels (Roodman and Lensen, 1996; Dimson, 1996 and Locken, 1994).

As it currently stands, there is no increase, but rather a decrease in timber use in the country. A decreasing trend in wooden homes in Costa Rica continues, standing at 30% in 1984, 10% in 2000 and less today. Some environmental groups have falsely demonized the use of timber as a cause of deforestation or degradation of the environment, claiming that deforestation in Costa Rica results from agricultural policies that convert wooded areas to agricultural uses. Increasing the consumption of sustainable wood is critical. For this, the REDD+ Strategy must finance a program led by the ONF to eliminate cultural, legal, technological, and information barriers that discourage the generalized use of timber.

4. Improve control over illegal activities that degrade and eliminate forest cover.

- ***Strengthen SINAC's efforts to control illegal logging and forest fires:*** Legality of forestry production depends mainly on a process of transparent and reliable documentation of the activity. The current system of documentation is unreliable, does not prevent double counting, and has no controls to ensure full documentation and the quality of the information. (Spatial information is insufficient, as is the recording of the volume or species involved in trading). The current documentation system, Continuous Improvement System (SEMEC), is inefficient, time consuming and provides no useful information for decision-making in the SINAC. The current control system requiring presentation of documents and labels does not prevent the transport

of illegal timber. It also fails to cross check documents and labels against approved permits.

SINAC must develop a digital system that allows quick field checks for control, chain of custody procedures, and the creation of task reports. Such a system should consider consumption and industrialization, be centralized in SINAC, available on the internet and properly integrated with CIAgro and FONFAFIFO (particularly the geographical data). Obstacles for implementation of the system are: a) need to increase SINAC staff capacity to use digital systems and b) improvement of SINAC governance.

At the same time SINAC should reactivate the ECTI, strengthen the institutional presence through road raids in hot spots, and resume preventive campaigns. Likewise, the National Fire Management Strategy (ENMF) must be strengthened so it can extend its scope of action to areas beyond Protected Wilderness Areas identified as high-risk areas for forest fires.

- ***Strengthen CIAgro's enforcement capacities:*** The Government has delegated supervision of the execution of forest activities to CIAgro. This task is to be performed by the Prosecutor of the CIAgro, which is underfunded despite the fact that almost one billion colones are raised through forest taxes annually. Only a small portion of that tax revenue is assigned to the CIAgro for its enforcement activities by the Ministry of the Finance. CIAgro is currently funded by the members union (69 million colones annually) and 5.5 million colones from forest taxes (where 40 million colones are allocated annually). Even though there will be no deficit this year, in other years enforcement activities have been funded by the union's general budget. Even if the share of PSA increases there will be no improvement since responsibility also increases.

  On the other hand, tax on wood of national origin is currently under review (to stimulate national timber production) and the funding for forestry enforcement activites is not aligned with the overall policy framework. A sustainable financial scheme is required that ensures adequate control of forest activity by CIAgro. CIAgro must immediately address the lack of enforcement activities. The REDD+ Strategy should allocate human and financial resources to CIAgro on a temporary basis so it can address its lack of ordinary inspections and catch up with processing and following up on formal complaints. CIAgro should also benefit from logistics resources such as transportation, hardware and software, and a documentation system that creates information for decision making that is properly linked with other initiatives (FONAFIFO and SINAC).

5. Create new, predictable and long-term funding to finance the implementation of PPSA: The total costs of the PPSA as implemented by FONAFIFO during 2000-2005 reached little more than 94.5 million USD (19 USD million per year). Of this, 41.9 million USD were financed with public funds, 52.7 million USD with external funds and 0.3 million USD with private funds (see table 15 in Annex 2b). For this period estimated carbon sequestration was 55,808 Gg CO_2.

The annual average cost of the program, maintaining the higher level of coverage of 10% of the forest cover (observed in 2000-2005) at a cost of 64 USD/ha, sums to approximately 19 million USD per year. Unlike what happened in the period 2000-2005 where external funds were needed (8.3 million USD per year), all of this amount could be financed via 85% tax on fuels, 13% from the water tariffs and 2% by private funds (GFAP-FUNDECOR, 2010). If these

funds could be secured, it would be possible to reach a carbon sequestration target of 61,924 Gg CO_2 for the period 2010-2030. This amount is significantly less than the period 2000-2005, basically because of the aging forests.

Additional funding of 5.1 million USD per year[12] is required to induce recovery of forest cover via natural regeneration and reforestation; 2.7 million USD per year[13] is needed to retain the natural regeneration; and 7.9 million USD per year[14] to extend the coverage of the PPSA program in old growth forests. These enhancements in the PPSA program could eventually produce 139,125 Gg of additional CO2 during the 2010-2030 period. Finally, between 2010-2030, the implementation of the REDD+ Strategy through PPSA program[15] will amount to 728.7 million USD. Approximately 399 million USD could be covered by local resources derived from the tax on fuels, the water tariffs and private funds. The remaining 329.7 million should be covered by other sources.

It is critical that the REDD+ Strategy acknowledges mitigated carbon emissions from avoided deforestation and stock enhancement by both the early actions and the implementation of new and expanded REDD+ Strategies (including afforestation and conservation).

At the same time FONAFIFO is required to increase the percentage of private funds capitalizing the PPSA program (2%), by improving current initiatives such as the *Ecomarkets* II project, the certificate of environmental services[16] (CSA), the biodiversity fund or resuming emissions reductions through avoided deforestation programs such as CARFIX[17] and Pax Natura[18]. It should also take advantage of the opportunities of the declaration of Carbon Neutrality made by the country to promote the development of local and global environmental service markets, among which the forest sector constitutes the supplier with the lowest cost and highest co-benefits.

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[12] In estimating this amount it is assumed that 50% coverage recovery will be induced through a 128 USD per Ha PSA, which is double what is currently paid to old growth forests, since it is likely that the opportunity cost of these lands is greater. The remaining 50% coverage recovery is assumed to be achieved with a reforestation program at a cost of 1000 USD per Ha.

[13] Regeneration retention will be induced through a 128 USD per Ha PSA, which is double what is currently paid to old growth forests, since it is likely that the opportunity cost of these lands is greater.

[14] Since current demand in PPSA program is more than twice than PSA offer it is expected to keep the PSA cost at $64 per ha.

[15] These amounts do not consider management, transaction or monitoring of carbon rights costs.

[16] With the certificates of environmental services, the FONAFIFO captures funding of businesses and institutions that benefit from environmental services (local, and international) to give back to forest owners for keeping them.

[17] Project CARFIX is a forestry project located in central Costa Rica registered as Activities Implemented Jointly under the Pilot Phase in the UNFCCC. This project aims to stabilize the existing natural forest and create additional forest cover in the Central Volcanic Conservation Area (ACCVC), which constitutes a 290,187-hectare (Ha) buffer zone surrounding the World Biosphere Reserve of Braulio Carrillo National Park. The greenhouse gas (GHG) benefits of the project accrue from conservation of existing carbon stocks and increased carbon sequestration on 108,265 Ha of forest land.

[18] The Rainforest Alliance has validated that Pax Natura Foundation's Programmatic Project for the Payment for Environmental Services Mitigation of Greenhouse Gas Emissions through Avoided Deforestation of Tropical Rainforests on Privately-owned Lands in High Conservation Value Areas of Costa Rica Central Volcanic Range Conservation Area, Cartago y Limón, Costa Rica' is in compliance with Climate, Community and Biodiversity Project Design Standards, First Edition, May 2005 at the Gold level of approval. The project payment period is planned for ten years beginning in 2009. The project area may include up to 12,000 hectares, although the full extent depends on the voluntary enrollment of land owners in the project.

All this requires the strengthening of FONAFIFO's resource management capacity to meet the challenge of getting the funding required to implement the REDD+ strategy in an articulated manner with other relevant entities.

National risks of leakage caused by the REDD+ Strategy options: The risk of leakage resulting from the implementation of the REDD+ Strategy is expected to be insignificant. This finding is based on four main reasons: a) the REDD+ Strategy applies nationwide, b) the PPSA program does not consider the purchase of land, c) owners are voluntarily recruited into the PPSA program, and d) the PPSA program will discourage illegal logging through the promotion of production and consumption of sustainable timber from natural primary and secondary forests as well as from reforested lands.

Although in the REDD+ strategy some activities propose that owners who voluntarily join the PPSA program replace overused pastureland with regenerated or forested areas, keeping the forest will have to be a better business than its alternate use in order to maximize owner earnings. In any case, if the owner is driven by the demand of agricultural products and decides to migrate and cut down a new forest (in addition to benefitting from the PSA), he would need to find unoccupied forest land (without an owner) to transform to pasture, for example. This is an unlikely situation as in Costa Rica nearly all forest outside of national parks and biological reserves has already been claimed or has an owner.

The owner's next option would be to invade an area, with all the legal implications such behavior implies. This has little chance of success given the protection of private property provided by the State of Costa Rica through land tenure legislation. Another option would be to invade a National Park or Biological Reserve. Such a situation has not yet been reported thanks to the effective possession by the State of these absolute protection areas. The landowner would have the final option of reclaiming land through the Institute for Agrarian Development (IDA) where he would doubtfully be awarded a new estate since he already owns at least one other property (the one subject to PSA). Thus he would become a beneficiary only if irregular procedures were followed. Regulations of the IDA today do not allow land-use change, nor does it award forest lands. If lands are owned by the IDA they are considered as part of the natural heritage of the State.

7. Sustainability and integration with policies and strategies in other sectors. The country has a legal and institutional platform operating at the international, regional and national level that has been developed over the last twenty years in response to international organizations, conventions, and protocols that have developed an international framework for engaging in climate change mitigation and adaptation. This has positioned climate change amongst the highest political concerns in the country as witnessed in the National Development Plan, Presidential Initiative Peace with Nature, the Governing Council agreement of 1 August 2007 (Ugalde, et al, 2009), and the national climate change strategy. The PPSA program addressing avoided deforestation is an integral part of the Government's national strategy on climate change in both mitigation and adaptation as described below:

- **Mitigation:** the PPSA program has a dominant role in reducing emissions from deforestation. According to INCAE Business School (2010), 58% of the total reductions needed to reduce emissions to the 1990 level by 2021 can be achieved by the forestry sector with PPSA through avoided deforestation, promotion and maintenance of regeneration (6,856 Gg of CO_2).
- **Adaptation:** GFAP-FUNDECOR (2010) Consulting Group identifies the PPSA program as an adaptation measure for the conservation of biodiversity and the provision of goods and services of terrestrial ecosystems to climate change. According to the IMN (2000),

very humid tropical and dry tropical ecosystems around the country will be seriously affected, as well as ecosystems located in the altitudinal basal or tropical floor. The PPSA is particularly relevant in connecting the network of biological corridors and therefore protected areas, and in mobilizing species and ecosystems resulting from changes in temperature and rainfall regimes associated with climate change.

The Country's Declaration of Carbon Neutrality integrates national development policies and plans, and singles out the participation of the forestry sector as fundamental to achieving the goal of becoming emissions neutral by 2021. The REDD+ Strategy as tool that integrates the retention of carbon, the displacement of products with a high carbon footprint, the increase in use of timber, the sustainable management of the forest, the increase in carbon stocks and a greater provision of raw material for the forestry industry makes the REDD+ Strategy a central policy in the transition to a low carbon economy in the short, medium and long term.

Costa Rica's recent change in Government policies includes plans for the next four years to no longer promote the development of open sky mining or oil exploration and to fully support payment for environmental services and REDD+. Table 2.1 shows how the REDD+ strategy would be affected by different development sectors in the country.i.1i.1

Table 2.1: Economic Sectors that could impact Costa Rica's REDD+ Strategy

Economic sector	National Expansion Plans	Policies and Strategies by Sector
Transport	According to the Government Plan and national development plans it is expected that the country's forest coverage will not be affected	New road networks that could affect the forest cover of the country are not expected. Instead transport planning is focused on reducing travel costs and times, both for merchandise and people, which has leads to important improvements of the population's quality of life, especially that of the working class, the country's competitiveness, urban development, and a responsible management of the environment. Likewise, they focus on the development of collective public transportation systems.
Energy	According to the Government Plan, the national development plans and the electrical expansion plan, some impact on coverage is expected	The country's electric expansion plan foresees the increase in the ICE's capacity in 1,400 MW during the next decade. This requires the development and putting into operation of the Pirrís Toro III, Las Pailas Geothermic, Garabito, Reventazón, and Diquis projects, all of which could impact forest cover in different parts of the country. The Central American interconnection system will require the elimination of forest cover.
Agriculture	According to the Government Plan and the national development plans there could be impact on the coverage despite the prohibition of land-use change, which must be kept in mind, to strengthen the governance mechanisms	The country does not have an agricultural expansion plan. However, the new government is proposing the "Creation of a National Agricultural and Rural Development Strategy for the 2010-2020 period", which seeks to support producers in reaching export markets that could require more areas for the production of crops. Therefore, the land revenue element becomes a threat to forest cover in areas where land use is not currently forest.
Industry	The development plans for industries are not expected to affect coverage due to this government's commitment to the environment; however, tourism and real estate industry are important in the governance processes	Use change prohibition should be sufficient to avoid a negative impact, but because of the effects of land profit, the tourism industry is a constant threat in the areas of greater tourism, such as Costa Rica's Pacific coast.

Table 2.2: Link between proposed activities and specific causes of deforestation, by Land Use Strata in Costa Rica

Cause of deforestation and degradation of the forests	Strategic Option	"Readiness Plan" Line of Action
National Parks and Biological Reserves		
Inadequate supervision of National Parks and Biological Reserves with regard to the threat of squatters, illegal wood traders, hunters, and miners.	Contribute to the financing of the supervision of National Parks and Biological Reserves	Update, recertification and sale of the PAP (National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves)
	Contribute to the budget for the purchase of land expropriated in National Parks.	
	Improve supervision, border control and prevent forest fires in National Parks and Biological Reserves	Provide financial support to the National Fire Management Strategy of the SINAC
Indigenous Reserves		
Lack of competitiveness of forest use in comparison to the alternate use	Maintain the PPSA coverage in indigenous territories	Adapt the PPSA to the possession reality of indigenous territories
	Adapt sustainable forest management of primary forests to the reality of indigenous territories	Support the SINAC through the Sustainability Commission for the establishment of the principles and criteria for natural forest management by indigenous communities.
Squatters titling land irregularly within indigenous territories	Coordinate and support the Initiative for the Official Registration and Regularization of Special Lands including indigenous territories[19]	

[19] The project for the Official Registration and Regularization of Lands has the human and financial resources necessary to face this problem. The REDD+ Strategy, through the Secretary, will offer the necessary coordination and support for an effective implementation of this initiative.

Protected Wild Areas		
Slow and expensive process for the titling of lands in ASP	Authorize Sustainable Forest Management for the holders of natural forests	Support the SINAC in the implementation process of Sustainable Forest Management in holders of ASP forests of private property, when allowed by law (Forest Reserves, Wildlife Refuges)
	Facilitate access to the different modalities of positive incentive to the holders of forests in ASP	Design the legal architecture necessary to offer access to the owners of forests to positive incentives
	Finish the purchase process of lands in ASP	Update, recertification and sale of the PAP (National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves)
Privately Owned Forests		
Lack of competitiveness of forest use in comparison to alternate uses	Maintain the coverage of the Program of Payment for Environmental Services	Workshops with high government officials to maintain the REDD+ agenda at the highest level
	Promotion of Sustainable Forest Management for secondary and primary forests	Program for the promotion of commercial reforestation and sustainable management of natural forests (primary and secondary) led by the ONF.
	Promotion of the consumption of sustainable wood from natural primary and secondary forests, as well as reforestation	Program for the elimination of cultural, legal, technological, and educational barriers that discourage the massive use of wood, led by the ONF.
Imbalance between Protection/Production in the Forest Sector Policies that decrease the competitiveness of forest activities in comparison with alternative uses Over-regulation and administrative ban on sustainable forest management in the case of natural	Expand the coverage of the PSA to the Sustainable Forest Management of primary forests (Polycyclic Management) and secondary forests (Monocyclic Management)	Design of the PPSA for the management of natural forests (primary and secondary)
	Definition and adoption of clear guidelines for the management and handling of secondary forests by the SINAC	Support the SINAC through the Sustainability Commission in the definition and formalization of clear guidelines for the management and handling of secondary forests.

primary and secondary forests. Early liquidation and inadequate replacement of forest plantations		
Weakness of the State in the implementation of mechanisms for the control of illegal logging	Strengthen the supervising role of CIAgro	Establish a sustainable financial scheme that guarantees adequate supervision of forest activities by the CIAgro and the SINAC
		Provide the CIAgro with the logistics necessary become current in routine inspections and tend to, process, and follow-up on complaints
	Strengthen SINAC's role in controlling illegal logging	Development of the digital forest information system for quick field level verification of the control, custody chain, and preparation of work reports of the SINAC
		Reactivation of the Strategy for the Control of Illegal Logging by the SINAC, in order to reinforce institutional presence through road raids at hot spots

Table 2.3: Link between the proposed activity and the opportunity to improve carbon stock or conservation (REDD+) for each Land Use Stratum in Costa Rica

Opportunity to improve the carbon stock or conservation	Strategic Option	Line of Action for the "Readiness Plan"
National Parks and Biological Reserves		
Up to 2005, National Parks and Biological Reserves protect a carbon stock of 191,289 Gg of CO2, and through coverage recovery 12,325 Gg of CO2 were captured during the 2000-2005 period	Improve the control of fires in National Parks and Biological Reserves	Offer financial support to the National Fire Management Strategy of the SINAC within a national fire control plan
	Request resources for the maintenance and improvement of the carbon stock in National Parks and Biological Reserves in order to finance the purchase of expropriated lands	Update, recertification and sale of the PAP (National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves)
Protected Wild Areas		
Up to 2005, Protected Wild Areas house a carbon stock of 160,684 Gg of CO2, and 10,177 Gg of CO2 were captured through forest cover recovery during the 2000-2005 period.	Request resources for the maintenance and enhancement of the carbon stock in National Parks and Biological Reserves in order to finance the purchase of expropriated lands	Update, recertification and sale of the PAP (National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves)
Lower opportunity cost of the land without forest	Focus the incentive on regeneration on protected wild areas	Design of the PPSA to induce and maintenance of regeneration
	Improve the control of fires in National Parks and Biological Reserves	Expand the coverage of the National Fire Management Strategy of the SINAC within a national fire control plan

Indigenous Reserves		
Lower opportunity cost of the land without forest	Focus the incentive on regeneration in deforested indigenous territories	Adjust the PPSA to the possession reality of indigenous territories
Up to 2005, Indigenous Reserves protect a carbon stock of 85,495 Gg of CO2. 2,439 Gg of CO2 were captured through coverage recovery during the 2000-2005 period.	Request funds for the maintenance and improvement of the carbon stock in Indigenous Reserves	Update, recertification and sale of the PAP (National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves)
Privately Owned Forests		
The conservation of biodiversity of National Parks and Biological Reserves depends on the conservation of buffer areas	Expand the coverage of the PSA to consolidate the Biological Corridors (GRUAS II) and the network of private reserves	Design of the PPSA to incentivize and maintain regeneration
	Improve the control of fires in Private Forests	Expand the coverage of the National Fire Management Strategy of the SINAC within a national fire control plan
It is estimated that there are more than 650,000 ha of privately owned lands with forest use capacity being directed to agricultural use (over use).	Offer positive incentives to induce regeneration and establishment of forest plantations to owners of properties with forest aptitudes that are in conflict of use	Design of the PPSA to incentivize and maintain regeneration

Table 2.4: Summary of Activities and Strategy Budget

Main activity	Sub-activity	Estimated cost (in thousands of US$)				
		2011	2012	2013	2014	Total
Integrate capture of carbon from National Parks and Biological Reserves to the REDD+ Strategy	Update the certification of PAP (National Proposal for Territorial and Financial Consolidation of Costa Rican National Parks and Biological Reserves)		$100.00			**$100.00**
Further reduce the deforestation rate in regenerated and old-growth or ancient forests	Design the legal architecture necessary to offer access to the positive incentives by owners of private forests	$10.00				**$10.00**
	Design the PPSA to incentivize and maintain regeneration	$50.00				**$50.00**
	PPSA design for natural (primary and secondary) forest management	$50.00				**$50.00**
	PPSA design for indigenous territories	$50.00				**$50.00**
Create new, predictable, and long-term funds to finance the implementation of the REDD+ strategy	Estimate of the reduction of emissions due to deforestation attributable to Early Actions	$25.00				**$25.00**
	Design of subnational avoided deforestation projects	$75.00	$75.00			**$150.00**
	Certification of existing subnational avoided deforestation projects	$75.00	$75.00			**$150.00**

Table 2.4 Summary of Activities and Strategy Budget (Continued)

Main activity	Sub-activity	Estimated cost (in thousands of US$)				
		2011	2012	2013	2014	Total
Improve control of illegal activities that degrade and eliminate the forest cover	Develop the digital forestry information system for quick field checking of control, chain of custody and preparation of SINAC's work report.		$100.00	$100.00		**$200.00**
	Reactivation of SINAC's Strategy for the Control of Illegal logging in order to reinforce institutional presence through road operatives in hot spots	$25.00	$25.00	$25.00	$25.00	**$100.00**
	Establishment of a sustainable financial scheme that guarantees proper surveillance of forestry activities by CIAgro and SINAC	$15.00	$15.00			**$30.00**
	Provide the CIAgro with the necessary logistics for resolving the gap in routine inspections and updating attention, procedures and demand follow-up	$75.00	$75.00	$75.00	$75.00	**$300.00**
	Offer financial support to the SINAC's fire control strategy	$10.00	$5.00	$5.00	$5.00	**$25.00**

Table 2.4: Summary of Activities and Strategy Budget (Continued)

Main activity	Sub-activity	Estimated cost (in thousands of US$)				
		2011	2012	2013	2014	Total
Foster the production and consumption of sustainable wood coming from natural primary and secondary forests and reforestation	Support the SINAC through the Sustainability Commission by defining and making official clear guidelines for the management and handling of secondary forests.	$10.00				**$10.00**
	Support the SINAC in the implementation process of Sustainable Forest Management by forest owners in privately owned ASPs where legislation allows it(Forest Reserves, Wildlife Refuges)	$10.00				**$10.00**
	Support the SINAC through Sustainability Commission for the establishment of the principles and criteria for the management of natural forests by indigenous communities.	$10.00				**$10.00**
	Foster program for commercial reforestation and sustainable natural (primary and secondary) forest management guided by the ONF.	$20.00	$20.00	$20.00	$20.00	**$80.00**
	Program for improving productivity of forestry plantations through genetic improvement directed by FONAFIFO	$50.00	$50.00	$50.00	$50.00	**$200.00**
	Program for the elimination of cultural, legal, technological and training barriers that discourage massive use of wood, guided by the ONF.	$60.00	$60.00	$60.00	$60.00	**$240.00**
Total		**$620.00**	**$600.00**	**$335.00**	**$235.00**	**$1,790.00**
College of Forestry Engineers		$10.00	$10.00	$10.00	$10.00	**$40.00**
Government		$5.00	$5.00	$5.00	$5.00	**$20.00**
Ecomarkets		$15.00	$15.00	$15.00	$15.00	**$60.00**
Other to be identified				$90.00	$90.00	**$180.00**
FCPF		**$590.00**	**$570.00**	**$215.00**	**$115.00**	**$1,490.00**

Note: The amounts indicated are additional to that invested on a yearly basis by the Government of Costa Rica in the budgets of the SINAC for the Control and Management of forests and the FONAFIFO for the Program for the Payment of Environmental Services.

2c. REDD Implementation Framework

REDD+ Implementation Framework

Costa Rica currently implements its REDD+ activities through a basic, although functional, implementation framework made of institutional, economic, legal and governance components. The existing framework will be compatible with any REDD+ criteria under an eventual UNFCCC REDD+ mechanism. Although no major institutional and governance reforms are required, the need to create a Fraud Control Unit and a Registry of Environmental Service Rights, are two additional elements identified as necessary alongside other instruments to guarantee transparency, accountability and equity. Emission reduction transactions based on forest carbon stock enhancements and avoided deforestation will further strengthen the REDD+ implementation framework and to solid independent monitoring, evaluation and reporting mechanisms.

Ownership of Carbon Rights: Ownership of environmental services generated by forests or plantations is considered an "asset" or "good" belonging to the owner of the land where the benefit is achieved. Despite its innovative features, which makes classification in terms of the traditional definition of goods difficult (articles 253 and subsequent ones of the Civil Code), its nature as item of value or "asset" generally accepted. The property right vested in the environmental services is the basis for the payment that the forest owner may eventually receive through mechanisms such as the PPSA.

Emission reductions and removals are rights derived from the ownership of the forest ("fruits") and therefore belong to the owner of the forest.[20] The asset becomes an economic factor that assigns value to a specific environmental service provided (through mitigation, water protection, protection of biodiversity, or protection of ecosystems).

Consequently, being the owner of the land and owner of the carbon, emission reductions and removals on public lands belong to the State. In indigenous territories, they belong to the indigenous community and in privately owned land to the individual owner. Likewise, the owner may assign his/her carbon rights to a third party. Therefore, carbon rights bought by FONAFIFO belong to the State, since they were acquired with public funds, and FONAFIFO, in turn, may commercialize such rights at its convenience according to the current legal framework.

Under the PPSA, the State's payment is offered as a compensation for the conservation or adherence of a land manager to the objective sought by Law 7575. Said compensation does not pay for a specific environmental service, since they are not considered individually for that payment. Where the State (through FONAFIFO) has in fact paid for the environmental service further assignment of the carbon rights by the forest owner to a third party would result in double counting and is therefore not permissible.

[20] See the doctrine of Constitutional Room resolution N° 546-90 at fourteen hours and thirty minutes of May the twenty second, nineteen ninety, concerning what it has indicated about the rights derived from forest ownership.

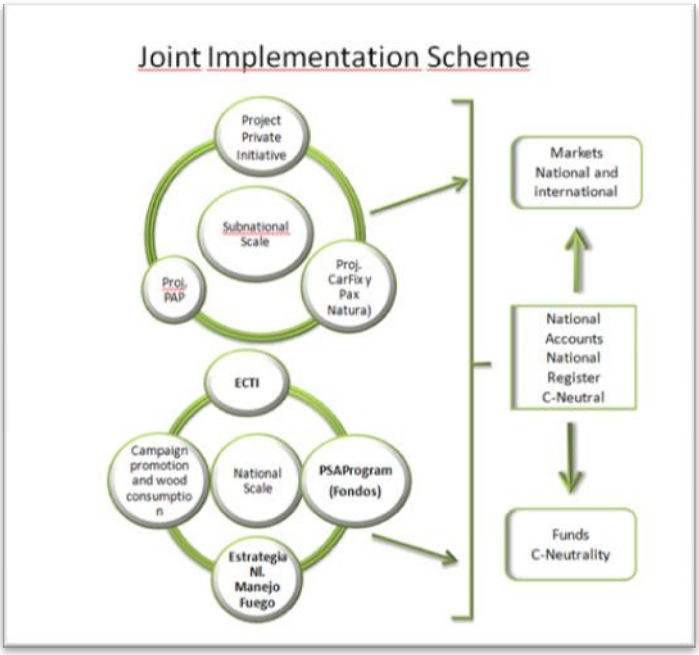
Given that the owner of the land and the forest is the owner of the emission reduction rights, it is important to clarify the possession and ownership of lands in areas of public domain (JAPDEVA, IDA), as well as to promote the regularization of the land titles in indigenous territories. This would avoid that those in possession of the land but without land title are excluded from REDD+ benefits.

Parties authorized to participate in emission-reduction transactions: The environmental service provided by a forest or plantation, and, consequently, the ownership of the resulting fruits and benefits, belongs to its owner. This is a right that can be exercised through different legal forms or procedures granted by the national legal system. Therefore, if carbon is considered an asset like any other, any person, whether natural or legal, is capable of participating in national and international emission reduction transactions. If the State is one of the parties, such transactions are regulated by Public Law. If both parties are private, the transaction is governed by private contract law. In both situations, whether the transaction is national or international, there are no special commercial regulations that exist for other goods (such as agricultural). Such absence of control (a carbon registry) may promote fraudulent sales of carbon rights and should be regulated through dedicated measures devised as part of the REDD+ Strategy.

Government role in the REDD+ Strategy: Building on the experience of FONAFIFO as in the implementation the PPSA program, the main role of the government in the REDD+ Strategy is to act as intermediary between the suppliers and consumers of environmental services. The Government's capacity to finance and execute the program at a national level provides the necessary economy of scale for reducing the transaction costs and enhancing the program's impact. Government management maximizes the PPSA program co-benefits associated to the avoided deforestation. Additionally, the requirement to comply with public administration regulations provides safety and transparency to the REDD+ Strategy. Finally, the Government will execute control functions to avoid the fraudulent sale of carbon rights, especially in those initiatives that are not subject to FONAFIFO administration, in order to maintain the credibility of GHG emissions reductions generated by avoided deforestation.

REDD+ benefit distribution: REDD earnings would be generated through two types of initiatives:

- ***Initiatives administered by FONAFIFO:*** Such initiatives include the PPSA program, in which emission reductions are assigned to FONAFIFO; sub-national avoided deforestation projects administered by FONAFIFO (such as Pax Natura); and stock enhancement initiatives in public-domain land (such as national parks and biological reserves). In each one of such projects, negotiated benefit-sharing arrangements exist. In the case of the PPSA program, FONAFIFO operates as an intermediary, purchasing the emission reduction at a specific local market price from the



owner of the land, in order to try to sell it in the different markets at a value higher than the production cost (the State takes the market risk). As for REDD+ revenues, in this particular case FONAFIFO is a public institution without a profit motive, and its earnings are re-invested in the different deforestation reduction programs. Its administration is subject to technical and financial audits.

- ***Private administration initiatives***: Private REDD+initiatives include projects in which, through private emission-reduction agreements, forest owners providing environmental services would market emission reductions directly, without the intermediation of FONAFIFO. In such cases, intermediaries may secure REDD+ profits and engage in speculation. Although precautions are taken in environmental service markets, the implementation of this type of initiatives is not regulated by the state, creating the possibility for fraudulent transactions of emission reduction rights, with the risk of double counting and unfair benefit sharing arrangements.

National Registry of Environmental Service Rights: In Costa Rica there is a problem of overlapping title deeds which may affect the adequate accounting of emission reductions of the REDD+. Even though the problem is being handled at the National National Property Registry [Is this a land registry?], effort will be required for clarifying the situation. A National Registry of Environmental Service Rights will be required will avoid such overlaps. It will also allow determination of the volume of stock improvements and emission reductions of the implemented initiatives determined by the MRV system (both private and administered by FONAFIFO). This will involve carbon stock and stock-change estimates on the lands of the different emission-reduction initiatives.

Finally, the links between the Registry of Environmental Service Rights and the MRV System, the Fraud Control Unit, and the different institutions of the current implementation framework for the PPSA must be clearly established. This requires inviting the two new instances to discussion and design workshops where the institutional architecture is established. They will also require financial resources necessary for their legal establishment.

Table 2.5: Summary of functions and institutions of the Costa Rica REDD+ implementation framework.

Functions	Institution or Entity	
	To Be Created	Current
• Link between the markets of environmental services, forest owners, the forest sector, implementers of the PSA, Government agencies, financial organizations, indigenous people, and Non-governmental organizations and donor organizations • Implementation of initiatives for the reduction of emissions, mainly of use of the land (REDD+ Strategy) • Intermediation between Suppliers and Buyers of Environmental Services • Commercialization of the emission reduction rights produced by the REDD+ Strategy (PPSA)		FONAFIFO
• Avoid fraudulent transactions of Environmental Service Rights • Regulate the transactions of Environmental Service rights	Fraud Control Unit	
• Maintain Official Registry of the totality of initiatives implemented in the country (both private and those administered by FONAFIFO) • Avoid double accounting of GHG emission reductions • Determine how much of the emission reduction determined by the MRV System can be claimed by each of the initiatives implemented and officially recorded in the country	National Registry of Environmental Service Rights	
• Offer technical and administrative support and supervision necessary so the forest owners can access PPSA		Private Implementers of PPSA (For example: FUNDECOR, ASIREA, CODEFORSA, Independent Forest Regents)

• Protection and control of the illegal logging of private and public forests		SINAC, MINAET, CIAgro

Table 2c: Summary of Activities and Budget of the Implementation Framework

Main activity	Sub-activity	Estimated cost (in thousands of US$)				
		2011	2012	2013	2014	Total
National Registry of Environmental Service Rights	Establishment of the National Geographic Registry of Environmental Service Rights	$100.00				**$100.00**
	Legal establishment of the Geographic Registry of Environmental Service Rights	$10.00	$10.00			**$20.00**
	Establish a position regarding the national problem of possession of the land in areas of public domain and indigenous territories	$5.00	$5.00			**$10.00**
Control Unit of Fraudulent Transactions	Establishment and validation of a transaction control unit and the regulatory framework for emission-reduction transactions through stock improvement and avoided deforestation	$10.00	$10.00			**$20.00**
	Total	**$125.00**	**$25.00**	**$0.00**	**$0.00**	**$150.00**
National Government		**$10.00**	**$10.00**			**$20.00**
FCPF		**$115.00**	**$15.00**	**$0.00**	**$0.00**	**$130.00**

2d. Social and Environmental Impacts

Social and Environmental Assessment System

SESA, the Social and Environmental Assessment System, is an assessment instrument that will be applied as ex-ante, during and ex-post the REDD+ activities to identify possible negative and positive impacts of REDD+ actions on different human populations and on the environment. It will be used to design mitigation measures for such impacts and to measure the performance and results of the REDD+ Strategy design, focusing on efficiency and efficacy, performance and results. It must be clear that this assessment does not have the legal and technical consequences of the Environmental Impact Assessment (EIA) defined by SETENA for public works such as dams, plantations, highways and housing developments.

Social and environmental risks and opportunities, specifically for indigenous peoples and local communities, should be identified and measured. Safeguards that guarantee the rights of the indigenous peoples are required. For the purpose of this document, we use the name "Indigenous Peoples and Local Communities" as accepted in the ILO 169 Agreement, an International Treaty that became a law in Costa Rica, and that holds a higher rank than the Indigenous Act itself. Such terminology is adopted by the World Bank in its Operative Policy 4.10 and in the document "REDD Legal Issues: Indigenous Peoples and Local Communities" (CIEL: 2009).

World Bank's Operative Policies concerning Indigenous Peoples (4.10) and environmental (4.01) and forest (4.36) assessment are the reference framework for this SESA proposal. The OP 4.12 will pay special attention to the restriction on the use of resources. In addition, national laws on the environment, indigenous people and forests are a mandatory frame of reference.

Below is a summary of the logical framework of the Social and Environmental Impact Assessment System presented in full in Annex 2d.

Table 2: Summary of logical framework of the Social and Environmental Impact Assessment System

OBJECTIVES	RESULTS	ACTIVITIES
1a. Social and environmental evaluation ex-ante of negative and positive impacts of REDD+ (includes the analysis of threats).	❖ The REDD+ impacts are identified and assessed based on their magnitude and relevance. ❖ Human populations and ecosystems considered vulnerable, threatened, and at risk in the REDD+ are identified	❖ Impacts are identified and assessed. ❖ Threats are analyzed.
1b. Mitigation measures are designed in a socio-environmental management plan.	❖ A management plan for the relevant impacts of REDD+ has been designed and implemented. ❖ Recommendation on the socio-environmental evaluations performed in the past on the REDD+ subject are included in the SESA.	❖ The SESA is designed and the socio-environmental management plan or SES is put into operation.
2. Carry out a social and environmental evaluation expost of the positive and negative socio-environmental impacts of the REDD+ design process	❖ An evaluation ex-post is carried out on the impacts and performance of REDD+ actions	❖ Hiring of person to undertake an expost evaluation on impacts and performance of REDD in socio-environmental matters.
3. Follow-up and perform an evaluation of the consultation and participation process	❖ Follow-up of the REDD+ consultation and participation process is carried out.	❖ A Follow-up plan is put in action.

Table 2d: Summary of Activities and Budget of the Social and Environmental Impact

Main activity	Sub-activity	Estimated cost (in thousands of US$)				
		2011	2012	2013	2014	Total
Impact identification and assessment based on internationally recognized methodologies		$25,00				$25,00
Threat analysis based on internationally recognized methodologies		$20,00				$20,00
Design of Socio-environmental Management Plan		$35,00				$35,00
Follow-up Plan		$10,00	$10,00	$10,00		$30,00
Systematization of other socio-environmental assessments		$10,00				$10,00
Ex post assessment of impact and performance of REDD++ concerning socio-environmental issues					$35,00	$35,00
Total		$100,00	$10,00	$10,00	$35,00	$155,00
Gobierno Nacional						
Otro aliado por identificar						
FCPF		$100,00	$10,00	$10,00	$35,00	$155,00

Component 3: Develop a Reference Scenario

Development of the Reference Scenario

Forest conservation and protection activities started in Costa Rica in 1977 with the adoption of the National Park System Act and the Indigenous Peoples Act. These laws included restrictions to land use change (deforestation) that were extended to all land types with the endorsement of the Forestry Law 7575 in 1996.

In addition, Costa Rica has implemented a Payment for Environmental Services Program (PPSA) since 1997, which has allowed the country to incentivize forest protection activities by private forest owners. The PPSAS currently covers approximately 598 433 ha or close to 11.7 % of the national territory, and 22.1 % of the country's forest cover by 2005. However, there is approximately 14.1% of the country outside protected areas. These land is mostly pasture land that has the capacity for afforestation and sustainable forest management. The most significant contribution of the country to the mitigation of GHG emissions through REDD+ is enhanced reforestation -and subsequent protection-of these pasture lands, an improved protection of the existing forests in the protected area system, and an improved implementation of the PPSA to protect privately owned primary and secondary forests - including forests in Indigenous Peoples Reserves. Such strategy would also reduce degradation as part of Costa Rica's REDD+ Strategy.

Several studies describe the deforestation process in Costa Rica from 1960 to the present, which can be divided into two periods. One from 1960 to 1985, where economic development based on agricultural and livestock activities was promoted, resulting in the reduction of the forest cover from 76.5% to 32%. In the second period, from 1985 to the present, the country has recovered its forest cover, which was estimated in 53% in 2005 (see Figure 6). These new forest cover includes approximately 900 000 ha of secondary forest on different stages of growth.

Despite the significant successes in reducing deforestation, the maps prepared for MINAE-FONAFIFO for the years 1997, 2000, and 2005, estimate gross deforestation of 9 100 and 23 700 hectares respectively for the 1997-2000 and 2000-2005 periods. This deforestation can be disaggregated in two components: illegal deforestation due to lack of enforcement of the current legislation, and land use change from secondary forests or forest plantations to cash crops such as pine-apple, cassava, sugarcane, etc.

The existing FONAFIFO forest cover maps for years 1997, 2000 and 2005 allow establishing a reference scenario using two options: a) calculating the carbon "stock" (in t of CO2) of a given year (for example: 2005), and b) estimating the expected forest recovery trend under the existing legal frame and status of implementation of the ESP program, in the absence of additional incentives from REDD+. Such estimates may be improved if a new forest cover map is prepared for year 2010.

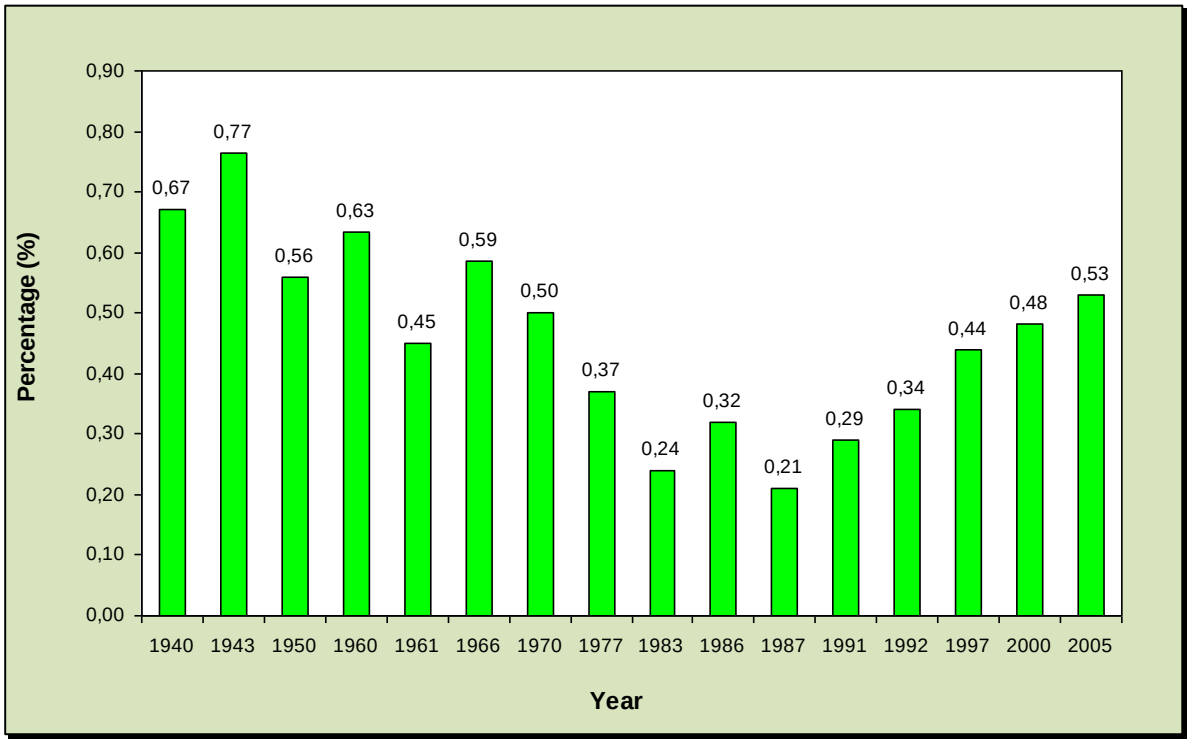


Figure 6: Forest cover in Costa Rica from 1940 to 2005

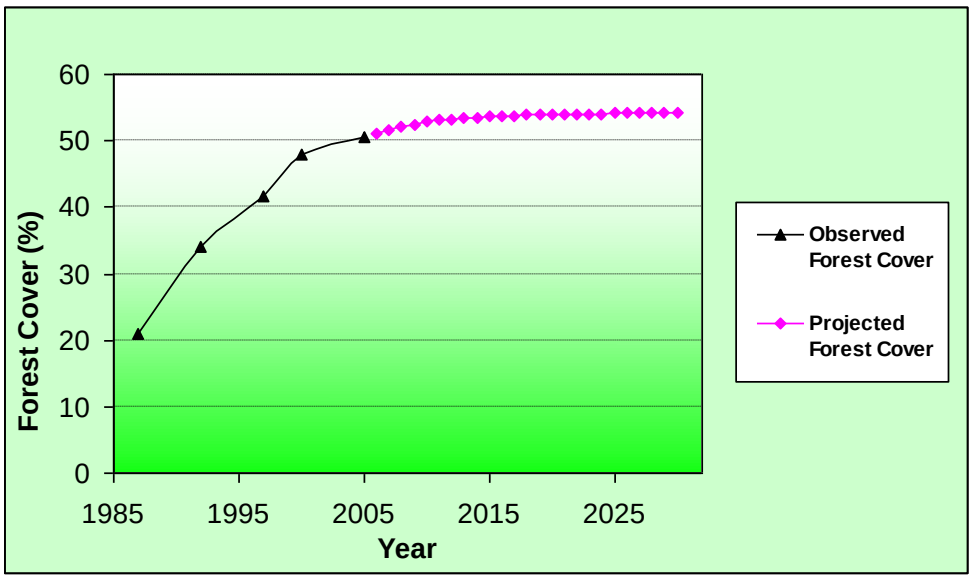


Figure 7: Measured and expected forest cover in Costa Rica without FCPF-REDD strategy.

Taking in to account only forest cover studies made after 1985, it is estimated that the recovery of the country's forest cover tends to stabilize at a value close to 55% (see Figure 7). It may be assumed that this is the maximum effectiveness of the current laws, policies and programs implemented in Costa Rica: the business as usual scenario. In order to obtain a better estimate of this baseline, the same calculation needs to be made disaggregating it by stratum according to: types of land ownership, life zone and succession status (primary, secondary, early, middle and late). In the same way, using data from Annex 3, such as average living biomass per forest type in Costa Rica (above ground and below ground biomass), and the 2005 forest cover map classified in the same forest types, it is possible to estimate the country's carbon stocks (in t CO2) for this year. This may be our carbon stock reference level for the proposed REDD strategy (see Table 3).

Assessment of options

The reference level for the REDD+ actions to be implemented by Costa Rica in its strategy may be established using two options:

- ***Based on the historical tendency of carbon stocks***
- ***Calculating the carbon stock at the reference year***

The first option is an ex-ante estimation of the carbon stocks (in t CO2) of the country for the next 20 years (to 2030), according to the historical trends of the past 10 years. It maps expected forest carbon stocks without changes to current laws, policies and programs. Once the tendency is estimated, it remains fixed for the entire duration of the strategy (until 2030). This can be done with three levels of precision (See Annex 3).

During the implementation of the REDD+ strategy, carbon stocks are re-estimated every 5 years using actual field data as described in the Measuring, Report and Verification system. The difference between the calculated stocks in the baseline or reference scenario and those estimated with the MRV are the actual emission reductions that the country achieved through the implementation of the REDD strategy. To claim early actions with this option, the rate of deforestation or forest recovery should be estimated without the effect of forest policies, laws and protection and conservation programs. This has already been carried out by different authors (Ortiz et al., 2003; Pfaff et al., 2008; and Arriagada, 2008).

In order to estimate baseline emissions with this option, five types of data are required: 1) the area observed for each type of forest, 2) the deforestation rate estimated in absence of REDD+ activities per type of forest, 3) a carbon fraction for forest type, 4) the initial above ground and below ground biomass density for each forest type, 5) and their biomass accumulation rate.

There are different methodologies for the assessment of each of these type of data, and their selection largely affects the number of emission reductions (in t C02-e) generated by the adoption of REDD+ activities. However, using the existing data, or better yet, using the 2010 coverage results, the carbon stocks (in t CO2-e) expected in the business as usual scenario as well as in the REDD+ scenario can be established.
The second option is to calculate carbon stocks (in t CO2) at a baseline year for which we may have good forest cover information where the global error is not higher than 10%, and in which the forest cover of primary, secondary, early, intermediate and late forests has been identified. With such information, a carbon fraction and the biomass density (above ground and below ground) for each forest type, the carbon stocks at the selected reference year are calculated. For Costa Rica this option may be implemented using 2000, 2005, or 2010 as the

reference year, if the cover map for 2010 can be prepared with REDD+ readiness preparation funds. The selected year will determine whether the country can claim emission reductions of early action or not. If 2005 is established as the reference year, then the country would claim the increases in carbon stocks achieved since that year; on the other hand, if 2010 is established as the year of reference, the country would in effect not be claiming any early actions.

As in the preceding case, carbon stock at a reference year may be calculated using different accuracy levels (see Annex 3). The carbon stock estimate requires three types of data: the area observed by each type of forest (a combination of ecosystem, degree of intervention, developmental status (early, middle, late) for the selected year of reference, the carbon fraction for forest type, and the living biomass density of each forest (above ground and bellow ground biomass).

During the implementation of the REDD+ strategy, the Measuring, Reporting and Verification system will estimate carbon stocks every 5 years using a new forest cover map, and existing biomass intensity data. The difference between stocks calculated at the base year and those estimated with the MRV are the actual emission reductions that the country has earned with the implementation of the REDD strategy presented to the REDD investor.

There are enough data in Costa Rica to define the reference scenario using the above mentioned options, and it can be defined using two or three levels of precision. However, the analysis of the two options shows that defining it as a carbon stock at given year of reference (for example 2005) is the best option because:

1. It may allow to claim country's early REDD+ actions,
2. It can be defined at different levels of precision,
3. It allows measuring the impact of the REDD+ strategy in reducing forest degradation,
4. The procedure is consistent since it does not require to estimate the true impact of the PPSA program,
5. It would allow using the Carbon Stock Change methodology recommended by the IPCC for estimating emission reductions.

Table 3: Estimation of the living biomass stocks (in M t of dry biomass) and of the carbon stocks (in M t of CO2) in Costa Rica for year 2005 using national forest biomass data

Life zone	Primary Forest	Secondary Forest	Mangroves	Palms	Sub-total
bs-T	14.2	1.2	0.4	0.0	15.7
bh-T	97.7	2.2	2.1	0.5	102.4
bmh-T	181.9	0.7	0.3	0.8	183.7
bh-P	54.7	2.2	2.2	0.0	59.0
bmh-P	180.7	2.1	1.8	1.7	186.4
bp-P	157.1	0.5	0.0	0.0	157.6
bh-MB	1.3	0.0	0.0	0.0	1.3
bmh-MB	23.1	0.2	0.0	0.0	23.3
bp-MB	189.3	0.2	0.0	0.0	189.5
bmh-M	0.2	0.0	0.0	0.0	0.2
bp-M	53.4	0.0	0.0	0.0	53.5
Pp-SA	0.0	0.0	0.0	0.0	0.0
Sub-total	953.5	9.3	6.7	3.0	
Total Biomass (M t b)	972.54				
Total CO_2 (M t CO_2)	1604.69[21]				

Reference Scenario Based on Development Scenarios

According to the legal framework of the reference scenario, three types of land can be identified in the country: a) Indigenous Territories, b) Protected Areas, and c) Privately-owned land.

In each of these categories land use change from forest to other uses is explicitly forbidden. On the other hand, the Soil Conservation, Management and Conservation Act proposes limitations for the overuse of soil. If the REDD+ strategy strengthens the enforcement of the existing legal framework the current forest-cover areas may be increased, since the Indigenous Act and the Forestry Law forbid deforestation. That means that progressively, land with forest land-use capacity should become covered by forests, and forests in land with agricultural or livestock land use capacity should remain, unless some kind of arrangement or compensation is provided, which is not currently clearly permitted by the existing legislation.

[21] Estimated using a carbon fraction equal to 0.45

According to this legal framework, and assuming that it will be effectively applied (and not amended) by the State, establishing the REDD+ reference level according to a development scenario is not viable since the existing laws will frame land-use planning trends.

Without REDD+, it is very likely that the trend towards an increase in forest cover witnessed since the nineties has come to an end. From now on and without any additional measures, the country will experience, at best, equivalent loss and restoration rates in different parts of the country that compensate each other. Depending on the capacity of reaction of the Government the national forest cover extension may decrease or, at best, become even more fragmented.

Assessment of Capacities

After analyzing the existing information, the conclusion reached is that Costa Rica has the capacity to establish its REDD+ reference scenario with the existing information, at detail level of tiers 1 and 2 (See Annex 3).

Existing forest carbon stocks may be estimated utilizing the 2005 forest cover map, as well as the biomass data for the different types of life zones, (see Annex 3). These carbon stocks would be the reference scenario against which to measure the adoption (intensification) of improved REDD+ policies that the country may include in the REDD+ strategy; i.e., the success of the REDD+ activities and the reduction of emissions would be assessed by measuring the increase in carbon stocks, using as reference the 2005 carbon stocks. This implies that, in the monitoring system, carbon stocks need to be re-estimated at a future date, for example in 2010, following a similar approach of using the 2010 cover map and the existing biomass intensity data.

Using the same biomass data guarantees that the effect of REDD+ policies is basically the effect of the increase in forest cover, and/or the improvement of the forest types (i.e., secondary forest that have improved their structure in terms of tree size and number of trees). It is important to note that a methodology for estimating biomass as a function of variables such as basal area (m^2/ha), average height and number of trees should be defined, and this methodology should continue to be consistently applied in different monitoring years. The change in the stocks will consist, then, of the emission reductions, and these may only be due to: changes in area for every type of forest, and/or b) changes in forest structure, therefore capturing the effect of the actions for preventing forest degradation.

The amount of emissions can be calculated ex-ante utilizing an expected deforestation rate under "without REDD+ strategy" conditions, versus a hypothetical rate under the REDD+ alternative. Ex-post reductions of actual emissions are calculated with the monitoring system, which consists basically of monitoring or calculating forest cover according to types of forests. For example, 5000 sampling points throughout the entire country: from these 5000 points, what is the percentage that is in a) No Forest, b) Natural forest, c) Plantations, etc.

The following table describes how the aforementioned information is obtained under the proposed option.

$$CO_2 = \frac{44}{12} FC \sum_{i=1}^{k} \sum_{j=1}^{n} B_{i,j}$$	CO2: Carbon stock in the country FC: Carbon fraction Bi,j: Biomass in life zone i of successional stage j
$$\Delta CO_2 = \frac{44}{12} FC(B_f - B_0)$$	ΔCO2: Change in carbón stock in country Bf: Total biomass at end of period B0: Total biomass in the country at beginning of period
$$B_f - B_0 = \sum_{i=1}^{k} \sum_{j=1}^{n} (a_{ijf} b_{ijf}) + \sum_{i=1}^{n} r_i b_{r_i} - \sum_{i=1}^{k} \sum_{j=1}^{n} (a_{ij0} b_{ij0})$$ $$B_f - B_0 = \sum_{i=1}^{k} \sum_{j=1}^{n} (a_{ijf} b_{ijf} - a_{ij0} b_{ij0}) + \sum_{i=1}^{n} r_i b_{r_i}$$	ai,j,f: Area of forest cover in life zone i, successional stage j, present at end of period. bi,j: Per ha biomass in life zone i, succesional stage j. ai,j,0: Forest area in life zone i, succesional stage j at beginning of the period. bi,j,0: Per ha biomass in life zone i, succesional stage j at beginning of the period. ri: Regenerated forest from other uses in life zone i. bri: Biomass of regenerated forest per ha in life zone i
$$a_{ijf} = d_{ij} + a_{ij0}$$ $$g_{ij} = b_{ijf} - b_{ij0}$$ $$B_{ijf} - B_{ij0} = a_{ijf} b_{ijf} - a_{ij0} b_{ij0}$$ $$B_{ijf} - B_{ij0} = d_{ij} b_{ijf} + g_{ij} a_{ij0}$$	$d_{i,j}$: gross deforstation in life zone i, successional stage j. $g_{i,j}$: change in biomass per ha in life zone i, successional stage j.
$$B_f - B_0 = \sum_{i=1}^{k} \sum_{j=1}^{n} (d_{ij} b_{ijf}) + \sum_{i=1}^{k} \sum_{j=1}^{n} (g_{ij0}\ a_{ij0}) + \sum_{i=1}^{n} r_i b_{r_i}$$ $$E_d = \frac{44}{12} FC \sum_{i=1}^{k} \sum_{j=1}^{n} (d_{ij} b_{ijf}); E_g = \frac{44}{12} FC \sum_{i=1}^{k} \sum_{j=1}^{n} (g_{ij0}\ a_{ij0})$$	E_d: Emissions from deforestation E_g: Emissions degradation E_r: Improvements in carbon stock.

$$E_r = \frac{44}{12} FC \sum_{i=1}^{n} r_i b_{r_i}$$	

Deforestation and Degradation:

The methodological approach allows disaggregating the change in carbon stock in terms of emissions from deforestation, degradation and carbon stock enhancements. The carbon-stock change will be calculated according to the following formula:

$$\Delta CO_2 = \frac{44}{12} FC \left[\sum_{i=1}^{k} \sum_{j=1}^{n} \left(a_{ijf} b_{ijf} - a_{ij0} b_{ij0} \right) + \sum_{i=1}^{n} r_i b_{r_i} \right]$$

Equation 7[22]

Where the forested area in life zone i of successaional stage j present at the end of period ($a_{i,j,f}$),can be expressed in terms of the gross loss of forest ($d_{i,j}$) and the forest area in life zone i of successional stage j, at the beginning of period ($a_{i,j,0}$):$\boldsymbol{a_{ijf} = d_{ij} + a_{ij0}}$. And the change in biomass per hectare in life zone *i* of successional stage *j* (g_{ij}), is expressed as $\boldsymbol{g_{ij} = b_{ijf} - b_{ij0}}$.

Thus the carbon-stock change of the country can be disaggregated as follows:

$$\Delta CO_2 = \frac{44}{12} FC \left[\sum_{i=1}^{k} \sum_{j=1}^{n} \left(d_{ij} b_{ijf} \right) + \sum_{i=1}^{k} \sum_{j=1}^{n} \left(g_{ij0}\, a_{ij0} \right) + \sum_{i=1}^{n} r_i b_{r_i} \right]$$

Equation 8

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[22] $a_{i,j,f}$: Área de bosque en la zona de vida i del estado sucesional j, que sigue presente al final del periodo

$b_{i,j}$: biomasa por ha de la zona de vida i del estado sucesional j.

$a_{i,j,0}$: Área de bosque en la zona de vida i del estado sucesional j, al inicio del periodo

$b_{i,j,0}$: biomasa por ha de la zona de vida i del estado sucesional j, al inicio del periodo.

r_i: bosque regenerado a partir de otro uso en la zona de vida i.

b_{ri}: biomasa por ha del bosque regenerado en la zona de vida i.

Where the emissions from deforestation (E_d) can be estimated using $E_d = \frac{44}{12} FC \sum_{i=1}^{k} \sum_{j=1}^{n} (d_{ij} b_{ijf})$. The Emissions from degradation (E_g) can be estimated as $E_g = \frac{44}{12} FC \sum_{i=1}^{k} \sum_{j=1}^{n} (g_{ij0}\ a_{ij0})$ and the improvement in carbon stock (E_r) is estimated as $E_r = \frac{44}{12} FC \sum_{i=1}^{n} r_i b_{r_i}$.

Of the four alternatives presented, only option 1 fails to provide the information necessary to identify the carbon-stoch changes in terms of emissions from deforestation, degradation and stock enhancements.

The three remaining options require estimates of the total area, and their respective average biomass per hectare, both at the beginning of the period and the end, for each life zone and successional stage of forest in the country. The same is true for the forest regeneration from other uses and average biomass for each life zone.

Table 4: Hypothetical matrix of forest area per life zone i and the successional stage j, to be used in calculating carbon stock via the stock difference approach.

	ZV_1	ZV_2	ZV_{n-1}	ZV_n
ES_1	$a_{1,1}$	$a_{2,1}$	$a_{n-1,1}$	$a_{n,1}$
ES_2	$a_{1,2}$	$a_{2,2}$	$a_{n-1,2}$	$a_{n,2}$
ES_{k-1}	$a_{1,k-1}$	$a_{2,k-1}$	$a_{n-1,k-1}$	$a_{n,k-1}$
ES_k	$a_{1,k}$	$a_{2,k}$	$a_{n-1,k}$	$a_{n,k}$

Table 5: Hypothetical matrix of biomass per ha per life zone i and the successional stage j, to be used in calculating carbon stock via the stock difference approach.

	ZV_1	ZV_2	ZV_{n-1}	ZV_n
ES_1	$b_{1,1}$	$b_{2,1}$	$b_{n-1,1}$	$b_{n,1}$
ES_2	$b_{1,2}$	$b_{2,2}$	$b_{n-1,2}$	$b_{n,2}$
ES_{k-1}	$b_{1,k-1}$	$b_{2,k-1}$	$b_{n-1,k-1}$	$b_{n,k-1}$
ES_k	$b_{1,k}$	$b_{2,k}$	$b_{n-1,k}$	$b_{n,k}$

The quantity of emissions can be calculated *ex-ante* with an expected deforestation rate in the "without REDD strategy" (BAU) scenario, versus a hypothetical rate under the "with REDD strategy" alternative. The *ex-post* reductions in real emissions are calculated using the MRV system, which consists of monitoring or calculating forest cover across forest types. For example, 5000 sample plots are defined in the country and the percentage of plots in non-forest areas, natural forest areas and plantations, etc are then calculated.

Additional data and capacities

There are three strategic definitions that have to be elaborated further:

1. How to handle stocks that already have been recovered? Protection of stocks has a maintenance cost, and on the other hand, achieving further stock increase has an additional cost. One possibility is to address these stocks as a bank account. If the current account is estimated at 1 522 M t of CO2, this may be increased through improved or expanded REDD+ actions. In order to be able to finance such activities, additional financing, other than the one provided by the PPSA, will be required.This should come from financially recognizing earlier conservation efforts by Costa Rica.

2. The mechanism and institutional alliances performed by FONAFIFO for the preparation of the 2010 forest cover map should continue to be used from now on. These alliances should be established in a formal and consistent manner so that this map can continue to be made with the same methodology used in the preparation of the 2005 map.

3. More monitoring plots should be established using the Permanent Plot Network, although following a sampling design to generate information for detail levels 2 and 3 (See Annex 3).

4. A framework agreement or letter of intent should be negotiated with the Permanent Plot Network in order to use the existing plots and obtain better above and below ground biomass estimates per life zone and succession status to improve the biomass estimates presented on Annex 3.

5. It is necessary to locally determine mechanisms to control and combat any possible increase of deforestation or forest degradation in some areas of the country due to the implementation of the REDD+ strategy or any other climate change policies. This effect may be defined as an domestic leakage or slippage according to old carbon sequestration literature.

Availability of Technical Assistance

There is prior experience for preparing REDD projects such as the PAP Project and the CARFIX Project. In a similar way, there is experience in preparing equations for estimating biomass per tree and per area unit. On the other hand, the country has accumulated an experience for over 12 years in the implementation of market mechanisms, such as the PESP, as a tool of positive incentives for controlling deforestation and forest degradation. Such experience may be extended to other participants of the FCPF

Collaboration with Local and International Crganizations

Cover estimates for 2010 need to be improved using a standardized methodology. Options for preparing this map include the use of sensors, such as ASTER, or the Chinese-Brazilian sensor. There is no work experience with such sensors, and it would be necessary to establish alliances with China and Brazil, both for obtaining access to the images in their sensor and for

training Costa Rican personnel in their use, in order to adapt the methodology used in the 2000 and 2005 land-use maps.

Benefits of preparing sub-national reference scenarios

Preparing sub-national reference scenarios is not considered necessary due to the size and the political situation of the country.

Regional reference scenario

Preparing the regional reference scenario has not been considered under the assumption that policy and legal framework of the Central American region does not apply for Costa Rica. Also, there is already enough data for estimating the reference scenario using levels 1 or 2 (See Annex 3).

3: Summary of Activities and Budget of the Reference Scenario

Main activity	Sub-activity	Estimated cost (in thousands of US$)				
		2010	2011	2012	2013	Total
2010 Forest Cover Map	Workshop: definitions and scope	$3,00				$3,00
	Elaboration of Forest Cover Maps using Spot imagery (resolution 10x10)	$200,00	$114,00			$314,00
	Field verification		$20,00			$20,00
Establishment and re-measuring of PPM for complementing biomass data per Life Zone	Workshop for standardization of norms and biomass estimates	$5,00				$5,00
	Establishment and measuring of plots		$110,00	$110,00		$220,00
Biomass calculation for the existing plots of the Permanent Plot Network and Holdridge Plots	Work with Holdridge Plots	$10,00				$10,00
	Work with existing plots from the Plot Network	$10,00				$10,00
Identification of causes and control measures of "internal leakage"	Update of "illegal deforestation" study and control measures	$40,00				$40,00
	Workshops (4) for validation and identification of control measures	$12,00				$12,00
Forest cover and carbon stock change projection using detailed biomass data and the 2010 forest cover map.	Estimation of deforestation rates by forest types		$5,00			$5,00
	Update biomass intensity by forest types using Network and Holdridge Plots		$3,00			$3,00
Total		$280,00	$252,00	$110,00		$642,00
Government		$30,00				$30,00
Ecomarkets		$10,00				$10,00
Other funder, to be identified		$134,74	$134,74			$269,47
FCPF		$105,27	$117,27	$110,00		$332,53

Component 4: Design a Monitoring System

Designing a System for Monitoring, Reporting and Verification

The MRV system must monitor the a) changes in the carbon stocks compared to the reference level, b) the implementation of the REDD+ Strategy as it was designed, and c) the co-benefits due to the REDD+. Monitoring the changes in the carbon stocks requires three types of data: a) an updated map of forest cover as of the date of the calculation carbon stocks; b) the biomass intensities by forest type in the map, and; c) the carbon fraction per biomass unit by forest type. This means that a standard methodology is needed for the elaboration of the forest cover map, which must be the same as that used on the maps that set the reference level of Costa Rica's REDD+ efforts. The reference map is to be thereafter updated at each monitoring event, and the carbon fraction and biomass intensities per type of forest cover type may be fixed or vary from those used in the calculation of the baseline. This indicates that the estimate of the "carbon stocks" (in t CO_2) during the implementation of the REDD+ Strategy can be done in several ways, this chapter evaluates the possible options and offers guidelines for monitoring the REDD+ Strategy implementation.

Monitoring and Calculation of Emission Reductions (Ex-post Estimations)

To calculate ex-post reductions in emissions, a method based on the calculation of the difference in carbon stocks (Carbon Stock Change Method) must be used. This method allows the estimation of changes in stocks for any "pool" or sink. However, we recommend the design of a monitoring system to measured the changes in the living biomass, that is, above ground and below ground biomass.

Options for Monitoring Carbon Stock Changes (Carbon Stock Change Method)

Option 1. Set the carbon fraction and biomass intensities by forest type for the entire crediting period when setting the baseline (reference level), i.e. those presented in Tabla 23 Annex 3. These data are used to calculate the carbon stocks in different monitoring events. With this option, on successive occasions a new land coverage map is needed to estimate the area for each forest type defined in the baseline (see Tabla 22 on Annex 3). The carbon stock at each monitoring event is equal to the area by forest type, multiplied by the biomass intensity per forest type, and the carbon fraction fixed at the setting of the baseline emissions. The credits generated are the difference between carbon stocks between two successive monitoring times. If the biomass intensities vary by forest type or carbon fraction, the carbon stocks in the baseline should be recalculated (i.e. the one presented in Tabla 24 of Annex 3), as well as those calculated in monitoring events prior to the change, in order to calculate emission reductions consistently. **Option 2.** The second option does not set the biomass intensities by forest type or the carbon fraction, but uses rather preliminary information available at before the participation in a REDD+ mechanism and the implementation of the REDD+ Strategy to establish the baseline.

Then as part of the strategy implementation, more data should be collected to refine the initial estimates of biomass intensities and for the carbon fraction by forest type. This is accomplished by establishing permanent plots in different forest types, by improving existing allometric equations (Ortiz, 1997; Cascante and Gonzalez, 2008; Fonseca, 2009) for biomass

per tree, as well as developing new methodologies[23] for easier estimation of above ground biomass using both stand variables (number of trees, height and basal area), or spectral reflectance values from permanent plots.

During a monitoring event every five years, areas by forest type identified in the baseline (life zone, ecosystems and successional stage) are calculated, and the new biomass data for forest type is used to calculate carbon stocks. Whenever there is a change in methodology for estimating biomass intensities by forest type or in the carbon fraction values, these are applied to the calculation of carbon stocks of previous monitoring events, including the baseline for carbon stocks.

Option 3. The third option is a continuous forest inventory with fixed area plots. This monitoring system calculates carbon stocks at each monitoring event using temporary sample plots. At each event, a vegetation map has to be prepared to calculate the area of each forest type defined in the baseline. Then, using this map, fixed area plots are established in each forest type where the species, diameter and height are measured for each tree in the plot, and then it is calculated per plot, the volume, basal area, total biomass, diameter medium, medium height, etc. The average biomass and carbon fraction by forest type are calculated, and then total carbon stocks are calculated by multiplying the estimated area for each forest type.

This needs to be repeated every five years, no permanent plots are used to streamline the monitoring system, and the difference in stocks every five years with respect to the baseline are the emission reduction credits resulting from the implementation of the REDD strategy. If during the implementation of the strategy, the allometric equations of biomass per tree or per area unit are improved, the carbon stocks from previous monitoring events should be recalculated, as well as the stocks from the baseline.

Option 4. The fourth option relies on a continuous forest inventory with variable area plots (point-sampling). This option requires the preparation of a map of forest cover at each monitoring event and calculates the total area. Initially, there is no need to distinguish forest types and successional stage in this map, since area by forest type can be estimated ex-post. On this map sampling points (1000 to 2000) are set systematically, then each point is visited, the type of forest is evaluated and the biomass per hectare is calculated for the corresponding point using allometric equations per tree or per existing area units. This type of sampling enables calculation of the proportion of points for each forest type which multiplied by the total forest area coverage on the map and adding, gives an estimate of the total carbon stock, and its variance, sampling error, etc. If during the implementation of the strategy, the allometric equations of biomass per tree or per area unit are improved, the carbon stocks from previous monitoring events should be recalculated, as well as the stocks from the baseline.

Assessing Options

The options presented above can be evaluated using five criteria: cost of preparing a forest cover map; cost of measurements in the field; effectiveness in assessing deforestation; effectiveness in assessing forest degradation, and; added value and national participation.

[23] Cascante and González (2008), or Fonseca (2009).

The first two criteria are self-explanatory and evaluate costs arising from the use of each option. For options 1, 2 and 3 it is required to prepare a detailed map of forest cover by forest type, whereas in option 4 only a forest cover map is required, with no need for identifying forest types. Sampling points are established in the field, and biomass is evaluated using measurements with variable area plots (point sampling), these data can then be used to classify the initial coverage map with more detail, if necessary. For this reason, Option 4 has the highest score in relation to preparation costs for the map (see Tabla 29 on Annex 4). With regard to the costs of field work, the options with lower costs and therefore higher scores are 1 and 2, as they are not field labor-intensive, while options 3 and 4 are highly expensive, although comparing options 3 and 4, the latter has the lowest cost.

All options are suitable to assess deforestation for which they have the same score, however, options 1 and 2 are not effective for assessing degradation as they depend on whether the methodology for preparing the forest cover map is capable of identifying degraded forests, which is difficult to perform using remote sensors with medium resolution (10x10 or 30x30), unless in addition to these, others with higher spatial resolution (1x1, 2.4 x 2.4) are used to estimate the coverage of primary forest and the percentages of degraded forest. On the other hand, options 3 and 4 are capable of assessing forest degradation, since these directly estimate biomass in the field for each forest type, and allow in-field identification of degraded forests.

Finally, the criterion of "value added and national participation" assesses the development of national capacity and participation of different actors in each option. Option 1 has the lowest value, as it does not generate national experience or allow broad participation of different actors in comparison to the other options. The options which provide for greater participation and generation of added value for the country are options 3 and 4, because both options allow the country to launch a national forest inventory system, which involves the participation of various domestic actors, and generates the most detailed information of biomass, volume, basal area, etc. for different forest types in the country.

Carbon Fraction Securities available for Costa Rica

The default carbon fraction recommended by the IPCC is 0.5 (2003 IPCC-Good Practice Guidance for Land Use, Land - Use Change and Forestry Chapter 3.2). However, in the case of Costa Rica, Cubero and Rojas (1999) found that for the reforestation of different species in Costa Rica the carbon fraction is 0.45. However, given that REDD+ is related to the conservation of natural forests, with a highly diverse composition of tree species, and with species with higher wood density than the species used by Cubero and Rojas, it is necessary to include the calculation of the carbon fraction for different forest types into the MRV system. The methodology for these calculations was described in detail by Cubero and Rojas (1999).

Monitoring Land Cover and Forest Cover Changes

The monitoring of land use and land-use change is intended to estimate the areas by forest type, to collect the information required to calculate the carbon "stock" (in t CO_2) during a monitoring event, and to monitor the REDD+ Strategy's effectiveness, identifying areas of recovery and loss of forest, to allow adjustments in the activities of the REDD+ Strategy. The area calculations for each forest type are more efficiently done by using remote sensing, and for purposes of consistency in the calculations of areas by forest type in different years, a similar methodology should be used during each monitoring event.

The forest cover map must that includes the same forest types identified in the baseline and uses the methodology of the baseline map will be prepared. Costa Rica has been using a similar methodology to prepare forest cover maps since 1997, which has yielded consistent data coverage. For future monitoring events the methodology used to prepare the map of 2005, proposed by Sanchez-Azofeifa et al (2005) should be used. Since images generated by Landsat may not be available in the future, satellite images from ASTER, SPOT, or other with similar features of spatial and spectral resolution should be used, but following the same methodology, including forest types or cover, and using the field testing methods proposed by Sanchez-Azofeifa et al (2005).

The unprocessed images used in the preparation of the coverage map in a monitoring event should be stored in a secure site and with backups in several institutions. If the methods for elaborating coverage maps are changed, without that a change of the type of sensor would be involved, the previous coverage map should be replaced and the methodology should be re-written to ensure that future monitoring is done using the new methodology.

Biomass Intensities by Forest Type

The calculation of biomass intensities by forest type requires a combination of establishing fixed area or variable area plots in different forest types (as discussed in the section **Options for monitoring the changes in the carbon "stock"**), as well as allometric models to estimate biomass per tree or per hectare. It is also possible to relate the biomass data in these plots to their spectral responses measured through remote sensing. As noted above, to detect changes in biomass resulting from forest degradation, field data is required which can be evaluated with high spatial and spectral resolution remote sensing. In Costa Rica there are already allometric models to estimate biomass by tree for different species of very humid and tropical humid forests including an equation for palms (Ortiz, 1989; Ortiz, 1997; Restrepo et al., 2003; Segura and Kanninen, 2005; Fonseca, 2009).

On the other hand, the preparation of allometric models has already started for estimating aboveground biomass per hectare using stand variables such as basal area (m2/ha), average height and average diameter (Cascante and Gonzalez, 2008; Fonseca, 2009; Ortiz et al., 2010). However, both the allometric equations by tree, as well as the allometrics by area unit have been prepared for very humid and tropical humid forests, and not for forests in the lower montane and montane altitudinal levels. Consequently the strategy to follow is to prepare allometric equations for aboveground biomass for species of the latter forest types, and then prepare allometric equations per area unit, and finally using remote sensing models for estimating aboveground biomass in a less expensive way. Protocols for developing biomass equations by tree have been prepared and those used by Ortiz can be used (1989).

The equations presented in Annex 4 are an example of equations systems that will be prepared. The equations in Table 26 require tree diameters and heights, however, height is a variable that is not always easy to measure, and for some plots they have not been measured. The equations in table 27 provide estimates of total tree height in terms of diameter, so they can be used integrated or combined with those on table 26.

After calculating the biomass per plot the equations can be used to develop allometric models to estimate biomass per hectare (see Figure 8 in Annex 4) in terms of basal area (in m^2/ha). Once these latest models of biomass per unit area have been obtained, it is possible to calculate biomass using temporary sample plots where the basal area is measured using either fixed area plots or variable area plots (point sampling). The total biomass, i.e. living biomass above the soil plus underground living biomass is obtained by multiplying the first by one plus the soil biomass-to-above ground biomass ratio or (1+R/S), where R/S is the "Root/Shoot"

Ratio. Values of R/S can be calculated for each forest type; however there are global application values like those shown in Tabla 32 of the Annex 4.

Monitoring of the Baseline

The baseline (reference level) is not monitored. Once established by the country it is fixed in terms of projected deforestation rate or areas by coverage type for the reference year. However, emission reductions (in t CO2e) must be calculated using a consistent methodology that is aligned with that used in establishing the baseline during the given accreditation period. If changes are made, especially in the definition of forest types, the biomass intensities or the carbon fraction by forest type, the baseline should be re-calculated using the new methodology.

Monitoring of Leakage

The baseline to be selected by Costa Rica should be national instead of sub-national as other countries have proposed in the context of current REDD+ negotiations at UNFCCC. By adopting a national baseline, the country is not obliged to monitor leakage.

Monitoring the Implementation of the REDD+ Strategy

The rationale for monitoring the implementation of the REDD+ Strategy is to record the activities that are executed as part of the Strategy, to monitor whether they are being implemented as planned, and assess whether they are leading to the expected results. With this background information the strategy can then be corrected in its implementation as well as its design. The monitoring of the implementation involves three sub-activities: 1) To prepare the logical framework for the Strategy; 2) To compile progress reports for each objective, goal and activity identified in the logical framework of the strategy, including environmental and social impacts, and; 3) To evaluate the results in order to correct the implementation and design as required.

The logical framework is the heart of the implementation and monitoring system of the strategy. It should be summarized in the form of a logical framework matrix (LFM) which is formulated as a four by five table (see example in Table 33 on Annex 4). Its columns will display the Narrative Summary of Objectives and Activities, Objectively Verifiable Indicators, Means of Verification and Assumptions. Its rows must show the Goal, Purpose, the Components-Products, the Activities, and the per-activity budget. The columns of indicators and means of verification are thus the key elements to monitor the implementation of the strategy. The column of indicators should specify the indicators for assessing the strategy defined for each the quantity, quality and compliance time. The column means of verification defines how the indicator is assessed, and who is responsible for preparing the reports.

The REDD+ Strategy proposed by Costa Rica, includes four major components to be monitored and must appear as main components in the LFM of the strategy: 1) Recovery, expansion and protection of forests in Protected Wildlife Areas, 2) Recovery, expansion and protection of forests on private land, 3) Recovery, expansion and protection of forests on indigenous territories, and 4) Control and combat of forest fires.

Reporting and Verification of Emission Reductions

Emission reductions will be measured using Option 3 or Option 4 described above. The emission reductions can then be reported through a format based on the contents described in Annex 4. For emissions reduction estimates at different times to be comparable among each other and with the baseline, section 3.1 of the report should include a map of vegetation cover, and a table like Tabla 22 on Annex 3. Also, tables should be elaborated

similar to those in Annex 3, which should respectively appear in sections 3.1 and 3.2 of the monitoring and verification of emission reductions report.

Because Costa Rica already has a standard methodology for preparing the vegetation cover map for the calculation of areas by forest type (see Sánchez-Azofeifa et al, 2005), and also because allometric equations for biomass by tree and by area unit have been developed, the monitoring and reporting system can be located within Level 3 (tier 3) of the IPCC. However, the estimation of the carbon fraction by forest type should be improved, and studies to calculate the root-shoot ratio (root/shoot ratio or R/S) for different forest types should be performed.

Local Capabilities Assessment

- **National Forest Inventory**: In the evaluation of options made in Section 4.2 the conclusion was that Options 3 and 4 allow local participation and thus represent higher added value for the country. Both options require a continuous forest inventory involving greater national involvement both in its design and implementation. The country has experience in the elaboration of vegetation cover maps (1997, 2000 and 2005) and on the other hand, knowledge and experience in the establishment of forest inventory plots, and biomass estimation, and preparation of allometric equations. However, organization and financial resources are unsatisfactory. The Forestry Law 7575 establishes that the Ministry of Environment and Energy, through the State Forestry Administration (SINAC-FONAFIFO) is responsible for: "Performing the inventory and assessment of the country's forest resources, their exploitation and industrialization." However, to date the only work reported as fulfilling this mandate is the work of Kleinn et al. 2001. This was a preliminary study of a FAO-funded project, which jointly with SINAC conducted a pilot study of the forest inventory for Costa Rica. The authors used a cluster sampling. 40 clusters were selected and within each cluster 4 sampling sites with nested plots. The study's report includes a field manual, forms, etc.

  On the other hand, there are higher education institutions that have the appropriate capacity and experience for the establishment and measurement of sample plots, which have created the Forest Permanent Plots Network, whose information has not been processed and made available to the public.

- **Permanent Plots Network:** The objective of the Network is to contribute to the generation of reliable scientific information in making decisions regarding the management and conservation status of forest resources and the mitigation of climate change, delivered through continuous monitoring of permanent sample plots in natural forests (Plots Network, 2009).

  The Network has a total of 375 plots in natural forests, 29 of 0.25 ha, 345 of 1 ha (Plots Network, 2009), however, the plot location map indicates that there are four areas that require to increase plot density. These are: Nicoya Peninsula, Central Pacific, El General Valley-Coto Brus, and Talamanca (see Annex 4). The highest density of plots is located on the Caribbean Basin, where the high density of monitored plots located in the area Sarapiqui, Heredia stand out.

Organization and Responsible Parties

Under existing law the party responsible for implementing the REDD+ strategy will be the Ministry of Environment, Energy and Telecommunications (MINAET). Within MINAET there are four entities that will implement REDD+ activities: the SINAC, FONAFIFO, the National Meteorological Institute (IMN), and the new Department of Climate Change.

The entity that conducts the monitoring should not be neutral and independent, i.e. it is not recommended that the implementing agency for the strategy be responsible for the MRV system. All activities involving monitoring, controlling, auditing, verification and evaluation should be conducted by an external third party. Traditionally the Government of Costa Rica has delegated the monitoring activities to public universities, other high level education centers, or local or international environmental NGOs. This list includes: a) the National University (UNA), the Organization of Tropical Studies (OTS), the Technological Institute of Costa Rica (ITCR), the Tropical Agricultural Research and Higher Education Center (CATIE), the University of Costa Rica (UCR), etc. These entities can create and develop the structure and capacities to perform REDD+ monitoring in accordance with a previously agreed design based on the general guidelines set forth in this report. The selection of the organization to implement the MRV system can be selected among this list using on an open selection, according to standard World Bank procurement procedures. The selected third party will implement the MRV, and prepare reports to the FCPF and the MINAET, and in order to avoid any internal pressure from local parties, it is preferable that it responds and be directly hired by the FCPF.

Table 4: Implementation Plan

Activity	Year			
	2010	2011	2012	2013
Preparation of REDD Log Frame	XXX			
Selection of the third party entity responsible for the MRV system.		XXX		
Design of the Continuous forest Inventory for carbon stock estimation		XXX		
Design of data storage system		XXX		
Reporting and communications		XXX		
Development of allometric biomass equation for lower montane and montane trees and forest.		XXX	XXXX	
Evaluation of baseline social and environmental impact of the existing PESP.	XXXX			

Participation by Civil Society in the Measurement, Reporting and Verification System in Costa Rica.

Activities	Option 1	Option 2	Option 3	Option 4
Preparation of a cover map (GIS analysis and control plot identification) Preparación de un mapa de cobertura (análisis SIG y toma de puntos de control)	• Technical Team • Equipo Técnico	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas
Field measurements of biomass by life zone and successional stage Mediciones en el campo de la biomasa por zona de vida y estado sucesional	• Not carried out • No se realizan	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas
Estimates of deforestation by life zone and successional stage Estimación de la deforestación por zona de vida y estado sucesional	• Technical Team • Equipo Técnico	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples • Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas

Evaluation of forest degradation	• Estimation not posible	• Technical Team	• Technical Team	• Technical Team
Evaluación de la degradación de bosque	• No permite su estimación	• Equipo Técnico	• Equipo Técnico	• Equipo Técnico
Workshops for validating the estimates	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples
Talleres de validación de la estimación	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas
Evaluation of social and environmental Impacts	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples	• Technical Team • Civil Society Organizations • Local Communities • Indigenous Peoples
Evaluación de impactos sociales y ambientales	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas	• Equipo Técnico • Organizaciones de la Sociedad Civil • Comunidades Locales • Pueblos Indígenas

4b. Other Impacts and Benefits

Monitoring of Environmental and Social Impacts

The monitoring of environmental impacts should be done based on activities defined in the Logical Framework Matrix of the Strategy. The Indicators and Means of Verification columns define what is to be evaluated and what means will be used to do so. To correctly evaluate these impacts it is necessary to obtain a "baseline" at the beginning of the Strategy that can be compared with the results of periodic evaluations. Costa Rica has already established procedures for an impact assessment. The procedures for assessing environmental impacts were prepared for the Ecomarkets 2 Project, and include procedures for monitoring biodiversity and impacts on water resources. Since the Ecomarkets Project has existing funds for this monitoring, it is advisable to avoid duplication of efforts and use the same scheme.

For the monitoring of social impacts, the country also has a methodology that has been implemented since 2001. It was revised in 2007 (MIDEPLAN, 2007a) and allows the calculation of Social Development Indices (SDI) per district, which are calculated based on the evaluation of four dimensions, each with different indicators (see Figure 18 on Annex4). The three dimensions that comprise the SDI are (MIDEPLAN, 2007a):

1. Economic: Participation in economic activity and benefiting of employment conditions to allow an income sufficient enough to achieve a decent standard of living.
2. Social participation: Reflected in the development of national and local civic processes so that the population develops a sense of ownership and social cohesion and with it the sense of active participation and responsibility in the duty and the right of citizens to participate.
3. Health: Aimed towards the enjoyment of a healthy, active life and an adequate quality of life for the population, this dimension monitors availability and access to formal health services networks and social security as well as proper nutrition.

Table 4: Summary of Monitoring Activities and Budget

Main Activity	Sub-Activity	Estimated Cost (in thousands)				
		2010	2011	2012	2013	Total
Decide on the most adequate monitoring option	Assessment study on MRV proposed options	$20	$20			**$40**
Preparing Logical Framework Matrix Strategy (LFM)	Workshop for the Identification and Analysis of Problems	$7				**$7**
	Workshop for the construction of the objectives tree and the LFM	$7				**$7**
Identifying and selecting responsible parties for MRV system	Workshops (two) for identification and selection of parties responsible for reporting	$4				**$4**
Detailed design of the National Forest Inventory	Preparation of the Proposal	$6				**$6**
	Consultation of the proposal	$2				**$2**
	Field tests		$20			**$20**
	Final Design		$4			**$4**
Development of biomass equations for trees and missing life-zones (Lower Alpine and Alpine Altitudinal Levels)	Calculation of carbon fraction for biomass in natural forests		$10			**$10**
	Workshop for validation of existing biomass equations and systems		$ 3			**$ 3**
	Preparation of biomass equations for trees in missing life zones		$40			**$40**
	Preparation of biomass equations for missing life zones			$20		**$20**
	Development of systems for calculating biomass using remote sensing			$50		**$50**
Baseline assessment of environmental and social impacts of the PSA Program	Preparation of methodology		$10			**$10**
	Implementation of the evaluation		$20			**$20**
	Presentation of results		$5			**$5**
Total		**$46**	**$132**	**$70**	**$0**	**$248**
National Government		$6	$9			**$15**
FCPF		**$40**	**$123**	**$70**	**$0**	**$233**

Component 5: Schedule and Budget

To complete preparation of the country to implement the REDD+ Strategy, more than 4 million USD will need to be invested during the 2011-2014 period. This amount is additional to that invested yearly by the Government of Costa Rica in the SINAC budget for the Control and Management of Forests and in the FONAFIFO budget for the Program for the Payment of Environmental Services.

Of these 4 million USD, the Government of Costa Rica through its national budget will provide 0.152 million USD and through the Ecomarkets II project another 0.220 million USD. From other allies we hope to obtain another 0.220 thousand USD. We expect to cover the remaining 3.4 million USD with FCPF funds (see Table 12). The implementation budget for the Strategic Options (component 2b) represents 44% of the total budget (see Table 13).

The timetable for the main activities is presented in Figure 6. For the elaboration of this timetable we assumed that the funds for the implementation of the Strategy would be available at the beginning of 2011. We plan to complete all institutional and legal arrangements identified in the present R-PP by mid 2014.

Table 5: Summary Budget by source of finance for executing activities presented in Costa Rica's RPP (thousands of USD).

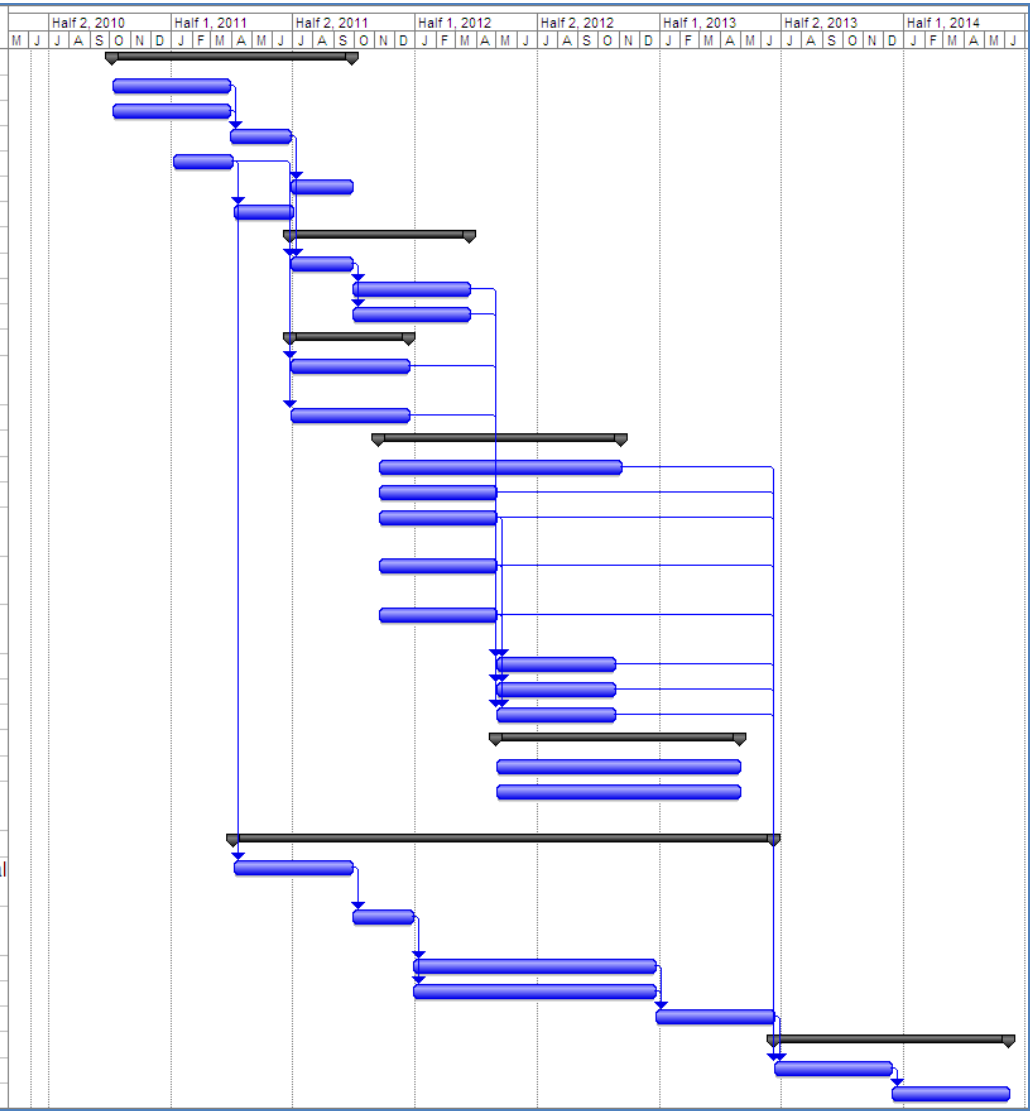
Source of Financing	2011	2012	2013	2014	Total
National Government	$76,00	$39,00	$20,00	$20,00	$155,00
Ecomarkets II	$100,00	$90,00	$15,00	$15,00	$220,00
Associations of Agricultural Engineers	$10,00	$10,00	$10,00	$10,00	$40,00
Other Allies to be Identified	$144,74	$134,74	$90,00	$90,00	$459,47
FCPF	$1.319,48	$1.153,77	$647,90	$353,74	$3.474,88
Total	**$1.650,21**	**$1.427,50**	**$782,90**	**$488,74**	**$4.349,35**

Table 6: Summary Budget by component for executing activities presented in Costa Rica's RPP (thousands of USD).

Component	2011	2012	2013	2014	Total
1a. Arrangements for the National Readiness Management	$184,21	$203,50	$202,90	$218,74	$809,35
1b. Consultations and Participation of the Actors	$150,00	$205,00	$55,00	$0,00	$410,00
2a. Evaluation of the Use of the Land, Forest Policy, and Governance	$145,00	$0,00	$0,00	$0,00	$145,00
2b. Options of the REDD Strategy	$620,00	$600,00	$335,00	$235,00	$1.790,00
2c. Implementation framework for REDD	$125,00	$25,00	$0,00	$0,00	$150,00
2d. Social and environmental impacts	$100,00	$10,00	$10,00	$35,00	$155,00
3. Develop a Reference Scenario	$280,00	$252,00	$110,00	$0,00	$642,00
4. Design of a Monitoring System	$46,00	$132,00	$70,00	$0,00	$248,00
Total	$1.650,21	$1.427,50	$782,90	$488,74	$4.349,35

Figure 6. Timetable of the main activities planned in the R-PP Costa Rica

ID	Task Name
1	**REDD Management Arrangements**
2	Creation of an Indigenous Organization
3	Appointment of the REDD+'s Board of Director's Vice president
4	Establishment of the REDD+'s Board of Directors
5	Contracting of the Secretariat's Staff
6	Establishment of an Inter Institutional Commission
7	Creation of the REDD+'s Gateway and Bulletin
8	**Consultation Process to PIR**
9	Designing of the Consultation Process
10	Consultation with PRI about the REDD+ Strategy
11	Indigenous Action Plan Implementation
12	**Soil Use Assessments**
13	Standardization and improvement of a Deforestation Determining Methodology
14	Assessment of the PPSA as Deforestation Controlling Mechanisms
15	**Strategic Options**
16	Updating, recertification and selling of PAPs
17	Development of a Forest Data Digital System for the SINAC
18	Designing of a juridical architecture required to allow forest owners accessing positive incentives
19	Implementation of a Sustainable Forest and Indigenous Reservation Management
20	Implementation of Sustainable Forest Management for Secondary Forests
21	Designing of the PPSA to induct and retain regeneration
22	Designing of the PPSA for Natural (Primary and Secondary) Forests
23	Designing of a PPSA for Indigenous Territories
24	**Implementation Framework**
25	Creation of the Fraud Control Unit for Carbon Rights Transactions
26	Establishment of the National Registry for Environmental Service Rights
27	**Monitoring, Reporting and Verification**
28	Defining of an Instance responsible for the MRV; preparation of a logical framework
29	Assessment of the Monitoring and Designing Options for the final forest inventory
30	Completion of data and creation of biomass equations
31	Preparation of forest coverage maps
32	Definition and Validation of Reference Scenarios
33	**Social and Environmental Impacts**
34	Reference Assessment of Environmental and Social Impacts
35	Designing of a Socio Environmental Management Plan



Component 6: Design a Program Monitoring and Evaluation Framework

The following component seeks to establish a framework to enable the measurement of progress and performance of the implementation of the R-PP. The objectives are to offer transparent and efficient handling of the resources, allow for introduction of corrections and improvements to the monitoring and evaluation program.

A system of indicators that will allow any evaluator to assess the progress made in the implementation of the R-PP, facilitating evaluation of the performance in R-PP implementation.

Component	Subcomponent	Product Indicators	Progress Indicators	
			Year 1	Year 2
Component 1: Organize and Consult	1a. National Readiness Management Arrangements	Integration of Indigenous Organizations	Document on legal analysis and recommendations	
		Establishment of the Board of Directors for REDD+	Minutes from the Meetings of the REDD+ Board of Directors with representation of both chairs	Minutes from the Meetings of the REDD+ Board of Directors with representation of both chairs
		REDD+ Secretariat in operation	2 Annual reports from the Executive Secretariat	2 Annual reports from the Executive Secretariat
		Consultation Process with PIR	1 annual report with minutes from meetings of PIRs summoned by groups that have affinity in subjects of interest.	1 annual report with minutes from meetings of PIRs summoned by groups that have affinity in subjects of interest.
		Inter-institutional Commission in operation	1 progress report	1 progress report
		Positioning of REDD+ at the highest level	1 Workshop	1 Workshop
		Creation of the REDD+ Webpage and Newsletter	REDD Website in operation 2 Brochures 4 Quarterly Newsletters	2 Brochures 4 Quarterly Newsletters
	1b. Stakeholder Consultation and Participation	Consultation Process	1 progress report on the consultation process	1 report on the consultation process.
		Execution of Indigenous Action Plan	Action plan designed and put into action	Execution reports

Component 2: Prepare the REDD Strategy	2a. Assessment of Land Use, Forest Policy and Governance	Standardization and methodological improvements for the determination of deforestation	1 methodology report on the use of the land	
			1 document with standards and official definition of deforestation and degradation	
		Evaluation of the PPSA as a mechanism for controlling deforestation	1 document identifying efficient PSA schemes for deforestation and degradation	
			1 document evaluating opportunity costs of national land	
			1 document on dynamics and causes of degradation	
	2b. REDD Strategy Options	REDD+ pilot projects	1 project design document for the updated Protected Areas Project	Certified Project
		Design of the PPSA for different modalities of use of the land	1 PSA document with operating rules for the induction and regeneration maintenance activities	
			1 PSA document for the handling of natural forests (primary and secondary)	
			1 PSA document for indigenous territories	
		Access of the forest owners to positive incentives	1 document defining the legal architecture for the application of incentives to	

			owners	
		Sustainable Forest Management in ASP, Indigenous Reserves, and Secondary forests defined	Document on coordination meetings and workshops with experts.	Manual on Sustainable Forest Management.
		Improved ECTI in operation	1 improvement plan	1 progress document
		Campaign promoting production and consumption of sustainable wood from natural primary and secondary forests and reforestation	1 Campaign report	Campaign report
			Report on genetic improvement in forest plantations	Report on genetic improvement in forest plantations
			Report on the elimination of barriers on the use of wood	Report on the elimination of barriers on the use of wood
		Creation of new, predictable, long-term funds to finance the REDD Strategy	1 document on Financial Strategy	1 progress report
	2c. REDD Implementation Framework	Fraud Control Unit to oversee carbon rights transactions	Design of the Fraud Control Unit	Fraud Control Unit in operation
		National Registry of Environmental Service Rights	Design of the technological platform for the National Registry of Environmental Service Rights	National Registry of Environmental Service Rights in operation
	2d. Social and Environmental Impacts.	Design and implementation of the SESA	1 report	1 report

Component 3: Develop a Reference Scenario	Definition and Validation of the Reference Scenario	Elaboration of the 2010 coverage Map	Map elaborated Report of the Workshop on definitions and scopes carried out	
		PPM System adapted to REDD	Report of the Workshop for the standardization of regulations and numbers of parcels	Document for the location and description and measurement of the parcels
Component 4: Design a Monitoring System	4.a Validation of standards and monitoring methodology	Preparation of the Matrix for the Logical Framework	Report of the Workshop on the Identification and Analysis of Problems Report of the Workshop for the construction of the objectives tree and the MML	
		Responsible for the definition and legalization of the MRV system	Reports of Workshops (two) Legalization Document	
		National Forest Inventory designed	Inventory proposal document, consulted and validated	
	4b. Other Impacts and Benefits	Baseline assessment of the social and environmental impacts of the PSA Program	Methodology Document	

Logical framework of implementation of R-PP Costa Rica with their respective verifies and products delivery dates, subject to the effectiveness of the Project (the date of entry of operation thereof)

Activities	Verifiables	Products Delivery
Arrangement for management of REDD		
Definition of Indigenous Peoples Representative	Representative Indigenous People Defined	I Semester 2011
Determination of second chair in EB REDD+	Representative of Society Actors Defined	I Semester 2011
REDD+ Executive Board establishment	Act or Minute of the Executive Board first session REDD +	I Semester 2011
Secretariat Staff Contracting	Forms of recruited staff	I Semester 2011
Interinstitucional Commission Establishment	Executive Board of REDD + Agreement designing participant institutions.	II Semester 2011
Creation of REDD + Portal and Brochure	Creation of REDD + Portal and Brochure	II Semester 2011
Positioning the highest level REDD	Workshops with high level officials	I Semester 2011
Consultation Process to RIP		
Design Consultation Process	TOR's of the Consultation Process	II Semester 2011
Strategic REDD + with PIR Consultation	Action Plan in execution	I Semester 2012
Indigenous Action Plan Implementation	Indigenous Action Plan in execution integrated with the General Action Plan.	I Semester 2012
Standardization and methodological improvements to the determination of deforestation	Deforestation and Degradation official definitions Manual.	II Semester 2011

	TOR's for standardized methodology for determining deforestation	II Semester 2011
	Identification Technical Report of PSA efficient schemes for deforestation and degradation	II Semester 2011
Evaluation of the PESP as a mechanism to control deforestation	Evaluation Technical Report of land opportunity costs at a national level	II Semester 2011
	Technical Report of dynamics and causes of degradation	II Semester 2011
Strategic Options		
Actualization, Recertification and sale of PAP	Draft Document updated and certified Protected Areas	II Semester 2012
Digital system development or forest information for SINAC	Digital Forest Information System for SINAC running.	I Semester 2012
Design the legal architecture necessary to provide access to forest owners to positive incentives	Document that formalizes the legal architecture for implementation of forest owners incentives	I Semester 2012
Implementation of Sustainable Forest Management in ASP and Indigenous Territories	Official Practices Code for the Implementation of Sustainable Forest Management in the ASP and Indigenous Territories	I Semester 2012
Implementation of Sustainable Forest Management in Secondary Forest.	Official Practices Code for the Forest Management Implementation in Secondary Forest.	I Semester 2012

PESP Design for induction and retention of regeneration	Agreement for design approval by the Executive Board of FONAFIFO. Its implementation is subject to the availability of financing for the induction of PES for the retention of regeneration.	II Semester 2012
PESP Design for natural forest management (Primary and Secondary Forest)	Agreement for design approval by the Executive Board of FONAFIFO. Its implementation is subject to the availability of financing for the natural forest management (primary and secondary)	II Semester 2012
PESP Design for Indigenous Territories.	Agreement for design approval by the Executive Board of FONAFIFO. Its implementation is subject to the availability of financing for PES for the Indigenous Territories.	II Semester 2012
Creation of fresh funds, predictable and long term to finance REDD Strategy	Financing Strategy Document	II Semester 2012
Control Strategy for Illegal Logging.	ECTI Revision and a document with the improvement proposal.	II Semester 2012
	Execution Campaign.	II Semester 2012
Campaign to promote the production and sustainable consumption of wood from primary and secondary natural forest and reforestation	Academic Programs of genetic improvement in forest plantations strengthened.	II Semester 2012
	Plan to eliminate barriers to the use of wood in execution.	II Semester 2012

Implementation Framework		
Fraud Control Unit in carbon rights trading	Fraud Control Unit in carbon rights trading implemented en the C-Neutrality Framework.	I Semester 2013
Establishment of the National Register of Environmental Services Rights.	Technology platform for the National Register of Environmental Services rights implemented in the framework of the C-Neutrality	I Semester 2013
Monitoring, Report and Verification		
Definition of the panel responsible for the MRV, and preparation of logical framework	REDD + Executive Board agreement formalizing the body responsible for the MRV.	II Semester 2011
	Logical Framework Matrix of MRV	II Semester 2011
Evaluation of options of monitoring and final inventory design.	REDD + Executive Board agreement formalizing the monitoring option and forest inventory design.	II Semester 2011
Complete data and biomass equation construction.	Technical Document formalizing the allometric equations and the reference data.	II Semester 2012
Preparation of Forest Cover Maps.	Cover maps prepared.	II Semester 2012 I Semester 2013
Definition and Validation of the baseline.	A Document formalizing the country baseline	
Social and Environmental Impacts		
Social and Environmental Evaluation System (SESA)	SESA Design and Implementation	II Semester 2011

Reference review of the environmental and social impacts.	REDD + Executive Board agreement formalizing the baseline of environmental and social impacts.	II Semester 2013
Design of Socio-Environmental Management Plan	Socio-Environmental Management Plan being implemented	I Semester 2014

Annexes

Annex 1a: National Readiness Management Arrangements

Tabla 7 Partes Interesadas Relevantes para la Estrategia REDD+

ORGANISMOS GUBERNAMENTALES	
1. FONAFIFO ❋	Su Junta Directiva está formada por actores gubernamentales y no gubernamentales como MINAET, MAG, ONF (empresa privada, CAC y ONG's) y Sistema Bancario Nacionalizado. Es un ente desconcentrado del MINAET. Es la responsable política y técnica de REDD+ y lleva el tema del financiamiento forestal, entre ellos el PSA.
2. MINAET ❋	Ministerio rector que lleva variados temas como ambiente, minas, energía y recientemente telecomunicaciones. El Ministro representa al MINAET en la JD de FONAFIFO y SINAC tiene un asiento con voz pero sin voto.
3. SINAC-MINAET ❋	Sistema de 11 áreas de conservación y tiene un estatus desconcentrado. Atiende dentro de MINAET el tema ambiental, el de bosques y de ASP. Están representados en Junta Directiva de FONAFIFO.
4. IMN ❋	Órgano adscrito al MINAET. Atiende el tema meteorológico y está relacionado con el tema de cambio climático porque llevan su registro histórico. Forman parte del grupo de trabajo de REDD+.
5. SETENA	Órgano desconcentrado de MINAET que atiende lo referente a las ESIA's. Tiene una Junta Directiva en que se representan varios sectores. Se relaciona con REDD+ porque sus protocolos contemplan la evitación de deforestación en los proyectos de desarrollo.
6. TRIBUNAL AMBIENTAL	Órgano desconcentrado de MINAET que atiende lo referente a las denuncias por delitos ambientales, entre ellos la deforestación.
7. CONAGEBIO	Ente desconcentrado de MINAET encargado de la gestión de la biodiversidad (REDD+). Tiene una Junta Directiva en que están representados varios sectores, incluyendo la Mesa Indígena, Mesa Campesina, FECON y UCAEP.
8. MINISTERIO HACIENDA ❋	Se encarga del control de la recolección de los impuestos al combustible mediante el cual se financia parte del programa de PSA. Los fondos para REDD+ pasan por el control de dicho ministerio.
9. MAG ❋	Es el ministerio rector de los sectores ganadero, pesquero, agrícola y de planificación del uso del suelo. Han incursionado en los servicios ambientales de la protección del suelo. Forman parte de la JD de FONAFIFO.
10. INTA	Órgano adscrito al MAG y se encarga de la transferencia de tecnología, la conservación y el mejoramiento fitogenético de obtenciones vegetales de cultivos nativos y exóticos (REDD+).
11. SEPSA ❋	Órgano adscrito al MAG y se encarga de la planificación del uso del suelo. Forman parte del grupo de trabajo de REDD+. Trabajan la Agenda Agroambiental con MINAET desde hace varios años.
12. SENARA	Ente semiautónomo con Junta Directiva que se encarga de los temas de agua para riego y avenamiento. Se relacionan con REDD+ porque administran la protección y uso del agua, que es uno de los servicios ambientales del PSA.
13. CNE	Institución encargada de la prevención y mitigación de emergencias por causas naturales. Se relacionan con REDD+ porque la evitación de la erosión y las inundaciones son parte de los servicios ambientales del PSA.
14. ICAA (A y A)	Institución autónoma que se encarga de los temas de acueductos y alcantarillados. Se relacionan con REDD+ porque administran cientos de acueductos y el agua es uno de los servicios ambientales del PSA. Muchos de esos acueductos urbanos y rurales tienen reservas forestales.

15. CONAI	Institución estatal establecida con el fin de coordinar la acción del Estado en los Territorios Indígenas y con los Pueblos Indígenas (Sala IV 05-6856). Tiene una asamblea formada por ADII's y otras organizaciones indígenas y una Junta Directiva. Su relación directa con REDD+ es que buena parte de los problemas de gobernanza de las ADII's que les impiden a veces accesar al PSA son provocados por recursos de revocatoria de legalidad que esta institución estatal presenta contra las ADII's.
16. MINISTERIO DE SALUD	Ministerio rector del área de salud. Mucha de la legislación ambiental aplicable de modo represivo en C.R procede de la Ley de Salud Pública, por ejemplo la que prohíbe deforestar bosques de galería.
17. INCOPESCA	Institución estatal encargada de los temas de pesca y acuicultura. Dentro de sus áreas de competencia están los estuarios, que son generalmente bosques de mangle. Se relaciona con REDD+ porque administran los estuarios y sus manglares.
18. PAZ CON LA NATURALEZA	Iniciativa política de la Casa Presidencial para coordinar sus asuntos en el tema ambiental. Trabajan el tema del cambio climático y han estado en el tema REDD+ desde el principio.
19. ICT	Institución encargada del desarrollo del turismo. La belleza escénica es uno de los servicios ambientales del PSA.
20. MOPT	Ministerio responsable de las concesiones de obras de vialidad. Se relaciona con REDD+ porque sus obras implican deforestación y reforestación.
21. IDA ❋	Institución responsable de la distribución de parcelas. Tienen bosque en muchas de las fincas y los parceleros tienen sistemas agroforestales y pequeños bosques.
22. INA	Institución encargada de fomentar la capacitación técnica. Tiene cursos en Forestales y Ambiente.
23. Procuraduría Ambiental	Ente encargado de vigilar la acción del Estado en el tema ambiental y en ello el forestal.
24. Contraloría General de la República	Ente contralor del uso de recursos públicos como el caso del PSA o de la buena administración de las ASP estatales.
25. Ministerio de Planificación❋	Ente de velar por la inclusión de la Estrategia REDD+ a los planes Nacionales de Desarrollo y su coordinación entre los mismos.
ORGANISMOS PARAESTATALES	
26. CAC's ❋	Organismos adscritos al MAG y se encargan de fomentar el desarrollo agrícola. Han sido importantes intermediarios de PSA. Se organizan en la ONF y en JUNAFORCA. Algunos tienen más de 30 años en el tema forestal.
27. ADII's ❋	Organismos adscritos a DINADECO y representan legalmente a los Territorios Indígenas y a los Pueblos Indígenas que allí viven. Son importantes dueños de bosques y oferentes de PSA. Las ADII's se relacionan directamente con FONAFIFO en el negocio de los servicios ambientales, sin intermediarios. Las ADII's del sur tienen una importante oferta de área para regeneración de pastos degradados y su conversión a bosques (proyecto identificado por FONAFIFO) (Borge: 2005).
28.COORDINADORA DE ADII'S DEL CARIBE ❋	Instancia de coordinación de las 8 ADII's bribris y cabécares del Caribe. Recibe fuerte apoyo de la Dirección Regional de Limón del M. Salud. El tema de PSA es parte del plan de trabajo ya que las 8 ADII's son dueñas de 215.000 hectáreas de bosques maduros y continuos con las casi 400.000 hectáreas de bosque de las ASP de la RBA. La RBA es el mayor bloque de bosque de Costa Rica con más de 600.000 hectáreas y que tiene continuidad con otras 600.000 hectáreas en Panamá (Borge: 2004). En la Baja Centroamérica la RBA es el mayor bloque de bosques.
29. ONF ❋	Oficina que enlaza a varios actores del sector forestal con el Estado. La mayoría de sus miembros son importantes oferentes de servicios ambientales como FUNDECOR, los CAC's, JUNAFORCA, CODEFORSA, la CCF, COECOCEIBA, CBTC, etc. Están representados en la JD de FONAFIFO.

30. SIREFOR	Iniciativa de comunicación virtual del sector forestal, que nació del PNDF, en ella confluyen MINAET, la ONF y otros organismos del sector.
31. COOPERATIVAS ❋	Organismos adscritos a INFOCOOP y algunos de ellos están en el tema de PSA, como las cooperativas cafetaleras (CoopeAgri, CoopePilangosta). Su potencial para REDD+ es muy grande en SAF de cafetales y en su misma constitución de plantación forestal de café.
32. ASADAS	Son entes adscritos al ICAA y muchos de ellos son propietarios de bosques en las cuencas en que operan sus acueductos. En Costa Rica ya hay varios bosques comunitarios que nacieron con el fin de proteger fuentes de agua (Atenas, Palmares, Hojancha, etc.).
33. ICAFE ❋	Es el instituto que lleva la agenda nacional sobre el cultivo del café. Están muy interesados en participar en REDD+ porque los une los temas del café como plantación forestal, el café en sistemas agroforestales y los servicios ambientales del café.
ORGANISMOS UNIVERSITARIOS ESTATALES	
34. UCR	Tienen varias carreras, centros e institutos de investigación ligados al tema ambiental y de bosques. Mantienen una política de opinión pública en los temas ambientales por parte de su Consejo Universitario. Son dueños de bosques en distintas partes de Costa Rica, constituidos como reservas biológicas y forestales.
35. ITCR ❋	Tienen varias carreras, centros e institutos de investigación ligados al tema ambiental, entre ellas Ingeniería Forestal y Tecnología de la Madera. Una parte de los regentes forestales se forman aquí.
36. UNA ❋	Tienen varias carreras, centros e institutos de investigación ligados al tema ambiental, entre ellas Ciencias Forestales. Mantienen una política de opinión en los temas ambientales por parte de su Consejo Universitario. Una parte de los regentes forestales se forman aquí.
37. UNED	Tienen varias carreras, centros e institutos de investigación ligados al tema ambiental.
38. ECAG	Tienen varias carreras ligadas al tema ambiental y forestal.
39. CONARE	Consejo Nacional de Rectores de universidades públicas. Es un ente que federa los intereses de las universidades y entre ellas toman decisiones con respecto al medio ambiente y los bosques.
ORGANISMOS AUTÓNOMOS ESTATALES	
40. BNCR ❋	Administra el fideicomiso del PSA.
41. ICE ❋	Es una compañía estatal eléctrica y de telecomunicaciones, la más grande de Centro América. La relación con REDD+ sería múltiple porque deforestan para construir PH y LT, reforestan las cuencas que intervienen, tienen grandes viveros forestales, contratan el mayor número de ingenieros forestales del país, dependen del servicio ambiental del agua y de la evitación de erosión.
42. CNFL ❋	Es una compañía estatal eléctrica que se relacionan con REDD+ porque deforestan para construir PH, reforestan cuencas y tienen grandes viveros. Demanda servicios ambientales como el agua y la evitación de la erosión.
43. ESPH ❋	Es una empresa aguadora y distribuidora eléctrica. Cobra factor hídrico y tiene un esquema propio de PSA desde hace varios años.
44. Programa de Registro y Catastro ❋	Es un programa del Gobierno de Costa Rica y el BID que se encarga de la regularización de la tenencia de la tierra. Se relaciona con REDD+ porque la seguridad jurídica de la tenencia de la tierra da fortaleza a REDD+. Tiene un componente ABRE que trabaja este tema con ASP y TI (Borge: 2007).
45. MNCR ❋	Tiene un Departamento de Ciencia donde se ubica el Herbario Nacional que mantiene la colección más completa de flora de CA desde hace más de 100 años. Se relaciona con REDD+ en el tema de biodiversidad y su monitoreo.

46. RECOPE ❋	Es el ente encargado de la recaudación en su fuente del impuesto a los combustibles que financia parte del actual programa de PSA.
ORGANISMOS INTERNACIONALES	
47. IICA	Es un organismo internacional que trabaja el tema de la agricultura, la ganadería, los bosques, del cambio climático y la conservación de recursos fitogenéticos de plantas nativas y sus parientes silvestres. Su relación con REDD+ es en varios temas.
48. UICN ❋	Es un organismo internacional que trabaja en conservación de la naturaleza. En Costa Rica tiene una amplia membrecía privada y estatal. Produce varios estudios sobre PSA y sobre REDD+. Apoya diversas iniciativas con Pueblos Indígenas como a ARADIKES y ADITIBRI.
49. CRUSA	Es la heredera de los programas del AID en Costa Rica. Trabaja el tema ambiental y apoya procesos de PSA.
50. TNC ❋	Es un organismo internacional donante en el tema de REDD+ y en Costa Rica apoya programas en Talamanca y Osa que han facilitado el PSA. Trabaja con Pueblos Indígenas del sudeste de Costa Rica (ADITIBRI, ADICONTE y ARADIKES). Han comprado miles de hectáreas para la conservación de bosques.
51. CI ❋	Es un organismo internacional donante en esquemas de PSA-SAF. Ha trabajado en toda la Cordillera de Talamanca y tiene un amplio bagaje en la conservación de la RBA y de Osa.
52. FAO ❋	Es un organismo internacional donante en los procesos forestales del país. Apoyó de forma determinante el PNDF. Ha apoyado diversos estudios que son fundamentales para la comprensión de la deforestación en Costa Rica. Tiene un amplio bagaje en el tema de bosques.
53. CATIE ❋	Es un organismo internacional de investigación y enseñanza que forma profesionales en los temas ambientales y forestales. Trabajan el tema de PSA, cambio climático y MDL. Desarrollaron una investigación sobre captura de carbono en cacaotales de Talamanca con apoyo del BM. En cambio climático, es una autoridad científica reconocida.
54. PNUD ❋	Es un organismo internacional que tiene el Programa de Pequeñas Donaciones que ha jugado un papel determinante en la participación de las ADII's en PSA. Han hecho estudios sobre PSA en Territorios Indígenas.
55. UNESCO	Es un organismo internacional que trabaja el tema de las Reservas de la Biósfera y en Costa Rica hay tres de ellas, todas importantes en el tema de PSA (Amistad-Talamanca, C. Volcánica Central y Zona Norte).
56. R.F.ALIANCE	Es un organismo internacional que trabaja el tema de certificación forestal como consultores.
57. CCT ❋	Es un centro de investigación con una data histórica sobre bosques de alto valor científico, como los nubosos. También son consultores en el campo ambiental. Son parte de FECON.
58. OET ❋	Es un centro de investigación con una data histórica sobre bosques de alto valor científico, como la Selva, Palo Verde y las Cruces.
60. KFW ❋	Es un organismo bancario de la Cooperación Alemana que trabaja durante varios años el tema forestal en la Zona Norte de Costa Rica. Ahora estarían donando para la continuación del MIE en CA con CICA y CICAFOC.
61. GEF	Es un fondo mundial mediante el cual se financian en COSTA RICA muchos proyectos de ordenamiento territorial, de conservación de la biodiversidad y de protección de bosques.
61. GTZ	Es un organismo que financia distintos proyectos que se relacionan con bosques y acueductos.
62. BM	Es el banco que ha financiado Ecomercados I y II y ahora este proceso REDD+.

ORGANISMOS NO GUBERNAMENTALES (ONG's)	
63. CODEFORSA ❋	Es una organización forestal con muchos años en el tema de administración de PSA, viveros, regencia, extracción e incidencia política. Operan en la región Huetar Norte. Son parte de ONF. Fue de las primeras organizaciones forestales de Costa Rica.
64. FUNDECONGO	Es una fundación con varios años en PSA en Santa Cruz, Guanacaste. Son continuación del CAC.
65. ASIREA ❋	Es una organización forestal con muchos años en el tema de administración de PSA, viveros e industria. Operan en la Región Huetar Atlántica, sobre todo en Pococí.
66. FUNDACA	Es una fundación que intermedia PSA.
67. CEDARENA ❋	Es un centro de investigación legal en el tema ambiental. Administra fincas compradas por TNC y que tienen PSA en Osa. Tienen buen conocimiento de la Península de Osa. Intermedian PSA y dan consultoría. Son parte de FECON.
68. CBTC ❋	Es una organización que administra fincas compradas por TNC y que están en PSA, intermedian PSA y hacen regencia de PSA en Territorios Indígenas. En su Junta Directiva hay representantes de algunas organizaciones indígenas y campesinas. Operan en Baja Talamanca.
69. ASOPROLA	Organización que ha incursionado en PSA SAF en café orgánico. Son parte de la Red Quercus que trabaja el tema de Responsabilidades Compartidas en la RBA Talamanca con el apoyo de TNC. Son miembros de CICAFOC.
70. ACOMUITA ❋	Es una organización de mujeres indígenas de Talamanca. Han sido la principal contraparte del CATIE y el BM en los proyectos de carbono y cacao orgánico. Operan en Alta Talamanca. Reciben también apoyo de organismos como TNC, CBTC, UICN y son miembros de CICAFOC.
71. Mujeres en Espíritu de Lucha ❋	Organización de mujeres indígenas de la zona sur que agrupa a borucas, térrabas y bribris.
72. ARADIKES ❋	Es una organización que reúne a dirigentes de los ocho Territorios Indígenas de Buenos Aires, casi todos con PSA. Reciben apoyo de PNUD, UICN y TNC. Están ayudando de forma comprometida para la incorporación de las ADII's en REDD+.
73. FUNDECOR ❋	Es una fundación que intermedia PSA, hace regencias forestales, son consultores en temas forestales, dan servicios de extracción y comercialización de madera. Operan en la Región Huetar Central y Atlántica. Son miembros de ONF. Fueron los primeros que trabajaron en PSA con FONAFIFO.
74. ASANA	Es una fundación con varios años en PSA. Opera en Osa y Pérez Zeledón.
75. COLEGIO AGRÓNOMOS ❋	Allí se agremian los regentes forestales. Son parte de la ONF.
76. CNF ❋	Es una cámara que agrupa a una buena parte de los empresarios madereros, reforestadores, dueños de bosques, industriales de la madera e importadores de madera. Han estado en el tema de PSA desde su inicio. Son miembros de la ONF.
77. INBIO ❋	Es un instituto de investigación, como consultores han trabajado diversos temas relacionados con el PSA. Hacen investigación en distintas ASP estatales de Costa Rica y apoyan su fortalecimiento. Se relacionan con REDD+ por su trabajo enfocado en biodiversidad.
78. NATURE AIR	Son demandantes o compradores de CSA.
79. EL VIEJO	Son demandantes o compradores de CSA. Tienen bosques secos de alto valor.
80. ENERGÍA GLOBAL	Son demandantes o compradores de CSA.
81. PLATANAR	Son demandantes o compradores de CSA.

82. FLORIDA	Son demandantes o compradores de CSA.
83. AGUAS ZARCAS	Son demandantes o compradores de CSA.
84. LIFE GATE	Son demandantes o compradores de CSA.
85. PAX NATURA	Son demandantes o compradores de CSA.
86. COECOCEIBA ❋	Es una organización ambientalista, forman parte de FECON y de la ONF. Son activos en el tema de cambio climático. Han participado del proceso REDD+ desde el principio y mantienen una posición crítica y de oposición.
87. FECON ❋	Es una organización ambientalista formada por decenas de organizaciones ambientalistas del país como CCT, COECOCEIBA, CEDARENA, etc. Han estado en la JD de FONAFIFO representando al MINAET. Son muy activos en los temas de agua, bosques, cambio climático. Mantienen una posición crítica y de oposición a REDD+.
88. MESA INDÍGENA ❋	Es una organización formada por varios dirigentes indígenas del país relacionados con ARADIKES, ADITIBRI y ACOMUITA. Forman parte de CICA y del Proyecto MIE del BM. Son aliados de CICAFOC en MIE.
89. CICAFOC ❋	Es un ente que reúne a varias organizaciones de CA y es parte del Proyectos MIE del BM. Entre sus miembros está ADITIBRI, ACOMUITA y ASOPROLA.
90. JUNAFORCA ❋	Es una organización que agrupa a varias organizaciones forestales, la mayoría también están en ONF. Han estado en el tema de PSA por varios años. Son parte de la ONF.
91. RED RESERVAS PRIVADAS ❋	Agrupa a varios propietarios de bosques de protección y reservas privadas.
92. CONCHAL	Son demandantes y compradores de PSA.
93. HORIZONTES	Son demandantes y compradores de PSA.
94. COSTA RICA POR SIEMPRE	Es una alianza estratégica financiera entre TNC, Fundación Moore y Lind Trust for Conservation para la consolidación de las ASP, en su estructura operativa y política están MINAET y Paz con la Naturaleza.
95. COOPESOLIDAR	Es una empresa cooperativa consultora que acompañan procesos de varias organizaciones que trabajan el tema de PSA, como las cooperativas, las ADII's y otros organismos relacionados a los temas de PSA, de ASP y de conservación de bosques.
96. CONELECTRICA ❋	Es una corporación de varias pequeñas empresas privadas y cooperativas de generación y distribución eléctrica. Varias de ellas son demandantes de PSA.
97. UPANACIONAL	Es la más fuerte organización campesina de COSTA RICA y agrupa a muchos finqueros dueños de bosques y a cafetaleros con sistemas agroforestales. Su vinculación con REDD+ es que son propietarios de tierras con bosques, con café y con pastos.

❋ Las Partes Interesadas Relevantes (PIR) señaladas con este símbolo deben estar totalmente involucradas en el Plan de Consulta de REDD+, son muy relevantes o de alta prioridad.

ACRONISMOS: ACOMUITA Asociación Comisión de Mujeres Indígenas de Talamanca; ADII Asociación de Desarrollo Integral Indígena; ADITIBRI Asociación de Desarrollo Integral del Territorio Indígena Bribri; ADICONTE Asociación de Desarrollo Integral del Territorio Indígena DE Conte Burica; ARADIKES Asociación Regional Aborigen del Dikes; ASADA Asociación Administradora de Acueducto; ASANA Asociación Amigos de la Naturaleza de Pacifico Central y Sur; ASIREA Asociación de Industriales y Reforestadores del Atlántico; ASOPROLA Asociación de Productores La Amistad; BID Banco Interamericano de Desarrollo; BM Banco Mundial; BNCR Banco Nacional de Costa Rica; CAC Centro Agrícola Cantonal; CATIE Centro Agronómico Tropical de Investigación y Enseñanza; CBTC Corredor Biológico Talamanca Caribe; CCAD Consejo Centroamericano de Ambiente y Desarrollo; CCT Centro Científico Tropical; CEDARENA Centro de Derecho Ambiental y de los Recursos Naturales; CENAT Centro Nacional de Tecnología; CICAFOC Coordinadora Indígena y Campesina de Agroforestería Comunitaria Centroamericana; CI Conservación Internacional; CICA Consejo Indígena de Centroamérica; CNE

Comisión Nacional de Emergencias; CNF Cámara Nacional Forestal; CNFL Compañía Nacional de Fuerza y Luz; CODEFORSA Corporación de Desarrollo Forestal de la Zona Norte; COECO-CEIBA Amigos de la Tierra; CONAI Comisión Nacional de Asuntos Indígenas; CONAGEBIO Comisión Nacional de Gestión de la Biodiversidad; CONARE Consejo Nacional de Rectores; CR Costa Rica; CRUSA Cooperación Costa Rica Estados Unidos; CSA Certificados de Servicios Ambientales; DINADECO Dirección Nacional de Desarrollo de la Comunidad; EARTH Universidad del Trópico Húmedo; ECAG Escuela Centroamericana de Ganadería; EsIA Estudio de Impacto Ambiental; ESPH Empresa de Servicios Públicos de Heredia; FAO Organización Mundial para la Agricultura y la Alimentación; FECON Federación Conservacionista; FCPF Fondo Cooperativo Para el Carbono de los Bosques; FONAFIFO Fondo Nacional de Financiamiento Forestal; FUNDECOR Fundación de Desarrollo de la Cordillera Volcánica Central; GEF Fondo Mundial de Ambiente; GTZ Cooperación Alemana; ICAA Instituto Costarricense de Acueductos y Alcantarillados; ICAFE Instituto Costarricense de Café; ICE Instituto Costarricense de Electricidad; ICER Instituto Costarricense de Enseñanza Radiofónica; ICT Instituto Costarricense de Turismo; IDA Instituto de Desarrollo Agrario; IDH Índice de Desarrollo Humano; IICA Instituto Interamericano de Ciencias Agrícolas; IMN Instituto Meteorológico Nacional; INA Instituto Nacional de Aprendizaje; INBio Instituto Nacional de Biodiversidad; INTA Instituto de Transferencia Agrícola; INEC Instituto Nacional de Estadística y Censos; INFOCOOP Instituto de Fomento Cooperativo; INCOPESCA Instituto Costarricense de Pesca y Acuacultura; ITCR Instituto Tecnológico de Costa Rica; JUNAFORCA Junta Nacional Forestal Campesina; KFW Kreditanstalt fur Wiederaufbau; LT Líneas de Transmisión; MAG Ministerio de Agricultura y Ganadería; MDL Mecanismo de Desarrollo Limpio; MNCR Museo Nacional de Costa Rica; MIE Proyecto Manejo Integral de Ecosistemas del Banco Mundial; MINAET Ministerio de Ambiente, Minas, Energía y Telecomunicaciones; MOPT Ministerio de Obras Públicas y Transportes; OET Organización de Estudios Tropicales; OIT Organización Internacional del Trabajo; ONF Oficina Nacional Forestal; ONG Organización No Gubernamental; PH Proyectos Hidroeléctricos; PILA Parque Internacional La Amistad; PINDECO Corporación de Desarrollo Agrícola Del Monte; PNUD Programa Naciones Unidas para el Desarrollo; PSA Pago por Servicios Ambientales; RBA Reserva de la Biosfera La Amistad; RECOPE Refinadora Costarricense de Petróleo; REDD Reducción de Emisiones por Deforestación y Degradación; SEDER Sociedad de Estudios para el Desarrollo Rural; SESA Sistema de Evaluación Social y Ambiental de REDD; SEPSA Secretaría de Planificación del Uso del Suelo; SENARA Sistema Nacional de Riego y Avenamiento; SETENA Secretaría Técnica Nacional del Ambiente; SINAC Sistema Nacional de Áreas de Conservación; SNB Sistema Bancario Nacional; TNC The Nature Conservancy; UCAEP Unión de Cámaras Empresariales; UCR Universidad de Costa Rica; UICN Unión Internacional para la conservación de la Naturaleza; UNA Universidad Nacional; UNED Universidad Estatal a Distancia; UNESCO Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura; UPANACIONAL Unión de Pequeños Agricultores

Annex 1b-1: Stakeholder Consultations Held So Far on the R-PP

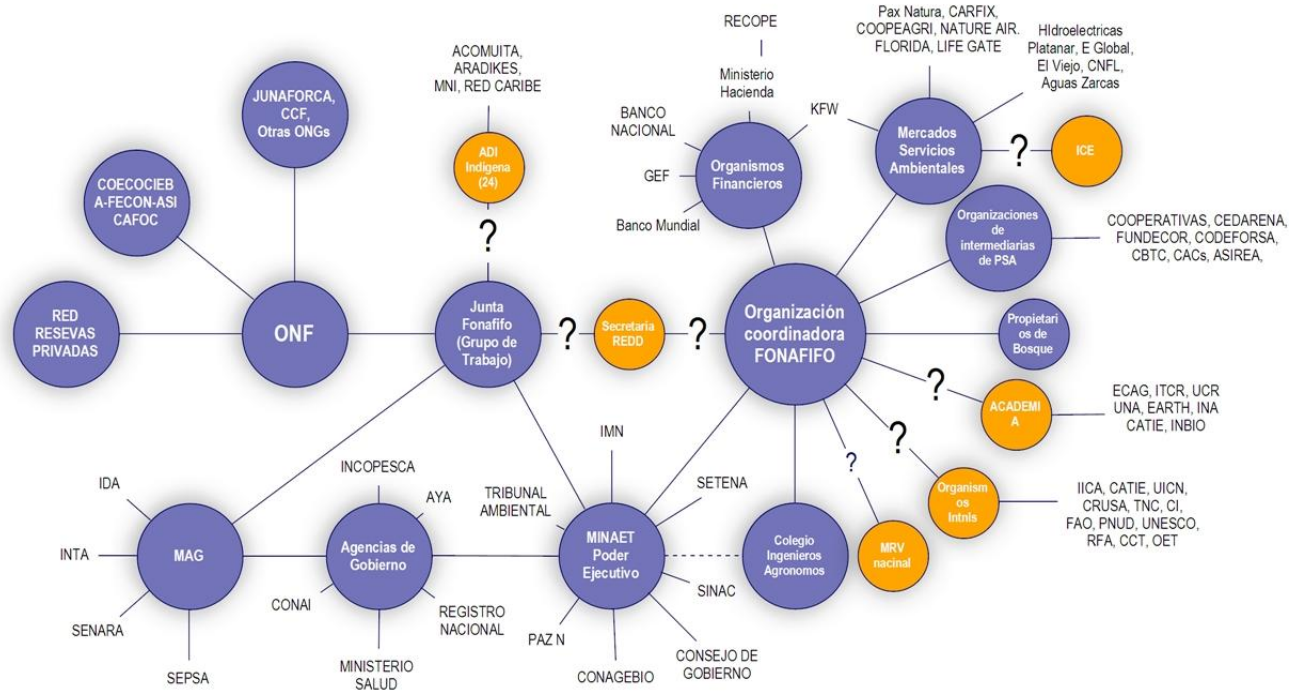


Figura 8 Mapa de Partes Interesadas, formalmente integrados (esferas azules) y con la necesidad de ser integrados (esferas naranja) en el actual marco de implementación del programa de pago por servicios ambientales de FONAFIFO (Elaborado por FUNDECOR y Carlos Borge) FECHA??

Annex 1b-2: Consultation and Participation Plan

Tabla 8: Marco lógico del plan de consulta de REDD

Lógica de intervención	Indicadores	Fuentes	Supuestos / Condiciones
Objetivo General			
Crear un proceso de consulta para que Costa Rica diseñe la estrategia REDD+ con una sola misión y una sola estrategia-país en este campo forestal.	Al finalizar el diseño de la Estrategia REDD+ Costa Rica contará con un capital social acumulado en el ámbito de la conservación de bosques superior al actual, con una institucionalidad para REDD+ establecida formalmente y con un sistema de gobernanza que le dará sostenibilidad política y financiera a REDD+	Evaluación social final del Plan de Consulta	La Junta Directiva de FONAFIFO se constituye en Grupo de Trabajo e incorpora a las ADI Indígenas como parte de su función decisoria en REDD+. Se crea la Organización Coordinadora y el Grupo de Apoyo Técnico. Funciona la Secretaría Técnica en FONAFIFO.
Objetivos Específicos			
A. Diseñar un proceso de consulta que permita acumular más capital social con base en la actual red de relaciones institucionales, incluyendo el sector privado e indígena.	Todos los sectores del universo de las PIR (indígenas, empresa privada, ONG's, Estado, academia, Organismos Internacionales) estarán relacionados con base en la confianza, la colaboración para REDD+ y sobre acuerdos firmes bilaterales y multilaterales	Evaluación social final del Plan de Consulta	Todas las PIR se comprometen a trabajar de forma conjunta en REDD+.
B. Que el proceso de consulta mejore la gobernanza al favorecer la representación de las P.I.R en los procesos de toma de decisión de REDD+.	Que las ADII's, la academia y las ONG's estén formalmente representadas en el Grupo de Trabajo, en la Organización Coordinadora y en el Grupo de Apoyo Técnico	Evaluación social final del Plan de Consulta	La actual JD de FONAFIFO tiene la amplitud de reconocer la existencia de más PIR y se realizan los cambios legales para darles cabida, sobre todo a las ADII's
Resultados			
1. Los Pueblos Indígenas y sus organizaciones que las representan las Asociaciones de Desarrollo Integral tienen un asiento en el Grupo de Trabajo de REDD+.	Hay un acuerdo escrito y protocolizado de la Junta Directiva de FONAFIFO en este sentido	Actas de JD FONAFIFO	Las ADII's están formalmente interesadas en ser parte del Grupo de Trabajo y los demás órganos de REDD+

2. Sectores como los ambientalistas, la academia, los indígenas, las organizaciones campesinas, los organismos internacionales, las instituciones estatales y la empresa privada están suficientemente representados en el Grupo de Trabajo, en la Organización Coordinadora y en el Grupo de Apoyo Técnico.	Existe un acuerdo firmado entre las PIR para incluirse en el proceso de discusión y diseño de REDD+	Actas de Secretaria	La convocatoria a los talleres nacionales, regionales y sectoriales es exitosa
3. Todas las PIR se comprometen en una agenda de trabajo multisectorial, interinstitucional e intrainstitucional para poner el tema REDD+ en sus planificaciones estratégicas y políticas operativas.	El compromiso con REDD+ se refleja en las planificaciones institucionales y la asignación de recursos humanos y económicos	Planes de trabajo	Las PIR interiorizan REDD+ como una oportunidad de trabajo que les permite crecer como instituciones
4. La ONF se constituye en un organismo con mayor fuerza jurídica en la representación de su membresía y cuenta con presupuesto sostenible.	Se aclara el rol legal de la ONF y se constituye un fondo para su funcionamiento operativo	Pronunciamiento legal de órgano correspondiente y presupuesto	A los directores de la ONF les interesa ese organismo con mayor fortaleza legal, institucional y económica
5. Las ADI Indígenas logran constituir un órgano federativo nacional que las representa y una sostenibilidad legal para cada ADII.	Se encuentra la figura legal y política viable para unir a las 24 ADII's del país y la forma de blindar legalmente las elecciones de JD de ADII's	Constitución legal y sus estatutos	Las instituciones estatales CONAI y DINADECO logran acuerdos para no obstaculizar este esfuerzo. El Gobierno de la República pone voluntad política en lograr levantar estas barreras
6. Las empresas e instituciones demandantes de servicios ambientales logran establecer acuerdos multilaterales para aumentar el poder de adquisición de CSA.	Se forman grupos de demandantes de CSA para invertir en determinadas zonas prioritarias del país	Cartera de CSA	Se logra que FONAFIFO articule grupos de demanda con grupos de oferta (ej. Dikes I y II se articula ADII's de Buenos Aires con ICE, PINDECO, COOPEAGRI, ICAA, TNC y CI. También se mercadean los CSA de ADITIBRI y ADICONTE)
7. Ejecutar el Plan de Acción del PSA Indígena identificado en ECOMERCADOS II.	FONAFIFO y las ADII's logran un acuerdo con tal fin	Se dispone de los fondos en REDD+	El BM, FONAFIFO y las ADII's logran encontrar la forma viable de poner en práctica este plan que garantiza la participación indígena en REDD+

8. La CCF logra representar a todos los empresarios privados con intereses en REDD+ como dueños de bosques, reforestadores, industriales, muebleros, comerciantes importadores de madera, consultores forestales, etc.	La CCF logra organizar eventos que le permitan unificar criterios de la empresa privada ligada a los negocios forestales y de REDD+	Bitácoras de encuentros	A la CCF le interesa ampliar su membresía y tener un rol activo y decisivo en REDD+

Tabla 9: Plan de acción para la consulta de REDD+

ACCIONES	RESPONSABLE	FECHA	VERIFICACIÓN
1. Hay un acuerdo escrito y protocolizado de la Junta Directiva de FONAFIFO y un Decreto del MINAET para que los Pueblos Indígenas y sus organizaciones que las representan las Asociaciones de Desarrollo Integral tengan un asiento titular y uno suplente en el Grupo de Trabajo de REDD+.	Director Nacional de FONAFIFO y Despacho del Ministro de MINAET	15 abril 2010	Publicación en la Gaceta y nota a las ADII's
2. Reuniones de consulta entre los Pueblos Indígenas y las ADII's para lograr acuerdos sobre participación en REDD+.	ADITIBRI y ARADIKES	Meses de abril a julio del 2010	Memorias de reuniones con fotos y listas de asistencia
3. Edición de un documento sobre el impacto del PSA en Territorios Indígenas y sobre REDD+.	FONAFIFO	15 mayo 2010	Documento editado, publicado y distribuido
4. Programa para radios indígenas sobre PSA en Territorios Indígenas y REDD+.	FONAFIFO e ICER	30 mayo 2010	Producido programa de radio
5. Taller de capacitación técnica sobre REDD+ a delegados indígenas.	FONAFIFO, ADITIBRI y ARADIKES	Mayo 2010	Memoria del taller
6. Colocación en sitios web de FONAFIFO, ONF, SIREFOR, MINAET, CEDIN y ADITIBRI de una carpeta informativa completa sobre REDD+	FONAFIFO	15 abril 2010	Información en línea
7. Taller Nacional de todas las Partes Interesadas Relevantes para definir Grupo de Trabajo, Grupo de Trabajo Técnico y Secretaría de REDD+.	FONAFIFO	Agosto 2010	Memoria y record de convocatoria
8. Instalación de órganos de trabajo de REDD+.	SECRETARÍA REDD	Enero 2011	Protocolo

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Annex 2a: Assessment of Land Use, Forest Policy and Governance

Aspectos metodológicos de la evaluación sobre el uso de la tierra.

Se estudia la capacidad del país para capturar carbono mediante el crecimiento y conservación de su cobertura boscosa. Para tal efecto se evalúa la dinámica del cambio de so del suelo en dos periodos de 10 años, que van de 1980 y hasta al 2000, y un último periodo de 5 años que concluye en el 2005. Este último periodo permite hacer un análisis de la etapa de mayor influencia del Pago por Servicios Ambientales, un actor muy significativo en la capacidad del país para mantener cobertura y además es la última fecha que posee datos de cobertura para todo el país.

Para este estudio, el uso del suelo se re-agrupó en 3 categorías básicas: Otro uso, Bosque, Bosques Secundarios, que facilitan la interpretación de los resultados. Se puede seguir la pista sobre edades, permanencia y recuperación de los bosques y permite determinar la dinámica de esas cohortes a través de los años de comparación.

La metodología empleada para el cálculo del secuestro de carbono se basa en la comparación de stocks en la cobertura boscosa para diferentes períodos. Esta técnica ya ha sido empleada y recomendada por Brasil, que trabajan al igual que Costa Rica desde hace varios años en esta área de estudios de fijación de carbono.

Dinámica de uso del suelo: Los mapas de uso del suelo que se usaron fueron los proporcionadas por Instituto Meteorológico Nacional (IMN), para las fechas de 1980, 1990, y se tomaron la 2000 y 2005 de FONAFIFO. Se recibieron los mapas en formato vectorial (shape) por parte del IMN y FONAFIFO. Una vez leídos los "shape files", se convierten a "raster" de Idrisi, con un tamaño de píxel de 100 x 100 m, pasándolo por una imagen en formato ".tif", para facilitar las recodificaciones y las tabulaciones cruzadas, necesarias para poder seguir la pista de los bosques y sus cambios, que sirven para definir los cohortes durante el período, es decir de 1980 al 2005.

Se define el área dentro de la cual todas las imágenes resultantes contienen datos de uso del suelo, lo que permite sobreponer los distintos mapas y obtener las cohortes respectivas. De las categorías de uso del suelo que se encontraron en los distintas clasificaciones, se re-codificaron a 16 categorías afines para el juego de imágenes utilizado (1980, 1990, 2000 y 2005), con el propósito de normalizar estas clases en todos los mapas. Las 16 categorías resultantes fueron: 1. Bosque Primario, 2. Bosque Alterado y/o Intervenido, 3. Pasto con Árboles, 4. Cultivos y Pastos, 5. Regeneración Temprana (Charral), 6. Suelo Desnudo, 7. Cuerpos de Agua, 8. Reforestación, 9. Nubes, Sombra de Nubes y No Datos, 10. Urbano, 11. Páramo, 12. Humedales, 13. Manglar, 14. No Clasificado, Fronteras, 15. Uso Mixto y 16. Deforestación FONAFIFO (con imágenes 1997-2000-2005).

Luego se reagruparon en las siguientes categorías[24]: 1. Cobertura Boscosa (1, 12, 13), 2. Bosque Secundario 1980 (2), 3. Otro Uso (3, 4, 5, 6, 10, 15,16), 4. Nubes/No datos (8, 9, 14), 5. Agua (7) y 6. Páramo (11). El propósito de esta reagrupación es obtener resultados lógicos, al realizar los análisis matriciales de cambio de uso del suelo, para las distintas fechas involucradas en el estudio (período 1980-2005), con el cual se estima la edad del estado sucesional de la regeneración observada.

De la revisión de las reclasificaciones se observó que el Bosque Secundario de 1980 (Categoría 2), solamente se consignó en una de las imágenes que se usó para obtener el mapa total del país, compuesto por varias imágenes. Por esta razón finalmente se decidió reunir esta categoría con el uso de Cobertura Boscosa (Categoría 1) y desechar la opción de fechar los bosques secundarios de 1980. Así mismo se excluyen los usos 4, 5 y 6.

A partir de esta imagen reclasificada, se estudia la dinámica del cambio de uso del suelo desde 1980 con el fin de establecer la edad media de la regeneración retenida en el período 2000-2005. Se utilizan períodos de 10 años para capturar el cambio neto de cobertura, obviando la regeneración efímera y la pérdida temporal de la cobertura boscosa. Esto con el fin de ser conservadores en las estimaciones de la recuperación de área boscosa, siguiendo la buena práctica del IPCC. El último período 2000-2005, es de cinco años, por cuanto la proyección del escenario de referencia requiere de la mejor estimación a partir de la información disponible, del efecto de las políticas actuales en el cambio de uso de la tierra. Si bien, el Programa de Pago por Servicios Ambientales (PSA) se establece desde 1997, su cobertura empieza a incrementar significativamente a partir del 2000.

El análisis se realiza para 7 estratos uniformes de dinámica de uso del suelo, con el propósito de evaluar el potencial de secuestro de carbono para áreas con diferentes realidades tanto socio-económicas como legales. Se separó aquellas áreas que se encuentran bajo régimen de propiedad pública (Parques Nacionales y Reservas Biológicas), Áreas Silvestres Protegidas de dominio privado, Reservas Indígenas y bosques en propiedad privada del resto del país. Se trabajó de manera independiente la provincia de Guanacaste. Últimamente las áreas de bosque en Guanacaste presentan una dinámica de recuperación propia de una realidad socio-económica diferente a la del resto del país, posiblemente por el impacto turístico, así como por decrecimiento de la actividad ganadera, muy propia de la zona.

Estimación de la Captura de Carbono: Se evalúa la capacidad del país de secuestrar carbono para cada estrato uniforme de dinámica de uso del suelo. La estimación de la captura se realizó en miles de toneladas de CO_2 para cada quinquenio. Se calculó mediante la diferencia de los "stocks" entre períodos. La estimación del stock para cada año se realizó considerando que un bosque secundario llega a ocupación total del sitio en 35 años y que tanto para los bosques en Guanacaste como para el resto del país, la biomasa promedio en ocupación total es de 60 y 100 toneladas por hectárea de Carbono, respectivamente. A cada cohorte de regeneración se le estimó

[24] Los números entre paréntesis representan las categorías de la leyenda con 16 categorías

su stock basado en la proporción de la edad media sobre el tiempo total para alcanzar la ocupación total del sitio (edad/ 35 años) multiplicado por el carbono en ocupación total del estrato. Se consideró una edad para la regeneración temprana de 22 años, y de 27 años para la regeneración media. La regeneración tardía se consideró en ocupación total del sitio, es decir con una edad superior a los 35 años.

Tabla 10: Cambio de uso del suelo y edad del bosque regenerado durante el periodo 2000-2005 en los *Parques Nacionales y Reservas Biológicas ubicadas fuera de Guanacaste*, Costa Rica.

	Otro Uso		Regeneración Temprana		Regeneración Media		Bosque de Viejo Crecimiento y Regeneración Tardía		Total Uso 2005
	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	
Otro Uso	6,608	60.83%	4,256	39.17%					10,865
Regeneración Temprana	500	3.39%			14,247	96.61%			14,747
Regeneración Tardía	582	1.17%					49,267	98.83%	49,849
Bosque de Viejo Crecimiento	1,001	0.27%					374,271	99.73%	375,272
Total Uso 2000	8,691	1.93%	4,256	0.94%	14,247	3.16%	423,538	93.97%	450,732

Tabla 11: Cambio de uso del suelo y edad del bosque regenerado durante el periodo 2000-2005 en las *Áreas Silvestres Protegidas ubicadas fuera de Guanacaste*, Costa Rica.

	Otro Uso		Regeneración Temprana		Regeneración Media		Bosque de Viejo Crecimiento y Regeneración Tardía		Total Uso 2005
	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	
Otro Uso	73,825	75.62%	23,795	24.38%					97,620
Regeneración Temprana	4,652	12.18%			33,540	87.82%			38,192
Regeneración Tardía	3,960	6.30%					58,926	93.70%	62,887
Bosque de Viejo Crecimiento	8,872	2.93%					293,911	97.07%	302,783
Total Uso 2000	91,309	18.21%	23,795	4.75%	33,540	6.69%	352,838	70.36%	501,482

Tabla 12: Cambio de uso del suelo y edad del bosque regenerado durante el periodo 2000-2005 en *las Reservas Indígenas*, Costa Rica.

	Otro Uso		Regeneración Temprana		Regeneración Media		Bosque de Viejo Crecimiento y Regeneración Tardía		Total Uso 2005
	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	
Otro Uso	96,345	89.71%	11,054	10.29%					107,398
Regeneración Temprana	1,405	15.57%			7,618	84.43%			9,023
Regeneración Tardía	2,944	9.53%					27,964	90.47%	30,908
Bosque de Viejo Crecimiento	4,621	2.35%					192,380	97.65%	197,002
Total Uso 2000	105,315	30.59%	11,054	3.21%	7,618	2.21%	220,345	63.99%	344,331

Tabla 13: Cambio de uso del suelo y edad del bosque regenerado durante el periodo 2000-2005 en los *Bosques de Propiedad Privada fuera de Guanacaste*, Costa Rica.

	Otro Uso		Regeneración Temprana		Regeneración Media		Bosque de Viejo Crecimiento y Regeneración Tardía		Total Uso 2005
	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	
Otro Uso	1,679,313	93.08%	124,773	6.92%					1,804,085
Regeneración Temprana	54,838	29.97%			128,127	70.03%			182,965
Regeneración Tardía	33,149	17.76%					153,484	82.24%	186,633
Bosque de Viejo Crecimiento	39,803	11.30%					312,447	88.70%	352,250
Total Uso 2000	1,807,103	71.54%	124,773	4.94%	128,127	5.07%	465,931	18.45%	2,525,933

Tabla 14: Cambio de uso del suelo y edad del bosque regenerado durante el periodo 2000-2005 en *los Parques Nacionales y Reservas Biológicas ubicadas en Guanacaste*, Costa Rica.

	Otro Uso		Regeneración Temprana		Regeneración Media		Bosque de Viejo Crecimiento y Regeneración Tardía		Total Uso 2005
	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	
Otro Uso	36,432	65.72%	19,006	34.28%					55,438
Regeneración Temprana	1,384	5.48%			23,862	94.52%			25,246
Regeneración Tardía	520	2.06%					24,783	97.94%	25,303
Bosque de Viejo Crecimiento	342	1.15%					29,357	98.85%	29,699
Total Uso 2000	38,678	28.51%	19,006	14.01%	23,862	17.59%	54,140	39.90%	135,687

Tabla 15: Cambio de uso del suelo y edad del bosque regenerado durante el periodo 2000-2005 en las *Áreas Silvestres Protegidas ubicadas en Guanacaste*, Costa Rica.

	Otro Uso		Regeneración Temprana		Regeneración Media		Bosque de Viejo Crecimiento y Regeneración Tardía		Total Uso 2005
	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	
Otro Uso	16,964	72.26%	6,511	27.74%					23,476
Regeneración Temprana	777	11.91%			5,745	88.09%			6,521
Regeneración Tardía	1,557	5.22%					28,288	94.78%	29,846
Bosque de Viejo Crecimiento	300	3.73%					7,749	96.27%	8,049
Total Uso 2000	19,598	28.87%	6,511	9.59%	5,745	8.46%	36,037	53.08%	67,891

Tabla 16: Cambio de uso del suelo y edad del bosque regenerado durante el periodo 2000-2005 en los Bosques de Propiedad Privada en Guanacaste**, Costa Rica.**

	Otro Uso		Regeneración Temprana		Regeneración Media		Bosque de Viejo Crecimiento y Regeneración Tardía		Total Uso 2005
	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	Área	Coeficiente	
Otro Uso	512,276	83.74%	99,490	16.26%					611,766
Regeneración Temprana	30,190	20.59%			116,462	79.41%			146,651
Regeneración Tardía	28,405	10.85%					233,354	89.15%	261,760
Bosque de Viejo Crecimiento	4,603	7.15%					59,739	92.85%	64,342
Total Uso 2000	575,474	53.06%	99,490	9.17%	116,462	10.74%	293,094	27.03%	1,084,520

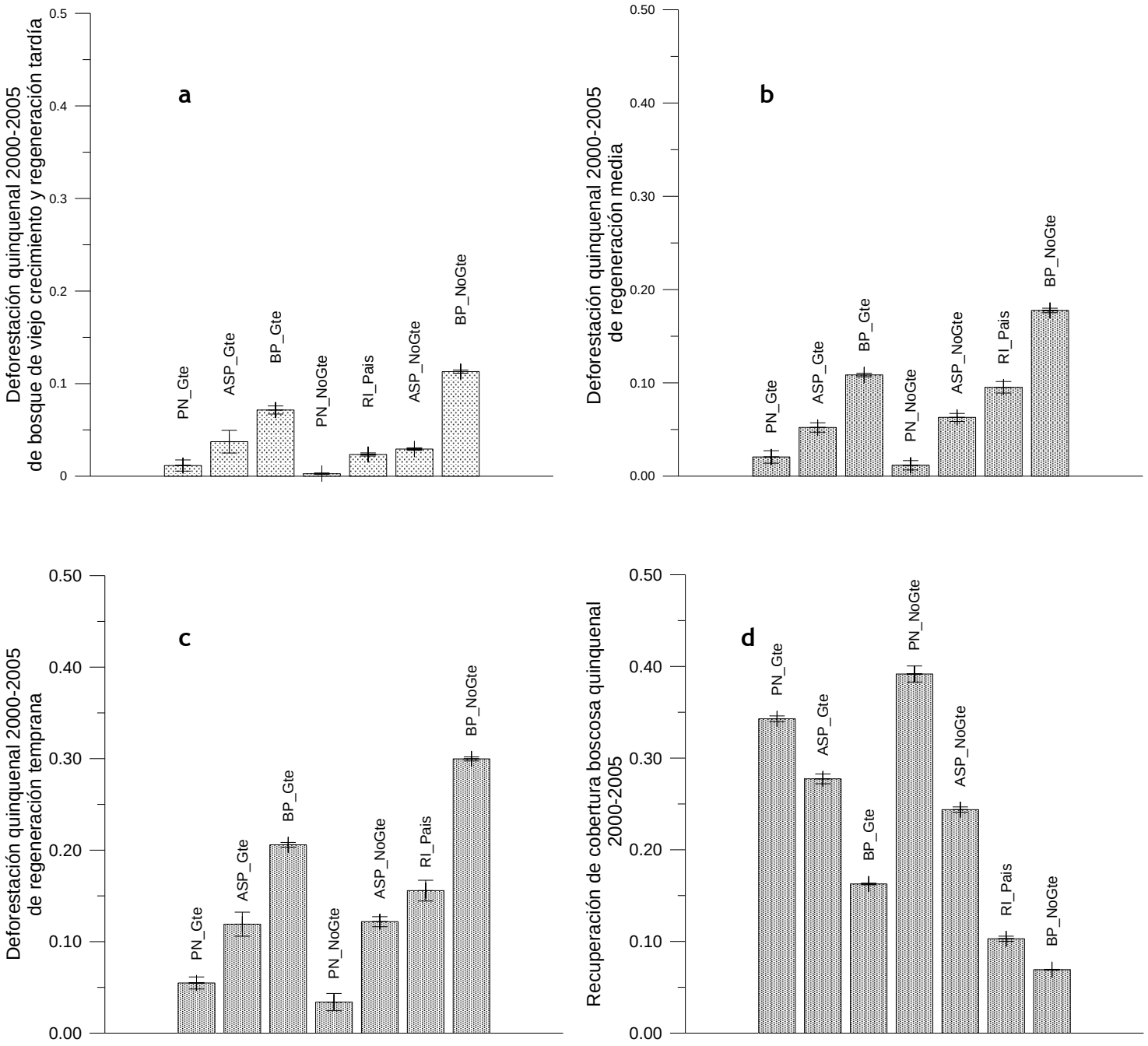

Figura 9: Tasa de deforestación quinquenal de bosques de viejo crecimiento y regeneración tardía (gráfica a) y bosques regenerados medios y tempranos (gráficas b y c), y tasa de recuperación quinquenal de cobertura boscosa (gráfica d), durante el período 2000-2005 para siete diferentes regiones homogéneas de dinámica de cambio de uso en Costa Rica: Parques Nacionales en Guanacaste (PN_Gte), Áreas Silvestres Protegidas en Guanacaste (ASP_Gte), Bosques en Propiedad Privada en Guanaste (BP_Gte), Parques Nacionales en el resto del país (PN_NoGte), Áreas Silvestres Protegidas en el resto del país (ASP_NoGte), Reservas Indígenas en todo el país (RI_País) y Bosques en Propiedad Privada en el resto del País (BP_NoGte).

Marco Teórico para el análisis de conductores de deforestación:

Cuando la deforestación empezó a emerger como un tema de preocupación internacional, era vista como "un fenómeno social irracional y algo misterioso" (Walker, 2004). Teóricos convencionales normalmente brindan explicaciones relacionadas con el crecimiento de la población o la intensificación de la agricultura. Las razones por las cuales la gente decide hacer cambio de uso, generando la deforestación, pasaron inadvertidas hasta hace muy poco. Existe amplia literatura relativa a las diversas causas de la deforestación en los trópicos (Kummer y Turner, 1994; Kaimowitz y Angelsen, 1999, Geist y Lambin, 2002; Brockett y Gottfried, 2002). Helmut Geist y Eric Lambin (2002) de manera intuitiva señalan en su estudio sobre las causas de la deforestación tropical que la transición se explica mejor por "conductores múltiples que actúan sinérgicamente, y que son impulsados por la interacción de variables económicas, institucionales, tecnológicos, culturales y demográficas".

Geist y Lambin (2002), así como Angelsen y Kaimowitz (1999) presentan ideas útiles respecto a las relaciones entre las diversas micro y macro-fuerzas económicas que actúan unos sobre otras de manera interdependiente, resultando en el fenómeno de la deforestación. Estas fuerzas se pueden desglosar en dos grupos principales: las causas subyacentes, que suelen ser las fuerzas socioeconómicas y políticas que ocurren a nivel macroeconómico y las causas inmediatas, que ocurren a nivel microeconómico para influir directamente en las acciones de los agentes (aquellos con control sobre las decisiones del uso de la tierra). Las diferencias en las causas subyacentes e inmediatas de un lugar del trópico a otro confirman que la deforestación no sólo difiere entre países tropicales, sino también entre regiones vecinas en un país

Para simplificar considerablemente el proceso que está explicado en detalle en el estudio de Angelsen y Kaimowitz, las distintas fuerzas que actúan sobre la deforestación podrían ser ilustradas por tres anillos por encima de una parcela de tierra determinada (figura 1): en el anillo exterior están las causas subyacentes, en el anillo medio las causas inmediatas, y el anillo central las medidas adoptadas de acuerdo con las decisiones tomadas por los agentes.

Usando este ejemplo como un modelo, se puede ilustrar el uso de la tierra y el cambio de cobertura como un efecto dominó a la inversa. Empezando desde el exterior, las fuerzas subyacentes más amplias en el anillo exterior (por ejemplo, presión de la población o los cambios de políticas) requieren cambios en el anillo central (por ejemplo, aumento de renta de la tierra o la construcción de carreteras), que a su vez ejerce presión o proporciona incentivos sobre los agentes en el anillo central para modificar el uso del suelo o de la cobertura (por ejemplo, conversión de bosques a tierras agrícolas).

Esta simplificación ilustra el hecho de que muy pocas veces existe una sola y aislada causa que conduce a la deforestación en una región determinada. Sin embargo, a lo largo de los trópicos, las tierras forestales son a menudo despejadas para dar paso a la expansión agrícola, lo cual incluye la conversión de bosque para cultivos permanentes, ganadería, agricultura migratoria, y agricultura de colonización (Geist y Lambin, 2002). En Costa Rica, la deforestación se atribuye principalmente a la remoción de tierras para la agricultura y la ganadería (Wyels, 2003; de Camino et al, 2000). Donde las decisiones tomadas por los agentes para despejar la tierra para estos fines, se realizan con el fin de maximizar los beneficios de la tierra.

Perspectiva espacial y económica de la deforestación: El concepto de que la cobertura cambia en el espacio con respecto a la renta de la tierra no es de reciente descubrimiento. Johann Heinrich von Thünen fue el primero en proporcionar un análisis profundo de la economía espacial en su teoría de *El Estado Aislado* en 1826. Su trabajo en el desarrollo de análisis espaciales y teoría de la renta de la tierra ha sido fundamental para los teóricos del uso del suelo y su mejor comprensión del proceso de deforestación.

El modelo de Von Thünen basado en la teoría de la renta de la tierra utiliza los mercados agrícolas para ejemplificar la relación entre renta de la tierra, distancia a los mercados, y el consiguiente uso de la tierra (Nelson, 2002). A pesar de que el suyo es un modelo rudimentario que deja de tomar en cuenta varios factores temporales y espaciales, si ilustra de manera simplista que la utilización de la tierra es inherentemente espacial. La teoría descansa en el concepto de que la renta de la tierra disminuirá a medida que aumenta la distancia al mercado, y viceversa. Hoy en día es sabido que la accesibilidad al mercado impulsa la deforestación en gran medida por la reducción de los costes de transporte y el aumento de los beneficios de la tierra. En otras palabras, entre más fácil sea hacer llegar los productos al mercado de una parcela determinada, mayor es el valor de la tierra, y es más probable que sea deforestada. Por lo tanto, al brindar accesibilidad a los mercados, los ríos, ferrocarriles, y particularmente los caminos estarán estrechamente vinculados al avance de la deforestación, haciendo el evento un fenómeno espacialmente explicito (Vance y Geoghegan, 2002; Walker, 2004) fácilmente ilustrable mediante Sistemas de Información Geográfica.

Sin embargo el alcance del modelo de Von Thünen es limitado, ya que no es capaz de explicar por qué una parcela de tierra podría ser convertida a la agricultura, mientras que otra parcela con acceso similar al mercado, se mantiene bajo cobertura boscosa. No obstante, si adicionalmente se conceptualiza la deforestación desde una perspectiva económica, se vinculan las acciones de los agentes a sus objetivos y se explica por qué la mayoría de las tierras deforestadas son aquellas que son económicamente más productivas.

Con la creciente preocupación sobre los efectos ecológicos y potencialmente desastrosos de la deforestación, investigadores y científicos interesados en la teoría del uso del suelo y en la conservación han desarrollado numerosos, innovadores y eficaces marcos conceptuales que tratan de identificar las fuerzas socioeconómicas que pueden ser utilizados para explicar los patrones espaciales y temporales de desarrollo del paisaje (Irwin y Geoghegan, 2001; Vance, y Geoghegan, 2002; Walker, 2004; Alix, 2007). Estos modelos tratan, y son a menudo muy útiles, de explicar y predecir la probabilidad de cambio de uso del suelo en una zona determinada. Si son apropiadamente desarrollados y aplicados, tales modelos econométricos pueden ser eficaces en la creación de una mejor comprensión de la deforestación, a fin de desarrollar e implementar medidas de control.

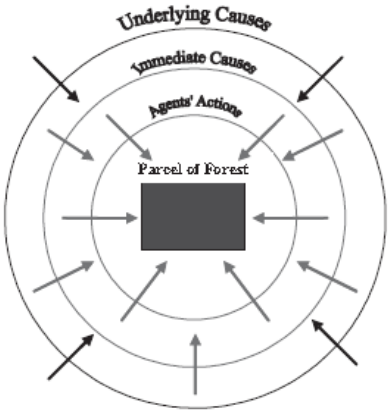

Figura 10 Ilustración de las fuerzas que actúan en el cambio de uso de la cobertura boscosa (Angelsen y Kaimowitz, 1999)

Creación de un modelo analítico: El que un propietario de tierra decida o no deforestar una parcela depende de una compleja combinación de características individuales, necesidades y factores socioeconómicos, incluyendo (pero no limitado a): valor de mercado de la producción de posibles alternativas de uso, consumo doméstico, disponibilidad de mano de obra, valor personal asignado al bosque, nivel de la educación, y valor potencial o esperado de la tierra en el futuro (Vance, y Geoghegan, 2002). Es poco probable, y prácticamente imposible, que cada una de estas innumerables fuerzas puedan ser medidas y tomadas en cuenta en un modelo, en la mayoría de los casos también resulta impráctico que sea así. En realidad, generalmente hay sólo unos cuantos factores críticos que influyen en gran medida en las decisiones de uso del suelo, y en consecuencia, en el cambio de cobertura. Los otros factores, aunque ciertamente están presentes e influyen, en comparación son sólo marginales. Es la tarea de los modeladores econométricos, entonces, capturar y medir esas fuerzas que son estadísticamente necesarias para determinar y predecir el cambio de cobertura.

El modelo de Walker (2004) supone que el factor determinante para efectuar un cambio de cobertura es la rentabilidad potencial de la tierra. Según Munroe et al (2004), la rentabilidad de la tierra, o renta de la tierra, es una función de dos variables: factores biogeofísicos que determinan la productividad de la tierra (p.e. topografía, fertilidad del suelo y condiciones climáticas) y, como von Thünen previó, accesibilidad al mercado (es decir, los costes de transporte). En una parcela de tierra dada, si su productividad y proximidad al mercado sobre valoran la tierra tal como está, entonces probablemente va a ser convertida para producir ese valor extra.

Walker (2004), en su trabajo sobre teorías del uso del suelo y del cambio de cobertura en relación con la deforestación tropical, desarrolla un modelo econométrico muy útil que incorpora tanto la dinámica espacial como la temporal, para determinar la probabilidad de que el cambio de cobertura (deforestación), ocurra en una determinada parcela de tierra. Con el fin de llegar a este modelo, Walker integra varias teorías tradicionales y contemporáneas, y las aplicaciones de varios académicos y científicos.

Según este modelo, la tierra es convertida a la agricultura (*a*), o dejada como bosque (*f*). La probabilidad de que la deforestación ocurra se puede expresar en los siguientes términos:

Ecuación 9: $$\text{Prob}[\textit{deforestación}] = \text{Prob}[\ln R_{al}(p,w) + \varepsilon_{al} > \ln R_{fl}(p,w) + \varepsilon_{fl}]$$

En este caso, l es una ubicación arbitraria donde la probabilidad está siendo medida, ε es una variable aleatoria que representa los efectos no observados, y R representa la renta de la tierra, la cual depende esencialmente de los costes de entrada (p) y salida (w), los cuales a su vez dependen en gran medida los costes de transporte (Walker, 2004). Para este modelo, la probabilidad de que el uso del suelo se convierta de bosque a uso agrícola depende del valor del bosque en comparación con el valor del mejor uso alternativo de la tierra (renta de la tierra).

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Annex 2b: REDD Strategy Options

Tabla 17: Proyección de la cobertura del Programa de Pagos por Servicios Ambientales para mantener y mejorar el stock de carbono en Costa Rica.

Año	Regeneración Temprana (ha)	Regeneración Media (ha)	Regeneración Tardía y Bosque Viejo (ha)	Gran total
2005	13,612	26,099	181,301	221,012
2010	22,311	43,173	302,487	367,971
2015	23,026	39,340	325,279	387,645
2020	21,361	36,408	344,190	401,959
2025	20,039	34,040	359,633	413,711
2030	18,996	32,119	372,226	423,341

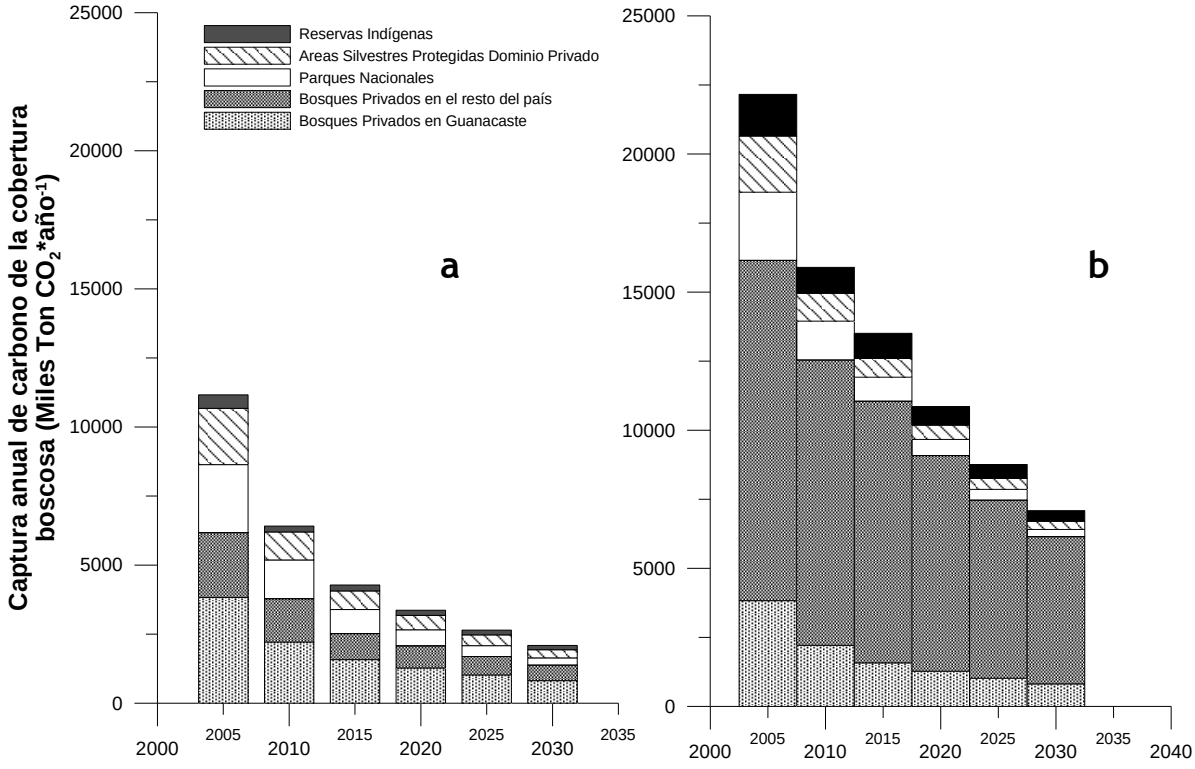

Figura 11 a) Proyección de la captura de anual de carbono en miles de toneladas de CO2 por año, manteniendo el nivel de penetración del programa de Pago por Servicios Ambientales observado al 2005, y b) Escenario esperado de reducción de emisiones, como respuesta a un aumento en la cobertura del programa de Pago por Servicios Ambientales, necesario para disminuir la tasa de deforestación en bosques de viejo crecimiento y bosques secundarios a la mitad y duplicar la

regeneración natural en los Bosques Privados fuera de Guanacaste y triplicar la regeneración natural en las Reservas Indígenas.

Tabla 18: Oportunidades y obstáculos para la implementación de la Estrategia REDD+ en Costa Rica.

Área	Oportunidades	Obstáculos
Reducción de emisiones y producción de co-beneficios por REDD+.	▪ Alta capacidad de mitigación de GEI del Sector Forestal por deforestación evitada, mejora del stock de carbono vía crecimiento secundario, productos de madera recolectada (**a**), sustitución de materiales de construcción y sustitución de combustibles fósiles con residuos biomásicos. ▪ Experiencias positivas en el desarrollo e implementación de políticas de reducción de la deforestación y degradación de los bosques: Sistema de Pago por Servicios Ambientales (Evita deforestación (**b**) y Mejora el stock de carbono por reforestación/regeneración), Sistema de Parques Nacionales y Reservas Biológicas y Sistema de Corredores biológicos (Consolidan la conservación de los ecosistemas boscosos).	▪ Los mercados regulados de carbono aún no reconocen REDD+ como mecanismo de mitigación. ▪ Las acciones tempranas en REDD+ no están siendo reconocidas. ▪ Mecanismos de transacción internacional de carbono poco desarrollados en Costa Rica ▪ Mercados globales de biodiversidad incipientes
Sostenibilidad Financiera de mecanismos de conservación y producción de SA	▪ Presencia de Mercados de Servicios Ambientales Locales (Agua, Belleza Escénica, Carbono) (**c**). ▪ Voluntad política para mantener el PSA (**d**)	▪ Ausencia de fondos frescos, predecibles y de largo plazo para atender las necesidades de todas las áreas forestales. ▪ Costos de transacción (**e**)
Marco de Implementación	▪ El actual Marco de Implementación del PSA es apto (**f**) para el desarrollo de actividades de REDD+: Existencia de mecanismos de transacción de derechos de carbono a nivel local; Seguridad Jurídica necesaria para el desarrollo de mercados de SA. ▪ El Marco contempla además del Carbono otros servicios ambientales como Agua, Belleza Escénica y Diversidad Biológica. ▪ Existencia de entes privados y organizaciones no gubernamentales especializadas en actividades REDD+ bajo el actual marco de implentación (**g**)	▪ El actual marco de implementación excluye a los poseedores de bosque que no tienen total claridad de tenencia de la tierra. ▪ La garantía de una distribución de beneficios, transparente y equitativa requiere de mejoras substanciales ▪ Sistemas de contabilidad y registro de transacciones de carbono poco desarrollados en Costa Rica ▪ Debilidad en la implementación de mecanismos de control de la tala ilegal ▪ Desbalance Protección/Producción en el Sector Forestal (**h**) ▪ Amenaza de los Biocombustibles

a. Las Directrices del IPCC permiten la inclusión de productos de madera recolectada (PMR) en los inventarios nacionales si un país puede probar que las reservas existentes de productos forestales de larga duración aumentan
b. Costa Rica, entre otros con los aportes a través del PSA, ha logrado revertir el proceso de deforestación que imperó hasta finales de los 80s. Con esto logró además posicionarse internacionalmente al lograr apoyo externo para el financiamiento de su sistema e incluso demanda para diseminar las lecciones aprendidas mediante cooperación Sur-Sur. La política ha logrado los objetivos para los cuales fue concebida, mejorando la cobertura forestal del país (de Camino, 2007).

c. Los aportes de empresas privadas, usuarias especialmente de agua y de belleza escénica, son claras señales de valores revelados en el mercado de servicios ambientales. También indican que, poco a poco, las empresas empiezan a internalizar los costos por pago de estos servicios, aún cuando posteriormente, a través de las tarifas, los transfieran a los consumidores finales (tarifas de agua y electricidad, precios de las facilidades turísticas, etc) (de Caminio, 2007).
d. El apoyo político al sistema de PSA y FONAFIFO continúa por parte del Gobierno y de las autoridades del sector económico, al mantenerse los niveles de aportes de presupuesto ordinario, además de la voluntad de contraer créditos para la producción de servicios globales (de Camino, 2007).
e. La eficiencia financiera y administrativa de FONAFIFO está en riesgo ante la disposición de la contraloría de que los recursos financieros del Estado que manejan entidades públicas no pueden ser manejados mediante fideicomisos. Esto implicará un aumento de los costos de transacción y una burocratización negativa de la operación del Fondo (de Camino, 2007; GFA, 2008).
f. El marco institucional para el pago de los servicios ambientales, se ha ido adecuando en busca de otorgar un mejor servicio a los que solicitan el PSA, al disminuir los costos del sistema y mejorar el control (de Caminio, 2007)
g. Estas organizaciones han desarrollado tecnologías de producción de plantas, reforestación, manejo forestal, sistemas agroforestales y suministran servicios técnicos y administrativos de calidad a sus asociados (de Camino, 2007).
h. Se ha producido un desbalance entre los sistemas fomentados por PSA a favor de la protección. Es excelente tener mayores superficies bajo protección, pero no es haber reducido la tasa de reforestación y haber eliminado el PSA al manejo forestal. La consecuencia inmediata de esto ha sido un déficit de madera en el mercado nacional, que ha llevado a cortar las plantaciones a un ritmo superior a la disponibilidad técnica de madera, y además se ha presentado nuevamente el problema de deforestación bruta ilegal, con el proceso de socola y luego corta de árboles en potreros (de Camino, 2007).

Tabla 19: Flujos de Financiamiento por Sector de Inversión y Totales del Programa de Pago por Servicios Ambientales de FONAFIFO Dólares Estadounidenses constantes del 2005.

Año	Financiamiento externo	Financiamiento Sector Público	Financiamiento Sector Privado	Total
1997	-	8,459,828	-	8,459,828
1998	-	15,362,060	8,360	15,370,420
1999	-	15,263,825	8,041	15,271,865
2000	-	12,035,760	0	12,035,760
2001	2,047,885	11,473,386	33,296	13,554,567
2002	8,394,495	12,501,131	67,477	20,963,102
2003	12,122,487	6,619,232	92,496	18,834,215
2004	9,963,211	6,294,040	3,928	16,261,178
2005	8,932,530	3,822,624	68,394	12,823,548
2006	6,726,173	10,675,716	76,908	17,478,798
2007	1,095,764	10,546,276	84,673	11,726,713
2008	728,270	9,758,950	102,399	10,589,620
2009	4,706,576	10,067,483	217,506	14,991,565
2010	4,706,576	10,470,183	226,206	15,402,965
2011	4,706,576	10,888,990	235,255	15,830,820
2012	4,706,576	11,324,550	244,665	16,275,790
2013	4,706,576	11,777,532	254,451	16,738,559
2014	-	12,248,633	264,629	12,513,262
2015	-	12,738,578	275,215	13,013,793
2016	-	13,248,121	286,223	13,534,344
2017	-	13,778,046	297,672	14,075,718
2018	-	14,329,168	309,579	14,638,747
2019	-	14,902,335	321,962	15,224,297
2020	-	15,498,428	334,841	15,833,269
2021	-	16,118,365	348,234	16,466,599
2022	-	16,763,100	362,164	17,125,263
2023	-	17,433,624	376,650	17,810,274
2024	-	18,130,969	391,716	18,522,685
2025	-	18,856,207	407,385	19,263,592
2026	-	19,610,456	423,680	20,034,136
2027	-	20,394,874	440,627	20,835,501
2028	-	21,210,669	458,253	21,668,921
2029	-	22,059,096	476,583	22,535,678
2030	-	22,941,459	495,646	23,437,105

Fuente: GFA-FUNDECOR (2010).

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Annex 2c: REDD Implementation Framework

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Annex 2d: Social and Environmental Impact Assessment

Tabla 20: Marco lógico del sistema de evaluación social y ambiental de REDD+

SESA	LÓGICA DE INTERVENCIÓN	INDICADORES	FUENTES	SUPUESTOS/ CONDICIONES
Objetivo General	Diseñar y ejecutar el Sistema de Evaluación Social y Ambiental de REDD+	Antes, durante y al terminar el diseño de la Estrategia REDD+ se contará con evaluaciones sociales y ambientales	Tres documentos de informes	El SESA tendrá presupuesto
Objetivos Específicos	A. Realizar una evaluación social y ambiental exante para identificar posibles impactos negativos y positivos de REDD+ y diseñar sus medidas de atención en un Plan de Gestión Socioambiental	Metodología de la evaluación exante	Documento	Consultoría contratada
	B. Ejecutar un ejercicio de seguimiento al Plan de Gestión Socioambiental de REDD+	La Secretaría hace el seguimiento	Informes	Secretaría tiene dentro de sus funciones el seguimiento
	C. Realizar una evaluación social y ambiental expost de los impactos socioambientales positivos y negativos del proceso de diseño de REDD+	Metodología de la evaluación exante	Documento	Consultoría contratada
	D. Realizar un seguimiento y evaluación del proceso de consulta y participación en REDD+	La Secretaría hace el seguimiento	Informes	Secretaría tiene dentro de sus funciones el seguimiento de la consulta

SESA	LÓGICA DE INTERVENCIÓN	INDICADORES	FUENTES	SUPUESTOS/ CONDICIONES
Resultados	1. Se identifican y valoran (cuantitativa y cualitativamente) por su orden de magnitud y relevancia los impactos positivos y negativos de REDD+	Existe una matriz de impactos y un árbol de efectos	Documento	REDD+ tiene un diseño de proyecto con un concepto de desarrollo, una estrategia de implementación y un marco lógico
	2. Se diseña un plan de gestión para atender y mitigar los impactos relevantes de REDD+	Existe un instrumento de planificación y un árbol de soluciones	Documento	Se produce un compromiso para atender los impactos por parte del Grupo de Trabajo
	3. Se identifican las poblaciones humanas y ecosistemas vulnerables, amenazadas y de riesgo en REDD+	Se realiza un análisis de amenazas con un método probado internacionalmente	Documento	La academia colabora con información
	4. Se hace seguimiento al proceso de consulta y participación en REDD+ para garantizar una efectiva inclusión de las PIR	Existe un instrumento de seguimiento	Documento	La Secretaría hace seguimiento
	5. Se incorporan al SESA recomendaciones sobre evaluaciones socioambientales hechas en el pasado en el tema REDD+	Se escribe un documento que sistematiza recomendaciones sobre evaluación social y ambiental del PNDF (2004) MDL (2005) ECOMERCADOS II (2006), el Plan Indígena (2006), Impacto del PSA en Mitigación de la Pobreza (2003), Identificación de alternativas para incrementar el impacto del PSA en mitigación de la pobreza (2006), Factores de éxito de las organizaciones en el PSA (2006) y Grúas II (2007)	Documento	Se contrata el trabajo

	6. Se hace una evaluación expost de impactos y de desempeño de REDD+	Se hace una evaluación participativa con las Partes Interesadas Relevantes	Documento	Se contrata el trabajo y las PIR participan activamente

SESA	LÓGICA DE INTERVENCIÓN	INDICADORES	FUENTES	SUPUESTOS/ CONDICIONES
Actividades	Se hace identificación y evaluación de impactos con base en metodologías reconocidas internacionalmente	Documento aprobado por Grupo de Trabajo	$12.000	FONDOS REDD+ y OTROS
	Se hace análisis de amenazas con base en metodologías reconocidas internacionalmente	Documento aprobado por Grupo de Trabajo	$8.000	FONDOS REDD+ y OTROS
	Se diseña Plan de Gestión Socioambiental	Documento aprobado por Grupo de Trabajo	$4.000	FONDOS REDD+ y OTROS
	Plan de Seguimiento	Secretaría ejecuta plan de seguimiento	$30.000	FONDOS REDD+ y OTROS
	Se hace sistematización de otras evaluaciones socioambientales	Documento aprobado por Grupo de Trabajo	$3.000	FONDOS REDD+ y OTROS
	Se hace evaluación expost de impactos y de desempeño de REDD++ en el tema socioambiental	Documento aprobado por Grupo de Trabajo	$12.000	FONDOS REDD+ y OTROS
	TOTAL		**$69.000**	

Annex 3: Reference Scenario

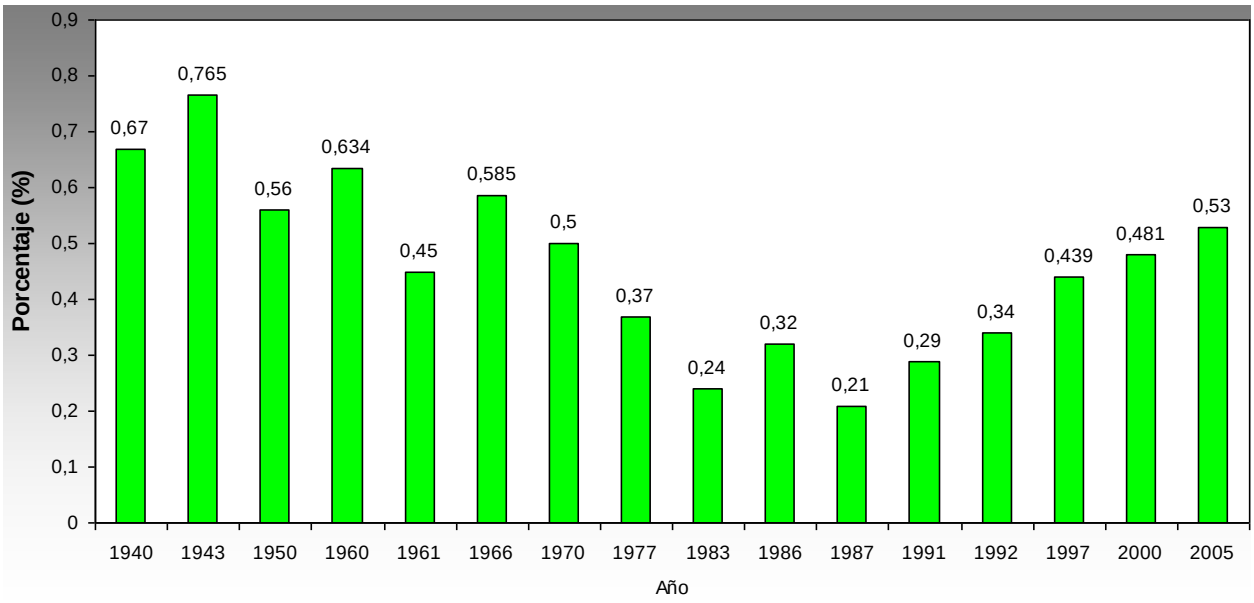

Figura 12 Porcentaje de cobertura boscosa en Costa Rica desde 1940 al 2005. Fuente: Ortiz (2010).

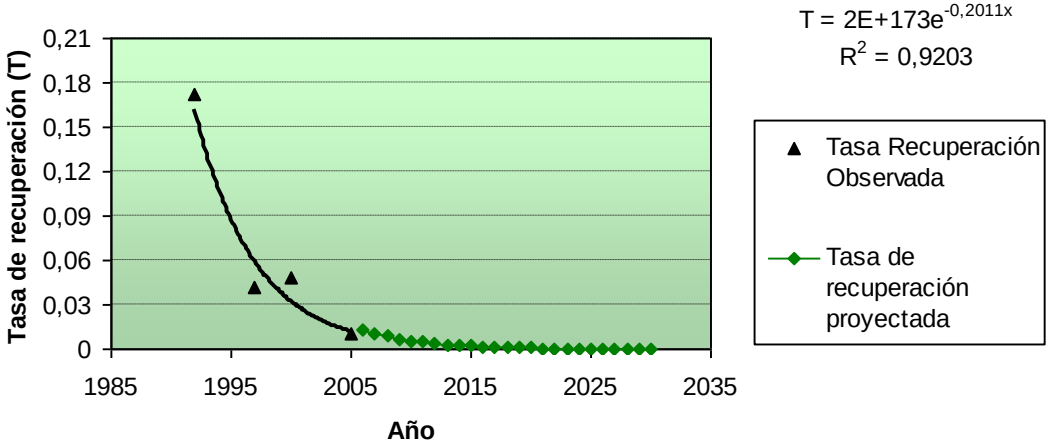

Figura 13: Tasa de Recuperación de bosques observada en Costa Rica (1992-2005), y Proyectada del 2006 al 2030. Fuente: Ortiz (2010).

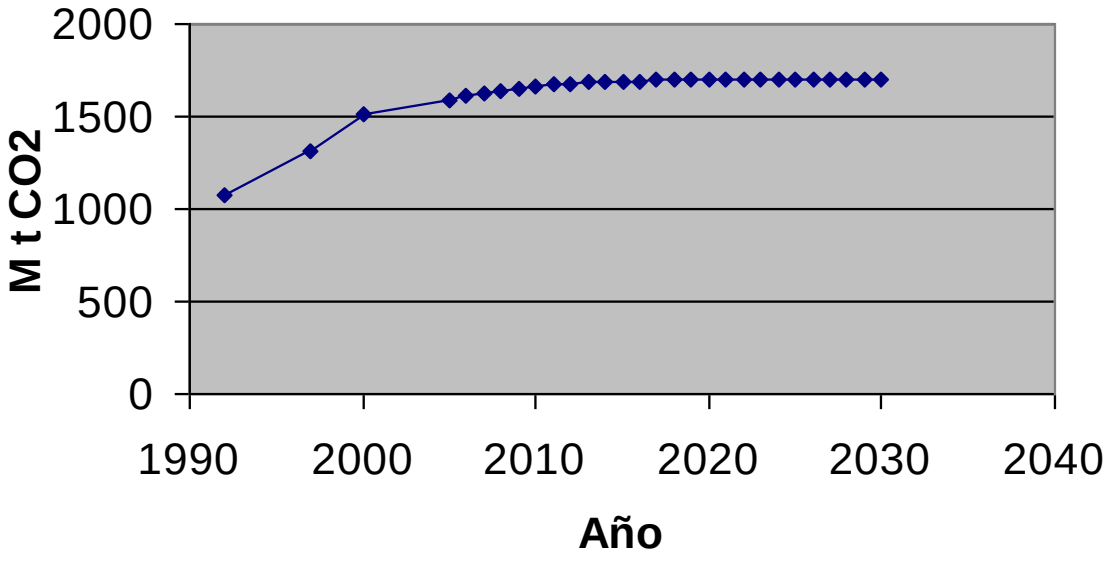

Figura 14: Ejemplo de línea base para cálculo de reducciones de emisiones para Costa Rica. Nivel de detalle 1. Fuente: Ortiz (2010).

Anexo 3a. Fuentes de Información para la estimación de la Densidad del Carbono

El segundo proyecto de carbono basado en la reducción de emisiones debidas a deforestación y degradación lo preparó Costa Rica en 1997, y anteriormente FUNDECOR en 1996 había preparado el Proyecto CARFIX. Ese proyecto se denominó el Proyecto PAP, y fue sujeto a certificación por parte de la SGS Forestry en el mismo año (SGS, 1997). Para el proceso de certificación se pudo hacer las primeras estimaciones de densidad de carbono por ecosistema[25] (utilizando zonas de vida) y estado sucesional (bosque secundarios) así como de tasas de deforestación en terrenos dentro de las ASP y dentro una zona de 10 km a su alrededor (SGS, 1997).

Desde la formulación del PAP se han preparado nuevas fórmulas para estimar biomasa de árboles de los bosque tropicales en Costa Rica, así como de valores y ecuaciones para estimar biomas por hectárea (Fonseca, 2005; Cascante y González, 2008). Los datos de densidad de biomasa arriba del suelo ya validados en el PAP pueden utilizarse para estimar la línea base densidad (stocks) de carbono al 2005 (en t CO2), así como realizar cálculos ex-ante de los stocks de carbono. Por ejemplo, si se asume como línea base una cobertura de bosques del 51% y una tasa de deforestación decreciente según la ecuación mostrada en la **Figura 12** del Anexo 3.

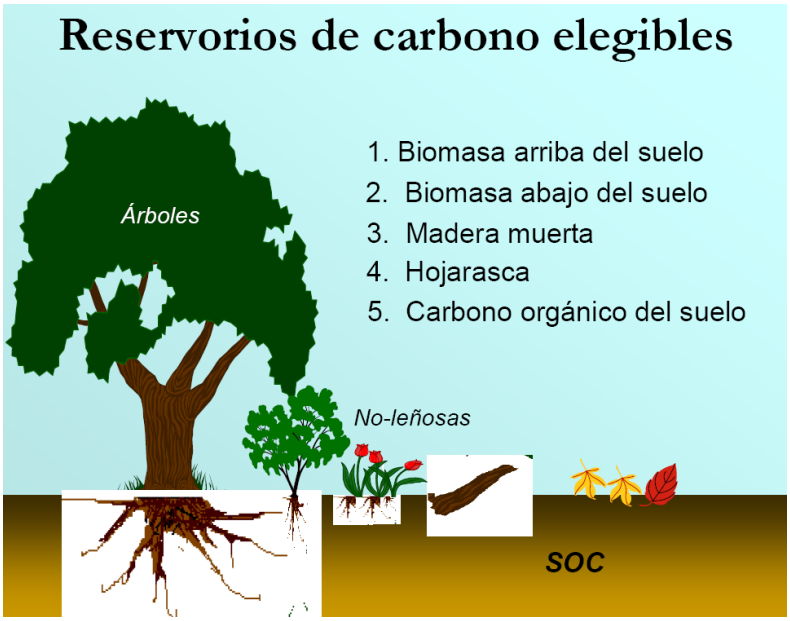

Figura 15: Reservorios de Carbono elegibles para el cálculo de línea de la base y para el sistema de Monitoreo de actividades REDD. Fuente: CATIE 2006. Curso Internacional: Diseño de Proyectos MDL en los sectores

[25] Densidades de Carbono de biomasa viva, es decir biomasa arriba y abajo del suelo

Ecuación 

Donde:

CO_2: es el stock de CO_2 en toneladas de CO_2e acumuladas en T años

CF: es la fracción de carbono

A_i: es el área de cada tipo de bosque al momento de inicio del proyecto en ha (i= 1 a K)

B_i: es la biomasa seca viva[26] por hectárea para cada el tipo de bosque al momento de inicio del proyecto en t bs/ha) (i= 1 a K)

G_i: es el crecimiento medio anual para cada tipo de bosque en t bs/ha/año ((i= 1 a K)

D_i: es la tasa de deforestación media observada para cada tipo de bosque. Di es negativa si en lugar de deforestación existe recuperación de cobertura (i= 1 a K).

T: es el tiempo transcurrido bajo la condición

K: número de tipos de bosques identificados

Los datos que se han recopilado en este trabajo se pueden mejorar usando los datos de parcelas permanentes existentes en Costa Rica, complementados con nuevas parcelas. Para la estimación de biomasa arriba de suelo por árbol, se pueden usar las ecuaciones alométricas existentes (Ortiz, 1997). Estas ecuaciones a su vez pueden mejorarse recopilando datos adicionadas de biomasa arriba de suelo en árboles volteados usando procedimientos estándar como los usando por Ortiz (1989).

Las ecuaciones alométricas de biomasa por árbol permiten calcular biomasa por hectárea para cada una de las parcelas permanentes, datos que a su vez sirven para desarrollar ecuaciones de biomasa arriba del suelo por hectárea, usando variables independientes de rodal de fácil medición, tal como número de árboles, área basal (G), y altura promedio del rodal (Hm), tal como la desarrollada por Cascante y González (2008).

Un paso adicional para obtener estimaciones de biomasa arriba del suelo es relacionar esta variable con mediciones de reflectancia calculadas con sensores remotos multi-espectrales, preferiblemente basados en plataformas satelitales. Este sistema permitiría en última instancia calcular biomasa arriba de suelo usando directamente sensores remotos, lo cual sin lugar a duda reduciría los costos de establecer la línea base y los costo del sistema de monitoreo (MRV).

La biomasa seca debajo de suelo, la cual incluye las raíces, se calcularía usando una razón de biomasa de raíces a biomasa de tallos (R/S ratio) tomado inicialmente de la

[26] Biomasa seca total = Biomasa arriba del suelo + biomasa abajo del suelo

literatura (R/S = 0.26 , Cairns et al., 1997) o los recomendados en el Manual de Buenas Prácticas para LUCLUC del IPCC (2006), o los modificados por Brown et. al. (2007).

Valores de Fracción de Carbono disponibles para Costa Rica:

El valor por omisión de la fracción de carbono recomendado por el IPCC es 0,5 (2003 IPCC-Good Practice Guidance for Land Use, Land - Use Change and Forestry. Chapter 3.2.). Sin embargo, para Costa Rica Cubero y Rojas (1999) encontraron que para diferentes especies de reforestación en Costa Rica es 0,45. No obstante dado que en REDD está relacionado con conservación de bosques naturales es preferible usar el valor de omisión de 0,5. Como parte de las actividades de MRV deberá incluirse actividades para validar el uso de CF=0,5.

Revisión de datos de biomasa por tipo de bosque disponibles para ecosistemas de Costa Rica

Datos de biomasa para bosques primarios en el PAP: Durante la preparación y certificación del proyecto "Protected Areas Project (PAP)", el primer proyecto de reducción de emisiones por deforestación preparado por el Gobierno de Costa Rica bajo la dirección de la OCIC en 1997, y que fue presentado como un proyecto de Implementación Conjunta al Gobierno de los Estados Unidos, se hicieron estimaciones de biomasa seca arriba del suelo usando datos existentes a la fecha: a) parcelas de muestreo b) datos de inventarios forestales c) ecuaciones de biomasa existentes (Ortiz, 1997). Los datos de parcelas provienen de Holdridge et al., (1970). Los datos de inventarios forestales fueron usados para estimar biomasa arriba de suelo usando la metodología propuesta por Brown (1997).

Los datos obtenidos para el PAP se presentan en el cuadro 16. El reporte de certificación de la SGS (1997) indica que los datos de biomasa arriba del suelo en el PAP constituyen una buena aproximación para el primera etapa del proyecto, en la medida de que estos permiten calcular un promedio ponderado con sus respectivos límites de confianza, sin embargo, estos deberían mejorarse a largo plazo usando un sistema de muestreo adecuado.

Tabla 21 Biomasa total (arriba + abajo del suelo) para bosques primarios en diferentes zonas de vida de Costa Rica

Zona de Vida	Biomasa total (t/ha)	SE (t/ha)	N
Bh-T	378,6	77,5	21
Bh-P	320.8	5,8	2
Bmh-T	341,0	24.4	77
Bmh-P	351,9	36,4	28
Bp-P	448,0	77,0	9
Bp-Mb	601,1	63,8	17
Bp-M	509,1	44,1	2

Fuente: Protected Area Project

Para América Latina el IPCC GPG-LULUCF presenta los siguientes valores (en t bs/ha) para diferentes tipos de bosque:

Tabla 22: Valores de Biomasa (en t bs/ha) del IPCC GPG-LULUCF para diferentes tipos de bosque en América Latina

	Bosque Húmedo	Húmedo con estación seca corta	Húmedo con estación seca larga	Secos	Montano Húmedos	Montano Secos
Media	347	217	212	78	234	60
Mínimo	118	212	202	45		
Máximo	860	278	406	90		

Fuente: IPCC GPG-LULUCF

Datos de biomasa para bosques secundarios: Los bosques secundarios se pueden clasificar según su estado sucesional en Bosque Secundario Temprano (de 4 a 10 años), Bosque Secundario Intermedio (de 11 a 30 años) y Bosque Secundario Tardío (más de 30 años).

Esta clasificación es útil ya que a nivel de clasificación de imágenes de satélite, y teniendo una secuencia de mapas de cobertura es posible determinar estos tipos de bosque usando un algoritmo como el usado por Calvo et al. (2006). Calvo (2008) cita

los datos de biomasa para bosque seco Tropical (bs-T) en Guanacaste Costa Rica que se presentan en el Tabla 23.

Tabla 23: Características de tres estadios sucesionales en el Bosque Seco Tropical en Guanacaste, Costa Rica

Variable	Bosque Secundario Temprano		Bosque Secundario Intermedio		Bosque Secundario Tardío	
	x	S	x	S	x	S
Altura dominante	7,5	2.2	10,3	3,4	15,0	2,2
Área Basal	11,7	5,4	21,4	6,8	30,1	6,5
No. árboles/ha	1120	640	1300	350	1070	420
No. Especies/0.1ha	15	7	29	5	29	7
Biomasa (t bs/ha)	56	33	109	46	160	43

Fuente: Kalacska et al. 20004

Fonseca (2005) en un estudio en el Área de Conservación Pacifico Central Costa Rica (ACOPAC) hizo una búsqueda de datos publicados de biomasa y crecimiento para bosques secundarios en Costa Rica. Los resultados generales de esta búsqueda se presentan en el cuadro 18. Adicionalmente, Fonseca (2005) estableció parcelas temporales de medición en diferentes sitios de APOCAC, de forma que tuviera muestras de bosque secundarios de zonas de vida y diferentes estados sucesionales. Los resultados de la medición de estas parcelas se presentan en el Tabla 25. Utilizando estos datos, es entonces posible aplicar la Ecuación 10 para calcular una línea base para las actividades REDD que podría implementarse Costa Rica dentro del marco del FCPF.

Fonseca (2005) señala que lo relacionado a bosque secos los estudios más completos, principalmente en la cuantificación del volumen son los realizados por Spittler (2002 a, b), de los cuales se deduce Tabla 24, que independientemente de la edad, este ecosistema presenta pocas diferencias en su incremento medio anual en volumen, con una ligera tendencia hacia el aumento conforme avanza la edad de la sucesión.

Tabla 24 Resumen de incremento medio anual en volumen y en biomasa encontrado en la literatura.

	Rango de edad (años)			
Tipo de Bosque/ Variable	4 -10	11-20	21-35	Mayor a 36
Bosque secos-Tropical				
IMA Volumen (m^3/ha/año)	2,16	2,54	3,74	2,6
IMA Biomasa (t/ha/año)	1,86	2,19	2,22	2,3
Bosque húmedo y muy húmedo-Tropical				
IMA Volumen (m^3/ha/año)	11,3	8,92	4,79	4,75
IMA Biomasa (t/ha/año)	11,81	9,03	5,8	9,24

Fuente: Fonseca (2005)

Tabla 25: Resumen de incremento medio anual en volumen y en biomasa para bosques secundarios.

	Rango de edad (años)			
Tipo de Bosque/ Variable	4 -10	11-20	21-35	Mayor a 36
Bosque seco-Tropical				
IMA Volumen (m^3/ha/año)	11,22	8,23	7,39	6,93
IMA Biomasa (t/ha/año)	9,07	8,03	7,06	7,68
Bosque húmedo Tropical				
IMA Volumen (m^3/ha/año)	7,61	5,12	12,74	-
IMA Biomasa (t/ha/año)	5,17	5,02	8,83	-
Piso Premontano				
IMA Volumen (m^3/ha/año)	11,3	13,63	17,61	11,3
IMA Biomasa (t/ha/año)	8,81	9,42	11,74	8,81
Piso Montano				
IMA Volumen (m^3/ha/año)	7,20	14,76	10,93	19,68
IMA Biomasa (t/ha/año)	6,16	11,53	11,54	21,55
Promedios Globales				
IMA Volumen (m^3/ha/año)	10,44	9,37	10,24	11,18
IMA Biomasa (t/ha/año)	8,04	7,04	8,67	13,79

Fuente: Fonseca (2005)

Tabla 26: Biomasa total para bosques en diferentes estadios sucesionales en la Península de Osa, Costa Rica

Tipo Bosque	Biomasa Total (t bs/ha)	Desviación Estándar	n
Bosque Primario	255,7	57,5	5
Bosque Secundario >30	134,7	3,9	3
Bosque Secundario 15-30	65,4	22,2	3
Bosque Secundario 5-15	27,7	14,5	3

Anexo 3b. Procedimiento de estimación del Escenario de Referencia basado en la tendencia histórica de los stocks de carbono

Para hacer los cálculos ex – ante de reducción de emisiones se puede usar la metodología usada en el PAP, la cual está basa en la ecuación Ecuación 10. Esta ecuación sirve tanto para estimar los "stocks" de carbono en el escenario base, como para el escenario con proyecto. Para el primer caso los valores de A_i, B_i, G_i, y D_i a usar son los estimados en el escenario sin proyecto, luego se usa la misma ecuación pero con los valores esperados con el proyecto. La diferencia de los "stocks" estimados en ambos escenarios representan las reducciones de emisiones brutas[27] logradas debidas a las actividades REDD. Hay que notar sin embargo, que los valores que van a diferir en ambos escenarios debieran ser D_i y G_i, ya que el área inicial por tipo de bosque (A_i), y la biomasa seca por hectárea (B_i) por tipo de bosque debiera ser la misma en ambos escenarios para obtener resultados consistentes y conservadores. Lo anterior indica que al inicio del proyecto deberían fijarse los valores de biomasa seca y las tasas de crecimiento esperadas para los tipos de bosque (IMA Biomasa viva) para todo el periodo de ejecución del proyecto REDD, como los que se presentan en la revisión de datos de biomasa por tipo de bosque disponibles para ecosistemas de Costa Rica.

Utilizando los datos existentes, y mejor aun, utilizando los resultados de cobertura del 2010 es posible establecer tanto los de stocks de carbono (en t CO2-e) esperados bajo el escenario de "sin Estrategia REDD" como con el escenario de "con Estrategia". La aplicación de la Ecuación 10, se puede hacer a diferentes niveles de detalle. A nivel de detalle más alto, Nivel 3 se requiere de:

Paso 1: Definiciones	Ejemplo de aplicación en Costa Rica
1.1 Establezca la definición de bosque	Bosque: Ecosistema nativo o autóctono, intervenido o no, regenerado por sucesión natural u otras técnicas forestales, que ocupa una superficie de dos o más hectáreas, caracterizada por la presencia de árboles de diferentes edades, especies y porte variado, con uno o más doseles que cubran más del setenta por ciento (70%) de esa superficie y donde existan más de sesenta árboles por hectárea de quince o más centímetros de diámetro medido a la altura del pecho (DAP)
1.2 Defina los reservorios de carbono que incluirá en las estimaciones de biomasa	Biomasa viva total = biomasa arriba del suelo+biomasa abajo del suelo
Paso 2: Estratificación	
2.1 Clasifique los bosque por tipo de protección o tenencia de la tierra	T1: Protección Permanente/Propiedad Estatal T2: Protección Temporal/Reservas Privadas T3: Territorios Indígenas/Territorios Indígenas T4: No protegido/Propiedad Privada

[27] Las reducciones de emisiones (ERs) netas son las emisiones brutas menos el aumento de emisiones de Gases de efecto Invernadero (GEIs) debidas al proyecto menos las fugas (Leakage).

2.2. Clasifique los bosques por zona de vida	Bs-T: bosque seco tropical Bh-T: Bosque húmedo Tropical Bmh-T: Bosque muy húmedo Tropical Bh-P: Bosque húmedo Premontano Bmh-P: Bosque muy húmedo Premontano Bp-P: Bosque pluvial Premontano Bmh-MB: Bosque muy húmedo Montano Bajo Bmh-M: Bosque muy húmedo Montano …
2.3. Clasifique los bosques según estado sucesional	BS1: Bosque secundario temprano BS2: Bosque secundario Intermedio BS3: Bosque secundario Tardío BP: Bosque Primario BI: Bosque Intervenido
Paso 3: Estime las tasas de recuperación/deforestación por tipo de bosque	Para cada posible combinación de Tipo de protección-Tenencia de la tierra-Zona de Vida-Estado sucesional de bosque estime una tasa de recuperación/deforestación (Di)
Paso 4. Estime las Áreas iniciales por tipo de bosque	Para cada posible combinación de Tipo de protección-Tenencia de la tierra -Zona de Vida-Estado sucesional de bosque estime el área inicial del estrato en hectáreas (Ai)
Paso 5. Estime la biomasa inicial por tipo de bosque	Para cada posible combinación de Tipo de protección-Tenencia de la tierra -Zona de Vida-Estado sucesional de bosque estime la biomasa seca por estrato en t bs/ha (Bi) según los reservorios escogidos
Paso 6. Estime las tasas de acumulación de biomasa por tipo de bosques	Para cada posible combinación de Tipo de protección-Tenencia de la tierra -Zona de Vida-Estado sucesional de bosque estime IMA en biomasa seca en t bs/ha/año (Gi) según los reservorios escogidos. Por ejemplo para todo tipo de bosque primario G=0
Paso 7. Defina el valor de Fracción de Carbono	Estime el valor de la fracción de carbono (CF) apropiada para el país
Paso 8. Estime los “stocks” de carbono bajo el escenario base (sin Estrategia REDD)	Utilizando la ecuación 1 estime los “stocks” de carbono (en t CO2) esperados a cualquier año (T) ya hasta una fecha meta, para cada posible combinación de Tenencia-Zona de Vida-Estado sucesional. Luego sume los resultados.

Para aplicar Ecuación 10, a nivel de detalle intermedio o Nivel 2 se podría seguir este procedimiento:

Paso 1: Definiciones	Ejemplo de aplicación en Costa Rica
1.1 Establezca la definición de bosque	(igual que ejemplo en Nivel 3)
1.2 Defina los reservorios de carbono que incluirá en las estimaciones de biomasa	Biomasa viva total= biomasa arriba del suelo+biomasa abajo del suelo
Paso 2: Estratificación	
2.1 Clasifique los bosque por tipo de protección o tenencia de la tierra	T1: Protección Permanente/Propiedad Estatal T2: Protección Temporal/Reservas Privadas T3: Territorios Indígenas/Territorios Indígenas T4: No protegido/Propiedad Privadas
2.2. Clasifique los bosques por Piso altitudinal	B-T: bosque tropical B-P: Bosque Premontano B-MB: Bosque Montano Bajo B-M: Bosque Montano
2.3. Clasifique los bosques según estado sucesional	BS: Bosque secundario BP: Bosque Primario BI: Bosque Intervenido
Paso 3: Estime las tasas de recuperación/deforestación por tenencia de la tierra	Estime únicamente una tasa de deforestación cada posible combinación de Tipo de Protección o Tenencia de tierra (Di)
Paso 4. Estime las Áreas iniciales por tipo de bosque	(igual que ejemplo en Nivel 3)
Paso 5. Estime la biomasa inicial por tipo de bosque	(igual que ejemplo en Nivel 3)
Paso 6. Estime las tasas de acumulación de biomasa por tipo de bosques	(igual que ejemplo en Nivel 3)
Paso 7. Defina el valor de Fracción de Carbono	(igual que ejemplo en Nivel 3)
Paso 8. Estime los "stocks" de carbono bajo el escenario base (sin Estrategia REDD)	(igual que ejemplo en Nivel 3)

Finalmente, para aplicar Ecuación 10, a nivel de detalle general o Nivel 1, se podría seguir este procedimiento:

Paso 1: Definiciones	Aplicación
1.1 Establezca la definición de bosque	(igual que ejemplo en Nivel 3)
1.2 Defina los reservorios de carbono que incluirá en las estimaciones de biomasa	Biomasa viva total = biomasa arriba del suelo+biomasa abajo del suelo
Paso 2: Estime un tasa de recuperación/deforestación general para todo el país	Usando los datos de cobertura estime la tasa o ecuación de recuperación/deforestación nacional (Di)
Paso 3. Estime las Áreas iniciales de bosque	Usando los datos de cobertura estime el porcentaje y área de bosque inicial para el país (Ai).
Paso 4. Estime la biomasa inicial	Estime una biomasa inicial para todos los tipos de bosque en el país usando un promedio ponderado. Si desea ser conservador use el límite inferior de la estimación.
Paso 5. Estime las tasas de acumulación de biomasa	Asuma conservadoramente que las tasas de acumulación de biomasa para todo tipo de bosques es igual a cero (Gi=0)
Paso 6. Defina el valor de Fracción de Carbono	Use el valor recomendado por el IPCC: CF=0,5
Paso 7. Estime los "stocks" de carbono bajo el escenario base (sin Estrategia REDD)	Utilizando la ecuación 1 estime los "stocks" de carbono (en t CO2) esperados de cualquier año (T) ya hasta una fecha meta.

Utilizando el nivel de detalle 1 la línea base para Costa Rica, en término de "stocks" de carbono (en M t CO2) se presenta en el Figura 16. Esta se estimó usando los siguientes datos:

Variable	Valor usado
Tasa de Recuperación/Deforestación:	$D = 2E+173e^{-0,2011* Año}$ (ver sección 3.3)
Área Inicial de bosques al 2005 (51.0%):	2 578 277 ha
Biomasa promedio por tipo de bosque:	374 t bs/ha
Tasa de incremento medio en biomasa(Gi):	0,0
Fracción de Carbono:	0,45

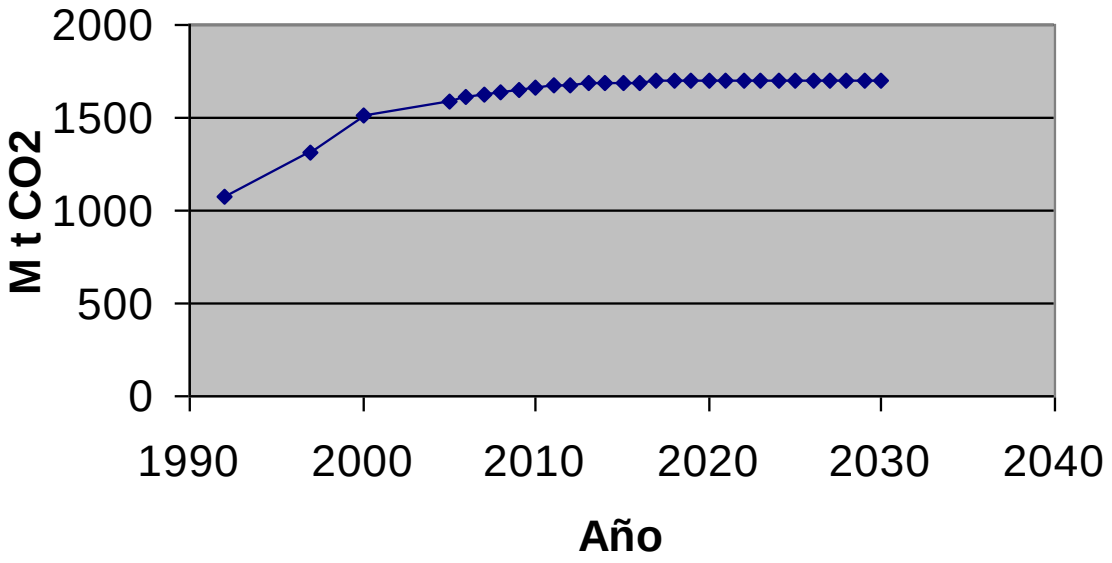

Figura 16 Estimación de la línea base en "stocks" de CO_2 para la estrategia REDD en Costa Rica. Usando Nivel de Detalle 1. Método de tendencia Histórica

Anexo 3c. Procedimiento de estimación del Escenario de Referencia a un año de referencia

Para implementar esta opción existen suficientes datos para el año 2005, y por otro lado la escogencia de este año implica que al país se le estaría reconociendo acciones tempranas REDD acumuladas desde el 2005 a la fecha de inicio de la estrategia REDD. La ecuación para implementar esta alternativa es una variación de la ecuación 1 presentada en la sección 3.4, es esto es:

Ecuación

$$CO_2 = \frac{44}{12} * CF * \sum_{i=1}^{k} A_{it_0} * B_i$$

Donde:

CO_2: es el stock de CO_2 en toneladas de CO_2e para el año de referencia.

CF: es la fracción de carbono

A_{it0}: es el área de cada tipo de bosque estimado para el año de referencia (por ejemplo: 2005).

B_i: es la biomasa seca viva[28] por hectárea para cada el tipo de bosque al momento de inicio del proyecto en t bs/ha) (i= 1, 2, 3,… a K)

K: número de tipos de bosques identificados

La aplicación de la Ecuación 11, se puede hacer a diferentes niveles de detalle. A nivel de detalle más alto o Nivel 3 se requiere de:

Paso 1: Definiciones	Ejemplo de aplicación en Costa Rica
1.1 Escoja el año de referencia	Por ejemplo: 2005
1.2 Establezca la definición de bosque	Bosque: Ecosistema nativo o autóctono, intervenido o no, regenerado por sucesión natural u otras técnicas forestales, que ocupa una superficie de dos o más hectáreas, caracterizada por la presencia de árboles de diferentes edades, especies y porte variado, con uno o más doseles que cubran más del setenta por ciento (70%) de esa superficie y donde existan más de sesenta árboles por hectárea de quince o más centímetros de diámetro medido a la altura del pecho (DAP)
1.3 Defina los reservorios de carbono que incluirá en las estimaciones de biomasa	Biomasa viva total= biomasa arriba del suelo+biomasa abajo del suelo

[28] Biomasa seca total= Biomasa arriba del suelo + biomasa abajo del suelo

Paso 2: Estratificación	
2.1. Clasifique los bosques por zona de vida	Bs-T: bosque seco tropical Bh-T: Bosque húmedo Tropical Bmh-T: Bosque muy húmedo Tropical Bh-P: Bosque húmedo Premontano Bmh-P: Bosque muy húmedo Premontano Bp-P: Bosque pluvial Premontano Bmh-MB: Bosque muy húmedo Montano Bajo Bmh-M: Bosque muy húmedo Montano…
2.2. Clasifique los bosques según estado sucesional	BS1: Bosque secundario temprano BS2: Bosque secundario Intermedio BS3: Bosque secundario Tardío BP: Bosque Primario BI: Bosque Intervenido
Paso 3. Defina el valor de Fracción de Carbono	Estime el valor de la fracción de carbono (CF) apropiada para el país
Paso 4. Estime la biomasa inicial por tipo de bosque	Para cada posible combinación de Zona de Vida-Estado sucesional de bosque, estime la biomasa seca por estrato en t bs/ha (Bi) según los reservorios escogidos
Paso 5. Estime las Áreas iniciales por tipo de bosque	Para cada posible combinación de Zona de Vida-Estado sucesional de bosque estime el área de estrato (A_{it}) para el año de referencia.
Paso 6. Estime el "stocks" de carbono para el año de referencia.	Utilizando la ecuación 2 estime los "stocks" de carbono (en t CO2) para el año de referencia para cada posible combinación de Zona de Vida-Estado sucesional. Luego sume los resultados.
Paso 7. Estime las reducciones de emisiones resultantes de la implementación de la estrategia REDD.	Utilizando los pasos 4 a 6 estime el stock de carbono para cualquier año de implementación de la estrategia REDD. Las reducción de emisiones debidos la estrategia REDD es igual a la diferencia en stocks de carbono con respecto al del año de referencia. Note que los pasos 1 a 5 no se varían para calcular las reducción de emisiones, si se hace algún ajuste en ellos debe de volverse a calcular el stocks de carbono al año de referencia.

Para aplicar Ecuación 11, a nivel de detalle intermedio o Nivel 2 se podría seguir este procedimiento:

Paso 1: Definiciones	Ejemplo de aplicación en Costa Rica
1.1 Escoja el año de referencia	Por ejemplo: 2005
1.2 Establezca la definición de bosque	Bosque: Ecosistema nativo o autóctono, intervenido o no, regenerado por sucesión natural u otras técnicas forestales, que ocupa una superficie de dos o más hectáreas, caracterizada por la presencia de árboles de diferentes edades, especies y porte variado, con uno o más doseles que cubran más del setenta por ciento (70%) de esa superficie y donde existan más de sesenta árboles por hectárea de quince o más centímetros de diámetro medido a la altura del pecho (DAP)
1.3 Defina los reservorios de carbono que incluirá en las estimaciones de biomasa	Biomasa viva total= biomasa arriba del suelo+biomasa abajo del suelo
Paso 2: Estratificación	
2.2. Clasifique los bosques por Piso altitudinal	B-T: bosque tropical B-P: Bosque Premontano B-MB: Bosque Montano Bajo B-M: Bosque Montano
2.2. Clasifique los bosques según estado sucesional	BS1: Bosque secundario temprano BS2: Bosque secundario Intermedio BS3: Bosque secundario Tardío BP: Bosque Primario BI: Bosque Intervenido
Paso 3. Defina el valor de Fracción de Carbono	Estime el valor de la fracción de carbono (CF) apropiada para el país
Paso 4. Estime la biomasa inicial por tipo de bosque	Para cada posible combinación de piso altitudinal y estado sucesional de bosque, estime la biomasa seca por estrato en t bs/ha (Bi) según los reservorios escogidos
Paso 5. Estime las Áreas iniciales por tipo de	Para cada posible combinación de combinación de piso altitudinal y estado sucesional de bosque estime el área de

bosque	estrato (A_{it}) para el año de referencia.
Paso 6. Estime el "stocks" de carbono para el año de referencia.	Utilizando la ecuación 2 estime los "stocks" de carbono (en t CO2) para el año de referencia para cada posible combinación de combinación de piso altitudinal y estado sucesional de bosque. Luego sume los resultados.
Paso 7. Estime las reducciones de emisiones resultantes de la implementación de la estrategia REDD.	Utilizando los pasos 4 a 6 estime el stock de carbono para cualquier año de implementación de la estrategia REDD. Las reducciones de emisiones debidos la estrategia REDD es igual a la diferencia en stocks de carbono con respecto al del año de referencia. Note que los pasos 1 a 5 no se varían para calcular las reducción de emisiones, si se hace algún ajuste en ellos debe de volverse a calcular el stocks de carbono al año de referencia.

La aplicación de esta metodología implica la preparación de cuatro tablas, las cuales deben consistentemente prepararse para cada año de reporte de implementación de la estrategia REDD o evento de monitoreo. Estas tres tablas son:

- Tabla de cálculo de áreas por tipo de bosque
- Tabla de intensidades de biomasa por tipo de bosque
- Tabla de fracciones de carbono general o por tipo de bosque
- Tabla de estimación de biomasa por tipo de bosque y del stock de carbono total (en M t CO2e)

Utilizando el método de stock de carbono aplicado al año 2005, y el nivel de detalle 1, el stock de carbono para Costa Rica sin incluir plantaciones se estima en 1604,69 M t CO2 (ver

). En los Tablas Tabla 27 y

Tabla 28 se presenta la información de base utilizada para hacer las estimaciones. Se uso una fracción de carbono de 0,45 para todos los tipos de bosque.

Tabla 27: Datos de área por tipo de bosque utilizados en la estimación del stock de carbono para Costa Rica para el año de referencia: 2005

		Area (ha)			
Zona de Vida	NOMBRE	Bosque Primario	Bosque secundario temprano	Manglar	Bosque Palmas
bs-T	Bosque seco Tropical	88803	18480	4504	0
bh-T	Bosque húmedo Tropical	286453	59973	12280	3454
bmh-T	Bosque muy hímedo Tropical	479911	18590	1349	5574
bh-P	Bosque húmedo Pre-montano	170412	35244	13447	0
bmh-P	Bosque muy húmedo Pre-montano	513285	34832	10504	12194
bp-P	Bosque pluvial Pre-momtano	350650	8390	0	0
bh-MB	Bosque húmedo Montano Bajo	2792	428	0	0
bmh-MB	Bosque muy húmedo Montano Bajo	56525	4457	0	0
bp-MB	Bosque pluvial Montano Bajo	315027	3868	0	0
bmh-M	Bosque muy húmedo Montano	662	89	0	0
bp-M	Bosque pluvial Montano	104955	698	0	0
Pp-SA[29]	Bosques pluvial Sub-alpino	0	0	0	0
Totales		**2369476**	**185049**	**42084**	**21221**

[29] No califica como bosque según la definición de bosque escogida en sección 3.1

Fuente: Ortiz (2010).

Tabla 28: Datos de Biomasa por tipo de bosque utilizados en la estimación del stock de carbono para Costa Rica para el año de referencia: 2005.

		Biomasa (t bs/ha)			
Zona de Vida	NOMBRE	Bosque Primario	Bosque secundario temprano	Manglar	Bosque Palmas
bs-T	Bosque seco Tropical	160	63,49	80	NA
bh-T	Bosque húmedo Tropical	341	36,19	170,5	136,4
bmh-T	Bosque muy húmedo Tropical	379	36,19	189,5	151,6
bh-P	Bosque húmedo Pre-montano	321	61,67	160,5	NA
bmh-P	Bosque muy húmedo Pre-montano	352	61,67	176	140,8
bp-P	Bosque pluvial Pre-montano	448	61,67	NA	NA
bh-MB	Bosque húmedo Montano Bajo	450	43,12	NA	NA
bmh-MB	Bosque muy húmedo Montano Bajo	408	43,12	NA	NA
bp-MB	Bosque pluvial Montano Bajo	601	43,12	NA	NA
bmh-M	Bosques muy húmedo Montano	308	43,12	NA	NA
bp-M	Bosques pluvial Montano	509	43,12	NA	NA
pp-SA	Páramo pluvial Sub-Alpino	20	NA	NA	NA

Fuente: Ortiz (2010).

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Annex 4: Monitoring System

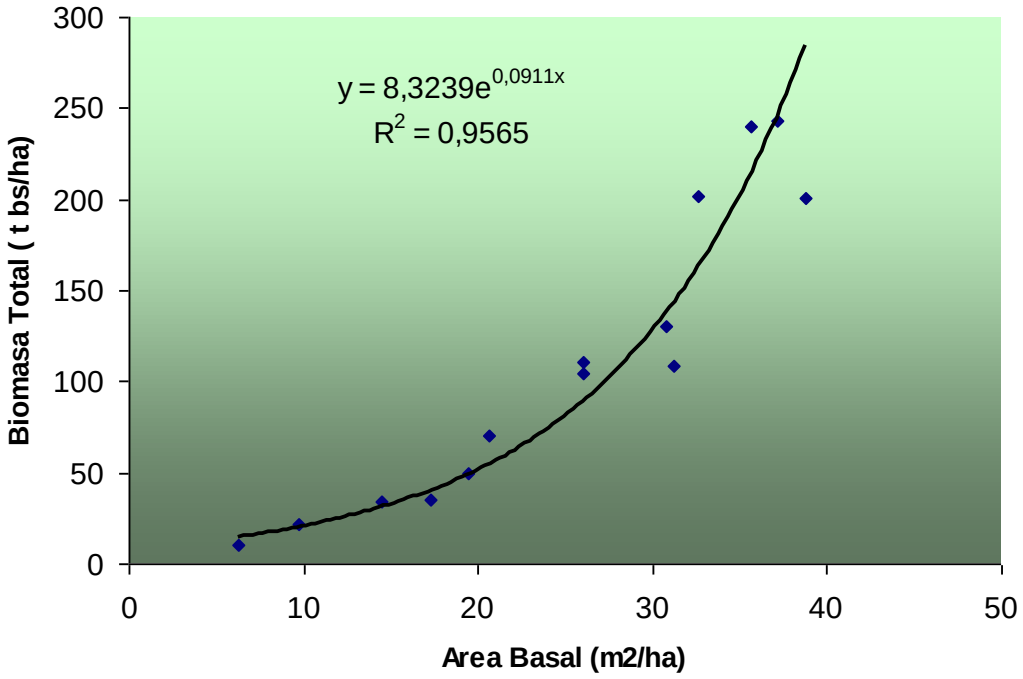

Figura 17: Relación de área basal (G) y biomasa viva arriba del suelo (t bs/ha) para bosques tropicales en Costa Rica

Tabla 29: Evaluación de opciones de monitoreo de los cambios en existencias "stocks" de carbono

Criterio de evaluación	Opción 1	Opción 2	Opción 3	Opción 4
Costo debido a mapa de cobertura	2	2	2	3
Costo debido a mediciones en el campo	4	2	0	1
Evalúa deforestación	4	4	4	4
Evalúa degradación	1	1	4	4
Valor agregado y participación nacional (comunidades, ONGs, etc.)	0	3	4	4

	11	12	14	16

Escala: De 0 a 4, siendo 0 el valor más bajo para evaluar el criterio, y expresa que no cumple o posee el valor más bajo de cumplimiento con lo indicado con el criterio de evaluación, 4 el valor más alto e indica que cumple mejor con la expresado en el criterio.

Tabla 30: Ecuaciones alométricas para la estimación del biomasa seca arriba del suelo (bt en kg/árbol) según grupo de especies en función del diámetro (cm) y altura total (en m) para árboles en un bosque muy húmedo tropical

Grupo de especies	Ecuación	r2	MSE	n	Rango dap	Rango altura
Esciófitas	$bt = 0.01689 * d^{1,6651} * ht^{1,4412}$	0,984	0,0233	40	4-115	7 - 38
Heliófitas y Esciófitas Parciales	$bt = 0.01363 * d^{1,8520} * ht^{1,2611}$	0,974	0,0265	60	12-100	14- 50

Fuente Ortiz (1997). Donde: d = Diámetro a 1,3 m de altura (e cm), ht = atura total (en m), r^2 = Coeficiente de determinación, MSE = cuadro medio del error logarítmico de la regresión, n = número de observaciones, Rango dap = Rango de diámetro de los árboles (en centímetros), Rango altura es el rango de altura de árboles usados para preparar el modelo (en m).

Tabla 31: Ecuaciones alométricas para la estimación del altura total en función del diámetro para árboles y grupo de especies en un bosque muy húmedo tropical

Grupo de especies	Ecuación	r^2	MSE	n	Rango dap
Vochysia	$ht = 3.7802 * d^{0,5236}$	0,9205	0.0069	20	18-93
Esciófitas	$ht = 3.7802 * d^{0,8487} * e^{-0.0040*d}$	0,9330	0.0124	40	4-115
Heliófitas y Esciófitas parciales	$ht = 3.7802 * d^{0,8487} * e^{-0.0085*d}$	0,98958	0.0095	40	12-100

Fuente Ortiz (1997). Donde: d = Diámetro a 1,3 m de altura (e cm), ht = atura total (en m), r^2 = Coeficiente de determinación, MSE = cuadro medio del error logarítmico de la regresión, n = número de observaciones, Rango dap = Rango de diámetro de los árboles (en centímetros).

Tabla 32: "Root to shoot ratios" (R/S) para bosque tropicales

Región	Zona ecológica	Biomasa arriba del suelo (t bs/ha)	R/S	Rango
Tropical	Bosques húmedos y muy húmedos	Menos de 120	0.20	0.09 – 0.25
		Más de 120	0.24	0.22 – 0.33
	Bosques secos	Menos de 20	0.56	0.28 – 0.68
		Más de 20	0.28	0.27 – 0.28

Fuente: Brown et al. (2007).

Table 33: Estructura General de la Matriz de Marco Lógico (MML) a utilizar para el monitoreo de las actividades de implementación de la estrategia REDD.

RESUMEN NARRATIVO	INDICADORES	MEDIOS DE VERIFICACION	SUPUESTOS
Fin (Objetivo General)			
Propósitos (Objetivos específicos)			
Componentes-Productos (Resultados)			
Actividades			
Presupuesto por Actividad			

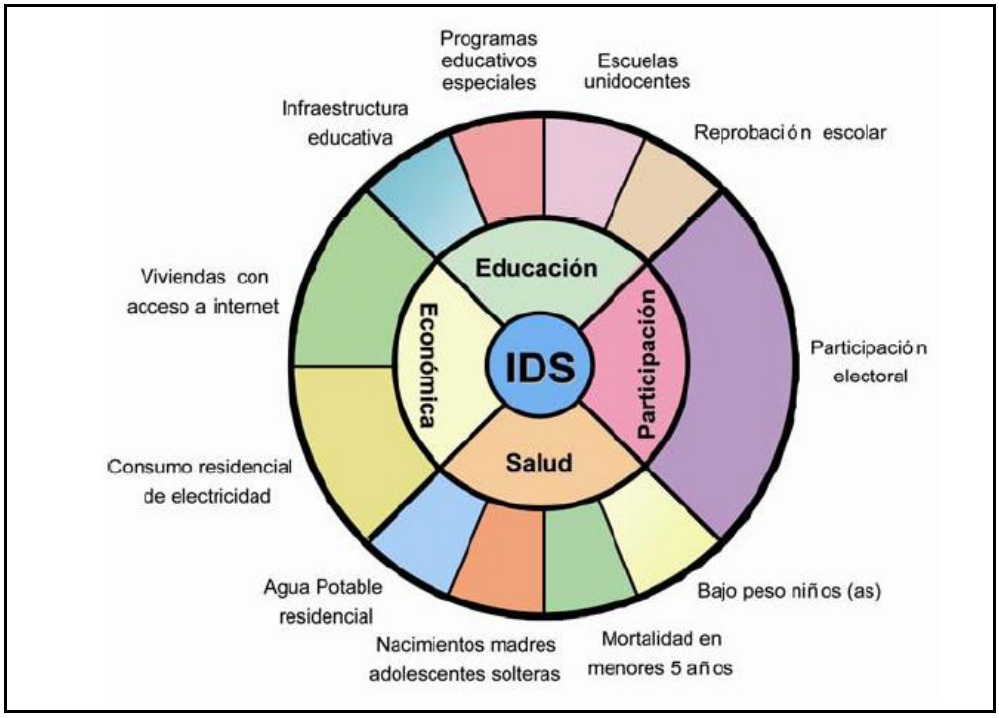

Figure 18: Dimensiones e indicadores del Índice de Desarrollo Social 2007. Fuente: MIDEPLAN (2007)

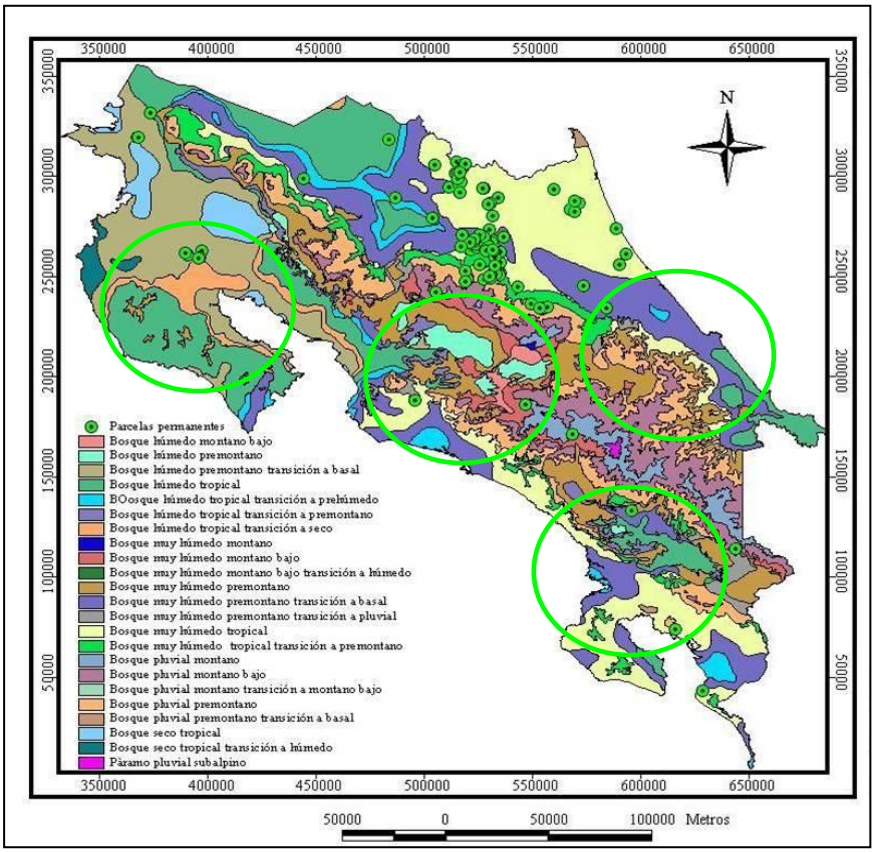

Figura 19: Adaptado de Presentación Power Point. Red de Parcelas-2009

Formato del Reporte de Reducción de Emisiones

Resumen

Abstract

1. Introducción

    1.1 Antecedentes

    1.2 Año de reporte

1. 3 Stocks de carbono en escenario de referencia

1. 4 Stocks de carbono en eventos de monitoreo anteriores

2. Materiales y métodos

2.1 Procedimientos para monitoreo de cobertura de la tierra y cambios cobertura de bosques.

2.2 Procedimientos para cálculo de intensidad de biomasa por tipo de bosque.

2.3 Procedimientos para cálculo de fracción de carbono.

2.4 Procedimientos de monitoreo de implementación de la estrategia REDD.

2.5 Procedimiento de monitoreo de impactos sociales y ambientales.

2.6 Identificación de cambios en la metodología y congruencia con periodos anteriores.

3. Resultados

3.1 Cobertura de la tierra y cambios de cobertura de bosques

3.2 Intensidades de biomasa por tipo de bosque

3.3 Estimación del stock de carbono (en t C02e) para el año de reporte

3.4 Estimación de reducción de emisiones acumuladas y para el periodo

3.5 Avances en implementación de la estrategia REDD

3.6 Impactos Sociales y ambientales

4. Conclusiones

    Evaluación de avances de la estrategia

        Cobertura de bosques

        Reducción de emisiones

        Impactos sociales y ambientales

5. Recomendaciones para próximo periodo

    Recomendaciones para el cálculo de reducción de emisiones

    Recomendaciones para la implementación de la estrategia REDD

Recomendaciones para mitigación de impactos y fortalecimiento de beneficios sociales y ambientales

Recomendaciones para el plan de monitoreo.

6. Bibliografía

Anexos

Información de puntos de contacto y responsables del informe

Localización de parcelas o puntos de muestreo

Información de almacenamiento de datos de campo e imágenes satelitales

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Annex 6: Program Monitoring and Evaluation

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