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CONSULTANT REPORT

Private Financing for Watershed Stewardship in Haiti

NOVEMBER 2009

This publication was produced for review by the United States Agency for International Development. It was prepared by Terra Global Capital under subcontract to DAI.

Private Financing for Watershed Stewardship in Haiti

Program Title:	**Développement Economique pour un Environnement Durable**
Sponsoring USAID Office:	***USAID / Haiti***
Contract Number:	***EDH-I- 00-05-00004-00***
Contractor:	***DAI***
Subcontractor:	***Terra Global Capital***
Date of Publication:	***November 2009***
Author(s):	***D. Kloss, J. Lewis***

PRIVATE FINANCING FOR WATERSHED STEWARDSHIP IN HAITI

A Unique Carbon Sequestration Opportunity

A scoping study submitted to the USAID – DEED Project

Final report **10 Nov 2009**

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Abbreviations

Acronym	Definition
ACES	American Clean Energy Security bill (Waxman-Markey)
ACP	Africa, Caribbean, Pacific Group of States (79, for sustainable development and poverty reduction)
AG	Above ground
AF	Agro-forestry
AFD	Agence Française pour le Développement
AFOLU	Agriculture, Forestry & Other Land-Use
AG	Above Ground
AID	Agency for International Development
ALM	Agricultural Land Management
ANR	Assisted Natural Regeneration
AOP	Agro-forestry Outreach Project
A/R	Afforestation/Reforestation
ASSET	Agriculturally Sustainable Systems and Environmental Transformation
BG	Below Ground
C	Carbon
CASEC	Conseil Administratif de la Section Communale
CARICOM	The Caribbean Community of States
CBO	Community-based organization
CCB	Climate, Community and Biodiversity Alliance (managing a carbon co-benefits standard)
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism of the UNFCCC
CER	Certified Emissions Reduction
CHIBAS	Centro Hispaniola de investigación en bioenergías y agricultura sostenible (research center on bio-energy and sustainable agriculture (Haitian/Dominican NGO)
CIDA	Canadian International Development Agency
CNFA	A US international agricultural economic development consulting organization
CNIGS	Centre National de l'Information Géo-Spatiale d'Haïti (National Center for Geospacial Information Management)
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
CODEP	Coordination of Development and Environmental Groups of Petit-Bois
COLUC	Chinchiron Light Cooperative
CUPEC	Peasants Cooperative Union of CaLouis
COP	Conference of the Parties (throughout here for the UNFCCC)
CRS	Catholic Relief Services
CSR	Corporate Social Responsibility

DAI	Development Alternatives, Inc.
DEED	USAID Economic Development for a Sustainable Environment project
DM	Dry Matter
DNA	Designated National Authority (for UNFCCC); French: *Autorité Nationale Designée* (AND)
DR	Dominican Republic
EDH	Électricité d'Haïti
ERPA	Emissions Reduction Purchase Agreement
FACN	Fédération des Associations Caféières Natives (de Coopératives de Café)
FAO	Food and Agriculture Organization of the United Nations
FAO	Food and Agriculture Organization
FFW	Food for Work
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GoH	Government of Haiti
GS	Gold Standard
GTZ	Gesellschaft für Technische Zusammenarbeit (German Cooperation Agency)
ha	Hectare (100 x 100 meter)
HAP	Hillside Agriculture Program
HTG	Haitian gourde (HTG 40 = US$ 1 in Oct 2009)
IDB, IADB	Inter-American Development Bank
IFM	Improved Forest Management
INARA	Institut National de la Reforme Agraire
km	kilometer
LCLUC	Land Cover and Land Use Change
LUCC	Land-Use and Land-Cover Change (same as LCLUC)
MarChE	Market Chain Enhancement (USAID Project)
MARNDR	Ministère de l'Agriculture, des Ressources Naturelles, et du Développement Rural
Mg, MT	Mega gram, metric ton
MoU	Memorandum of Understanding
MRV	Measurement, reporting, and validation
Msl	Meters above mean sea level
MYAP	USAID Multi-Year Assistance Program
NAPA/PANA	National Adaptation Plan of Action / Programmes d'Action Nationaux d'Adaptation
NGO	Non-Government Organization
NP	National Park
NRM	Natural resource management
PADF	Pan American Development Foundation

PAE	Plan d'Action pour l'Environnement
PD, PDD	Project (Design) Document
PPA	public private alliance
REDD	Reduced Emissions from Deforestation & Degradation
SO	Strategic objective
SOFIHDES	Société Financière Haïtienne de Développement, S.A.
SWC	Soil and water conservation
t	metric ton (see Mg, MT)
TA	Technical Assistance
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USD	United States dollar
USDA	United States Department of Agriculture
USG	United States Government
VCS	Voluntary Carbon Standard
VER	Verified Emissions Reduction
WINNER	Watershed Initiative for National Natural Environmental Resources (USAID project)

Acknowledgements

We gratefully acknowledge funding for this study by USAID through DAI. Terra Global Capital would like to thank all the DEED staff in Haiti for the practical support and personal cooperation during the field visit and beyond.

Special thanks go to Mike Godfrey for his tireless support and availability, Nick Hobgood and Martin Bush, Nadine Loiseau, Nathalie Brunet and Remy at DAI/DEED; Chris Adams and Gregory Groth at USAID; Donald Joseph, Jean Thomas Ferdinand, Jean Serge Antoine, Joubert Sénat, Jean Yves Mesian, Marie Eunide Alponse, Pierre Karly Jean Jeune and colleagues at MARNDR; Jean-Pierre Moïse of the Ministry of the Environment; Gina Procena Menéus and Bobby Pirard at CNIGS; Maurice Wiener and Cédric Brandt at CNFA/MarChE; Jean Robert Estimé at WINNER; Gilles Damais and Lumas Kendrick at IDB; Gregory Mevs and Vladimir Laborde; Jean-André Victor; Tanguy Armand and the Haitian Environment Foundation; Jean and Myriam Duret and James Kishler of the ARN Foundation; Yves-Lauren Régis and Gary Philoctète at CARE; Stephen Reid at ARD; Emmet Murphy, Mathieu Lucius of ACDI Voca; Lionel Isaac, Frank Williams and Julie Tanaka at World Vision Haiti; Greg Elder at CRS; Gael Pressoir at CHIBAS; Joel Ducasse of HSSA; Bétonus Pierre; Dr Jean Palème Mathurin at the Primature; Philippe Boyard at the Audubon Foundation; Amelia Shaw at UN MINUSTAH media; the Zephir brothers at Novella; Patrick Salles at AfD; Alan LeCorps at the Ministère de l'Agriculture and Rob Fisher at Jatropha Pepinyè; Patrick Blanchet at Club Indigo Resort and Alo Haiti; Finnish Ambassador to Mexico and Haiti Ulla Väistö; James Rhoads and Steve Taviner at Food Meds for Kids; Michael Kühn at Agro-Action Allemande; Katharina Hofmann and Dr. Stefanie Hanke at Friedrich-Ebert Foundation; Paul Rodney Henry at Fon Lanbi pou Ayiti; Emilio Barisano at GEOSAT Technology; Martine Deverson at CLED; Serge Cantave and Yves-André Wainwright at the Fondation Seguin; Sylvia Raulo of the Lutheran Church Aid; and thanks to the many representatives from these and other organizations we met.
You helped us tremendously. All errors or omission, however, are solely those of the authors.

Executive summary

Introduction: Haiti's environmental degradation and economic decline can be reversed, but many policies and practices, both in Haiti and from its international partners will have to change drastically. The land tenure, natural resource, and forestry issues Haiti and aid agencies are struggling with today were almost identical to those it faced 20, 30, or more years ago (Murray 1987). In many cases, the same 'new' ideas and fights over the right solutions are tried again, with many of the same arguments.

More than 20 years ago, a systematically overlooked fact was evoked by Murray (1987, Murray & Bannister 2004): economy is more important to a poor farmer than talks of ecology, and only if the environmental benefits are fully aligned with his economic needs can he afford to care enough about long-term environmental impacts. This observation still holds true today and is the basis of conclusions in this report: economic and environmental sustainability can be fostered by payments for environmental services, specifically, carbon offset credits for reforestation or other land uses.

Most of Haiti's foreign aid supporters are seeking a renewed push towards a comprehensive change in land use practices in this country's steep, fragile, and deteriorating watersheds. The neighboring Dominican Republic is beginning to display a systematic recognition of the fact that the fate of its, much less densely populated, watersheds is inextricably linked to that of Haiti's.

As governance reform and economic growth opportunities for Haiti look more promising today than they have in decades, climate change mitigation payments offer an enormous opportunity for this most environmentally abused landscape. USAID looked to its lead natural resources management project, DEED, to plan how international efforts to support adaptation to, and mitigation of, global climate change might be harnessed towards its ongoing watershed stabilization objectives for Haiti. DEED's prime contractor, DAI, sought the help of a landscape carbon asset development concern to recommend a way forward. Terra Global Capital, LLC, was chosen to perform this initial assessment of possibilities.

Principal observations: The Terra Global team found that in the two DEED watersheds and Haiti in general, much like other poor countries, the funding from the sale of carbon credits coupled with donor support for initial project actions before carbon revenues meet funding needs, can be used to: (i) convert suitable hillside farms to sustainable agro-forestry systems (a large enough scale must eventually affect several hundred thousand hectares), and (ii) compensate land-users on unsuitable land to stop agricultural exploitation and convert the areas to forests (through plantations or assisted natural regeneration). In order for this to happen, several conditions need to be met:

Haiti must have a minimum level of capacity to support project approvals and land tenure security to successfully generate carbon revenue from Agriculture, Forestry and Other Land-Use (AFOLU) projects. In addition, implementing organizations in country that are supporting projects need to have strong results-based implementation experts and bring in specialized carbon development expertise early in the design of potential carbon projects. This ensures the design and capacity of the implementing organization and its partners can support the successful creation of carbon credits. This is particularly true for Haiti where the environmental and social circumstances are so challenging, and where the institutional framework and capacity are missing or weak.

Transparent land governance in Haiti has to become the rule: Haiti's failure in land governance has resulted in decades of lax or non-existent urban zoning enforcement, and continuous over-exploitation of insufficiently "owned" slopes in almost all of its upper watersheds for economically minuscule grazing or charcoal revenue, or producers' own use. Most of the efforts of the past did not provide an institutional or legal tenure basis for sustainable land management, which is now necessary in documentable form for international carbon trading. This time though, the opportunities are different-- they are now,

thanks to the international market for *additional* carbon storage credits, increasingly economic, on all levels, from local, to national, to international. If, with initial donor help, Haiti's authorities can get themselves organized to capitalize on Haiti's comparative advantage (Mugnier & Cassagne 2009) for land-based, carbon dioxide (CO_2) and other greenhouse gas (GHG) offsetting investments, then the Haitian legal system and its poorest land managers can also get themselves organized to govern the land more accountably. This requires a much more formal allocation of land use rights and responsibilities than currently operates. The GHG offset value of even the most successful land management improvement cannot be realized without the explicit, government endorsed allocation of long-term rights and responsibilities, to legally incorporated local entities. This is required by reputable GHG offset standards, and particularly demanded by buyers. Beyond its innovative extension of several, economically and ecologically sustainable conservation agriculture technologies, the DEED project is providing a crucial template for identifying what such entities could and should be, depending upon both local institutional circumstances and the national watershed management imperatives.

Recommendations at three intervention levels: Haiti has the sad advantage of extremely low baselines of current biomass, which means in turn a significant potential for selling GHG offsets from land use change projects. In the medium-term this offers considerable revenue potential. However, this sustainable land management incentive from global carbon markets can only be achieved if comprehensive crop marketing, domestic energy and land governance transformations can be achieved at three levels simultaneously:

1. At the ***local*** farm and watershed level, economically viable soil and water conserving perennial (tree) crop alternatives need to be identified, extended, processed and marketed. Domestic fuel sources are one such cropping alternative in extremely high demand. Opportunities identified by our team are: more sustainable wood production for charcoal, timber, food, and other uses; and perennial bio-diesel alternatives (Moringa, Jatropha). In other locations, shade-grown coffee, cacao, and other high- value cash crops provide the highest afforestation incentive. The short-term income and food security costs of such perennial cropping transformations need targeted help from food aid, crop insurance schemes and project based carbon offset revenue. Mayors and chiefs need to be empowered for a transparent process of sanctioning non-participating land owners and/or farmers.
2. At a ***national*** level, land tenure security guarantees for all land managers converting to erosion-controlling perennials, as well as the processing and export of their fruits, need to be facilitated, and formalized. This should be structured by an institution such as the National Agrarian Reform Institute INARA, and put in place by an agency with full executive power. The carbon development can start on a project basis once Haiti's Designated National Authority (DNA) is operational and can approve the first projects. The DNA should then prepare to support future functions required under UN and U.S. cap-and-trade for national carbon accounting. The GHG transparency enabled by the DNA can focus national attention on implementing a comprehensive domestic fuel use transformation policy. Without such a policy implementation success, Haiti will not be able to reverse its environmental and economic degradation. It should feature both, alternatives to charcoal use, such as can come from the perennial bio-diesel crops mentioned above, and the encouragement of only sustainable charcoal production operations. Biomass efficient cook-stoves, particularly those that can simultaneously produce biochar as they release heat for cooking, should be featured here. Potentially, as a soil amendment, biochar could reduce use of chemical fertilizers and sequester carbon. Realizing value from C sequestration from biochar could be a reality in several years.
3. ***Internationally***, Haiti should be a showcase of how poverty can be reduced and climate change mitigated simultaneously. In addition to conspicuous donor support for this transformation of Haiti's landscapes with perennial tree crops, "climate friendly" international niche markets for Haiti's cocoa, coffee, bananas, other fruits, Jatropha products, vanilla and essential oil exports need

to be envisioned. Finally, the international community will need to collaborate with the Haitian Government in monitoring and adjusting the energy and urban forestry requirements of at least the Port-au-Prince watershed. USAID's just initiated WINNER project can merge these rural and urban watershed management necessities.

USAID and other donors have made progress at the first, most *local* level. However, at the second, *national* level, little comprehensive sustainable land management reform analysis and policy implementation has been achieved. Despite recent progress towards political order, donors are understandably preoccupied by more basic governance concerns until rural economic and environmental stability begins to emerge. At the third*, international*, level, despite initial successes, the export of Haiti's coffee, mangoes and cocoa continues to be thwarted by growing competition from other countries. Attention towards new perennial crop exports cannot mask the structural fact that, as coffee and mango exports grew, farm-gate prices shrank, eventually reversing that growth trend. Until international "fair trade" attention can deal with Haiti's structural tendency towards monopsony in agricultural marketing and sustain commodity chain competitiveness at a national level, Haiti's comparative advantage for fruit crops, and, therefore, for AFOLU carbon dioxide offsets from fruit trees, cannot be realized.

Next step recommendations: The DEED project, and USAID in other projects, could take at least four steps in the short term, with its current resource configuration, to expedite this win-win opportunity for Haiti's hillsides and begin the development of carbon projects that can develop income streams for sustainable land management. The first two steps should be the first priority for DEED in this context:

1. Invigorate implementation of DEED results[1] #3 and 4 by initiating two indicative CO_2 offset projects:
    - Afforestation with Moringa (locally called *benzolive*) mixed with other fruit and timber trees, and plantations of Jatropha (Damais et. al. 2007), on long-deforested uplands can qualify for A/R credits with the CDM. The same projects, coupled with bio-diesel fuel switching, complemented by more efficient cooking stove technologies, already under development in the Montrouis watershed, are eligible at the Voluntary Standards (VCS) registry for accreditation as coupled projects.
    - Shade-grown coffee intensification on the higher elevations and shade-grown cacao on the lower slopes of the Limbé watershed could fit within the reforestation protocol of the CDM, as a single project of sufficient scale. This shade-grown "coffee up the hill-cacao down the hill" formula could also be piloted in the Dame Marie watershed, through CNFA & CRS, on a smaller but still adequate scale for buyer interest and CDM accreditation.

The feasibility and rationale for these demonstration pilots is discussed in this report. DEED must succeed with practical solutions to the intractable land tenure issue mentioned above (see also Chapter 4.1 below). The following table presents some very preliminary carbon revenue estimates, based on simplified assumptions and, unless otherwise mentioned, provided at this early stage without regard to costs for the underlying project nor for carbon offset development:

[1] DEED result 3: Alternatives to hillside farming (area under improved management) increased; related result 4: communities' natural resource base protected and production increased

Carbon estimates	Assumptions
	- carbon credit price \$5/MT CO_2e - 30 yr duration - Conversion: 1MT C = 3.664 MT CO_2e - CO_2 stock in plants at start of plantation =0
Moringa A/R in the Montrouis watershed	
10,000 ha * 183 MT CO_2e * 5\$ = about \$8 million	a very general dry biomass average in a 30 year plantation of 100 t/ha (IPCC 2003, Good practice tables), would indicate a total of roughly 183 MT CO_2e/ ha, - including development and marketing costs
Jatropha A/R in the Montrouis watershed	
1,000 ha * 3.76 MT CO_2e * 30 yrs * \$5 = about \$ 560,000 gross revenue	- 1667 trees per ha - 37% of dry biomass weight constitutes carbon - 3.76 MT CO_2 storage per year per ha - before development and marketing costs
Shade cacao A/R in the Limbé watershed	
3,000 ha * 366 MT CO_2e = 1.1 million MT CO_2e sequestered * \$5 = about \$5.5 million gross revenue from carbon sequestration	- 100MT C/ ha for shade cocoa production in Haiti - A portion, e.g., 3,000 ha of the roughly 11,500 ha sparse or medium canopy forest can be planted in shade cacao - before development and marketing costs

2. Secondly, without a capable and fully staffed DNA and a way to track GIS-referenced land-use information for carbon projects (at Haiti's National Center for Geospacial Information Management CNIGS), the costs and risks of turning any carbon opportunity into tradable offsets may be prohibitive. DEED should try to maximize the technical assistance to these understaffed and underequipped entities. DEED has an MoU with CNIGS and is working to bring their expertise to scale: CNIGS should be appointed with the responsibility to prepare for a national GHG accounting capability to support participation in the emerging regulatory systems under the U.S. and UNFCCC. In the short-term, USAID should continue to work through the DEED and WINNER (which just negotiated a support with the Ministry of the Environment) and other projects to strengthen the DNA. These recommendations call for the simultaneous development of national DNA carbon offset oversight capability and the indispensible "learning by doing" capacity-building of the few, nearly "carbon ready" pilot projects.

3. USAID should capitalize on the ground-breaking work of the DEED project to move forward in other project types as well. For example, the WINNER Cul-de-Sac watershed management activities can be combined with a cross-border VCS-REDD, avoided deforestation project, connecting Haiti's Fôret des Pins and Morne La Visite parks with the Sierra de Bahoruco Park across the Dominican border (see page 34 Chapter 5.2 below. This would offer any Haiti Climate Initiative (HCI) five co-benefits: a share of possibly \$24 million carbon offset revenues, employment, unique biodiversity hot spot protection; symbolic cross-border success helps investment promotion; and abating considerable greenhouse gas emissions from continued deforestation. There are strong, local conservation NGOs on both sides of the border, including Fondation Seguin, and ARN, as well as donors and international NGOs willing to provide leverage to such an initiative by USAID's new WINNER project.

4. World Vision, a large international NGO, implements Area Development Projects on both sides of the border in Haiti's Central Plateau and in the Dominican Republic's Artibonito. World Vision Haiti is reviewing its USAID Multi-Year Assistance Program (MYAP) renewal to explore GHG offsetting, community-based a/reforestation alternatives in this particularly poor area: Jatropha bio-diesel, construction wood, sustainable charcoal production, fuel-efficient stoves, and some shade coffee. USAID should encourage feasibility work on these alternatives to proceed.

1 Context for the Report

1.1 Haiti's Background as it Relates to the Carbon Opportunity

Haiti's environmental resource base continues to deteriorate rapidly in the past decades. Forest cover, diminished from about 65% in 1500 to 40% in 1900, now accounts for just 3% of the land area. The decline was mainly caused by inappropriate farming and a lack of coordinated land use planning, which became unsustainable as population increased. The most productive lands are not used to their full potential and are often lost to housing, salinization or land tenure conflict. The unstable hillsides are exploited intensively and haphazardly by peasant farmers for erosive annual crops. Haiti has the highest population density in the western hemisphere and one of the highest population growth rates; it is heavily dependent on imports for basic staple food. Even agro-forestry based tree cover has been lost when mangos and then coffee became unprofitable and thus were cut down in favor of marginally profitable annual crops. Haiti's forests and biodiversity remain extremely degraded. Forest areas within and outside of protected areas account for less than 21,000 hectares.

A stable environmental resource base is a prerequisite for economic and political stability. The U.S. Agency for International Development (USAID) in Haiti focuses on environmental fragility and vulnerability to natural disasters, notably floods (which regularly kill several thousand people, most recently in 2004 and 2008). USAID has selected degraded, but potentially productive, watersheds as one of two key areas of geographic focus, Limbé in the North Department and the river systems around Montrouis in the West Department. This was based on findings that, while important, the primary reasons for environmental degradation are not land tenure insecurity or fuelwood supply for charcoal production, but (1) the sheer pressure of hillside farmers and their reliance on the production of annual food crops that cause soil erosion, (2) extensive de-capitalization of the rural sector which leads to low productivity, and (3) the overall absence of viable production or livelihood alternatives. A review of the environmental vulnerability in Haiti found that the two watersheds represent or exceeded the typical level of these problems in Haiti (Smucker et al. 2007), and both have very different agro-climatic and socio-economic conditions that help to provide an example for even more areas in the country.

Since 2007 the USAID Economic Development for a Sustainable Environment (DEED) project has focused on providing an alternative to the previous models of natural resource management (NRM) projects in these two watersheds. DEED establishes a market-based approach that integrates improved management of lands and other natural resource assets with expanded enterprise and job opportunities in the production of suitable high-value crops, creating livelihood options for hillside farmers currently trapped in continued poverty. Payments for environmental services, such as carbon offsets, can be one such market-based revenue mechanism.

1.2 This Report

The report presents the findings of a two week scoping mission by Terra Global Capital, LLC with the objective to evaluate the potential and scope the design elements for developing carbon offset projects from land use change with a focus on the DEED funded project actions and assessing the institutional capacity needed in Haiti to support it. It examines opportunities for Haitian farmers, the private sector and public agencies to engage in "carbon positive" land-based activities and access the emerging carbon markets as a way to generate income streams. The opportunities and mechanisms for implementing such schemes in Haiti were unclear so far.

During the in-country assessment and review, the team met the governmental agencies and implementing partners in Port-au-Prince, fielded visits to a selection of the targeted DEED project areas,

and interviewed relevant government agencies (ministries, local offices, extension staff), representatives of local population, non-governmental organizations and others (see meetings in Annex 1).

The main challenge for generating income from carbon credits is the lack of coordinated projects of sufficient scale that have suitable implementing organizations. These will then also need local enabling, approvals and oversight capabilities within the key government departments to act as a functioning designated national authority or approval focal point for carbon projects. Without this no local initiative can reach a global offset market.

Through the team's in-country visit and completing this assessment, the first important steps to identify these limiting factors and provide an assessment of the viability and potential benefits of land-based carbon offset opportunities in Haiti is complete.

2 Carbon Market Overview for Land-use Projects

While international carbon markets continue to develop and evolve, it is becoming increasingly clear that carbon offsets generated from Agriculture, Forestry and Other Land-Use (AFOLU) activities must be an essential component of any national or international emissions reduction scheme. A carbon offset is a greenhouse gas emissions reduction or removal that is used to compensate or offset the emissions from other activities. Offsets can be purchased by countries, companies or individuals. A key criterion for an offset is that its greenhouse gas reduction is "additional"; that it would not have occurred under a business-as-usual scenario. To ensure that this requirement and other critical measurement elements are sound, emissions reduction projects are implemented according to guidelines established by a number of carbon market standards. These standards ensure that projects are implemented using a standardized set of rules, and the value of and demand for the resulting offsets is influenced by the standard under which a project is developed. A few notable carbon market standards are discussed in detail in Sections 2.2 and 2.3.

According to current estimates, deforestation and its associated land degradation contribute to as much as 18% of annual GHG emissions around the globe. Agriculture contributes at least another 12%. AFOLU emissions and are not limited only to the CO_2 released when a field is tilled; but include: methane (CH_4) emissions generated from livestock, over-irrigated rice paddies, and nitrous oxide (N_2O) emissions when chemical fertilizers are applied to fields already too infertile to absorb it. A unique characteristic of AFOLU projects is that they provide an opportunity not only to reduce emissions but to sequester, or remove, carbon from the atmosphere. New vegetation can be introduced into areas where it has been removed or degraded, increasing the amount of carbon sequestered. The Inter-governmental Panel on Climate Change (IPCC 2006) that to avoid catastrophic effects of climate change, it will be necessary not only to protect existing land cover, but to at least triple the existing amount of bio-sequestering vegetation and soil organic matter (SOM). Thus, AFOLU carbon projects offer the opportunity to be a meaningful part of the climate change solution.

Financial flows from the sale of carbon credits are a significant potential revenue source. The total value of the carbon markets doubled between 2007 and 2008. Yet while regulatory markets reached US$126 billion, the voluntary markets totaled just over US$700 million in 2008 (Ecosystem Marketplace, 2009). Still, in 2008, developing countries received over $7 billion from the sale of about 389 million primary CER (i.e., CERs purchased directly from entities in developing countries or pCERs) carbon credits (World Bank 2009: 2). This private capital could increase substantially with the expected establishment of a US cap-and-trade system with an estimated at least doubling of demand from international offsets (EPA 2009). Additionally, if the EU accepts a new international agreement that it will adopt a stronger target of 30% below 1990 levels by 2020, additional demand of about 300 $MtCO_2e$ per year over 2013-2020

(World Bank 2009) will be created. The demand from the U.S. and EU combined will create an opportunity for developing countries to scale-up their supply of emission reduction offsets. To date, very few of these offset project were from land-use carbon, which is expected to change in post Kyoto and under a U.S. cap-and-trade system.

The Clean Development Mechanism (CDM) is a Kyoto Protocol mechanism under the United Nations Framework Convention on Climate Change (UNFCCC) allowing industrialized countries with a greenhouse gas reduction commitment to purchase offsets from projects that reduce emissions in developing countries. This facilitates cost-effective emission reductions and the opportunity for developing countries to receive payment for reduced emissions. While so far the majority of carbon offsets were from the clean energy and other industrial areas, there is a significant potential for forest carbon offsets in this market.

In addition to the compliance market, an increasingly active voluntary market has developed, in which corporations and individuals purchase offsets as an expression of their social responsibility. Given its almost completely deforested and degraded landscape, Haiti has a very low baseline of carbon storage, and might be able to develop a substantial volume of carbon revenue from reforestation and other improved land use.

2.1 AFOLU Carbon Project Types

AFOLU projects focus on activities in forests and on farms that can reduce emissions or increase sequestration. There are a number of AFOLU carbon project types, including the following main categories:

- Avoided Deforestation / Reduced Emissions from Deforestation and Degradation (REDD): the protection of existing forests and reduction in emissions from activities that deforest and degrade forestlands
- Afforestation/Reforestation (A/R): the process of restoring/replanting forests on land that was once forested but, for reforestation, was below the national forest threshold (crown cover, tree height and minimum land area) as communicated by the respective DNA since at least 31 December 1989, or, for afforestation, for a period of at least 50 years (UNFCCC 2005)
- Improved Forest Management (IFM): including activities such as reduced impact logging, extension of rotation age, and conversion of low-productive forests to high-productive forests
- Agricultural Land Management (ALM): increasing carbon stocks on cropland and grasslands and/or decreasing CO_2, CH_4 and N_2O emissions from soils.

Possibly the most fast-acting in terms of avoiding climate change of these project categories, is REDD. REDD projects provide carbon offsets for the protection of forests, and provide a mechanism to allow funding from developed nations to assist in the protection of native forests in developing nations. Deforestation can be avoided either by making direct payments to halt for forest conversion, or by promoting sustainable use of forest resources. REDD projects are currently only recognized under the voluntary carbon markets, as the regulatory carbon markets established by the Kyoto Protocol allow only A/R land-use projects. It is expected that REDD, will be included in post-Kyoto (which is set to expire 2012) climate agreements.

2.2 Regulatory Markets

Regulatory, or “compliance”, regimes are mandatory GHG emissions reduction requirements typically enacted and driven by national and international regulations. Regulatory emissions trading regimes work by distributing or auctioning a fixed number of “allowances”, essentially permits to pollute, to capped GHG emitters. If an entity is unable to emit less GHGs than their cap allows, that entity must

either purchase excess allowances from another capped emitter, or, offset credits from carbon projects. Presently, the scope of allowable AFOLU projects in regulatory markets is limited only to A/R under the Clean Development Mechanism (CDM), but AFOLU is increasingly gaining recognition as a project-category that is too important not to include in future climate agreements. Strong signals were sent at the UN negotiations in Bali in 2007, and in subsequent meetings, that a wider integration of REDD carbon projects in the regulatory markets will be a key component of ongoing emissions reduction efforts. Climate legislation in the United States in 2009 also gave emphasis to AFOLU carbon projects both in the United States A/R and REDD specifically international REDD as defined by the VCS. A summary of a few key regulatory carbon regimes relevant for Haiti is found below:

2.2.1 Clean Development Mechanism

The Clean Development Mechanism, perhaps the best known and most-utilized of all regulatory emissions reduction systems, was established through the Kyoto Protocol as a way to enable the development of emissions reducing projects in developing countries. Overseen by the United Nations Framework Convention on Climate Change (UNFCCC), the CDM allows projects to earn Certified Emissions Reductions (CERs), equal to one ton of CO_2, which can be purchased by capped emitters to satisfy emissions reduction requirements under Kyoto. The European Union Trading System (EU-ETS) covers more than 11,000 energy-intensive installations throughout the EU and has been in operation since 2005. The EU-ETS is the first multi-national system for trading CO_2 emissions and allows the use of CERs to meet capped requirements with limitations on the number and type of CERs that may be used.

At present, there are more than 1800 CDM-registered projects, covering some 25 project types or technologies, such as renewable energy and industrial gases. However, the CDM currently only recognizes A/R projects as an eligible land-use change project type, and only 8 such projects have been registered under the CDM to date. There are currently no CDM projects registered in Haiti, and a Designated National Authority (DNA), which sets country-specific regulations and approves projects, has yet to be formally ratified by government and communicated to the UNFCCC. In addition, the DNA must specify the forest definition that is to be adopted by the country, within the allowable guidelines. The establishment of a DNA is a prerequisite to CDM project implementation, and is discussed in Section 3.1.

2.2.2 Other National and Sub-Regional Carbon Market Initiatives

There are a number of initiatives creating national or regional carbon markets. These regional initiatives can often serve as models for the creation of larger-scale carbon markets. Among these are:

- Regional Greenhouse Gas Initiative (RGGI): the first mandatory, market-based effort in the United States to reduce GHG emissions, consisting of ten northeastern states seeking to reduce emissions from the power sector 10% by 2018
- The Global Warming Solutions Act of 2006 (AB 32) requires that by 2020 the Californian emissions of the 6 greenhouse gases be reduced to 1990 levels, bringing the state into near compliance with the provisions of the Kyoto Protocol
- New South Whales GHG Reduction Scheme (GGAS): sets state-wide GHG benchmark for electricity sector. The GGAS is expected to be replaced by an Australian cap-and-trade system.

While these regional initiatives are somewhat small in scope, they demonstrate a clear intention on the part of sub-national and regional governments and polluting entities that emissions regulations are necessary and important enough to enact without the aid or approval of national-level government. Other than the inclusion of a handful of Mexican states as “observers” in the WCI, there are currently no such regional or sub-national schemes in Latin America.

2.2.3 Emerging cap-and-trade legislation in the United States

The passage of the Waxman-Markey American Clean Energy Security (ACES) bill in the U.S. House of Representatives in June 2009, and the continuing negotiation of its counterpart version Kerry-Boxer in the U.S. Senate, introduces an important new opportunity for international GHG offsets – particularly from AFOLU projects. At the core of these bills is the creation of a cap-and-trade system in the United Sates, which has thus far been notably absent from the Kyoto compliance markets. Given the size or the caps being proposed in this economy wide scheme, the demand for international offsets would increase significantly from current levels. Offset credits from Haiti could be eligible through most of its proposed international offset windows, with both, A/R and REDD specifically allowable.

2.3 Voluntary Markets

The key distinction between regulatory and voluntary carbon markets is that the entities operating under the latter are not required by any external law or regulation to reduce their GHG emissions. Voluntary carbon markets emerged as a way for businesses or private entities to compensate for their carbon emissions by acquiring carbon offsets from various voluntary retailers and project developers. While the main purchasers of voluntary carbon offsets remain Corporate Social Responsibility (CSR) buyers, the voluntary carbon markets have emerged as a small but fast-growing segment of the carbon market. These will never be as sizable as the potential regulatory market but they can provide valuable funding to projects through their offset purchases. A pre-compliance market is emerging, as investors and major emitters, especially those anticipating future emissions regulations in the United Sates, have begun purchasing and banking offsets that can be used once a compliance market is established.

Carbon offsets generated from AFOLU projects are becoming increasingly desirable to voluntary carbon buyers, as these projects often offer invaluable biodiversity and social benefits in addition to their net-carbon sequestration benefits. A number of standards exist within the voluntary carbon market and CDM market, each with project type eligibility and emissions reduction quantification requirements. The robustness and perceived strength of these requirements translates into relatively higher prices for offsets in the marketplace.

2.4 Carbon Market Standards and Protocols

To sell on either the compliance or most recognized voluntary carbon markets, project owners and developers must choose the appropriate standards and their protocols or methodologies under which to submit and register their projects.

2.4.1 CDM A/R Methodologies

The most relevant CDM methodologies for the carbon opportunities examined here for Haiti are Afforestation and reforestation of degraded land, Restoration of degraded lands through afforestation/reforestation, Reforestation or afforestation of land currently under agricultural use; Afforestation and reforestation project activities implemented for industrial and/or commercial uses; Afforestation/Reforestation with Trees Supported by Shrubs on Degraded Land ; Afforestation and Reforestation of Land Currently Under Agricultural or Pastoral Use; Afforestation or reforestation on degraded land for sustainable wood production; and Afforestation or reforestation on degraded land allowing for silvo-pastoral activities. The choice or adaptation of a suitable methodology is one of the key tasks for which a project should work with an experienced carbon development partner like Terra Global.

2.4.2 Voluntary Carbon Standards

The Voluntary Carbon Standard (VCS) is one of the most respected and utilized voluntary carbon standards in the market today, and provides a robust set of carbon accounting and eligibility standards for carbon projects. Many project categories are eligible under the VCS, including AFOLU project activities such as REDD, A/R, IFM and ALM. The VCS requires the development of project-specific methodologies, documents that define the measurement and monitoring criteria for how emissions reductions are quantified. Methodologies that have been developed for CDM projects are also eligible for use under the VCS. The VCS also requires that all methodologies and projects undergo a double approval process, wherein two 3rd party validator organizations conduct an independent assessment. This assessment must be completed and approved before offset credits, known under the VCS as Voluntary Carbon Units (VCUs), can be issued. In order to insure against reversals of carbon stocks, an issue known as “permanence” that must be taken into consideration with all AFOLU carbon projects, the VCS maintains a “buffer pool”- an account of credits into which all projects must deposit a certain percentage of total carbon credits. This percentage is based on a risk determination tool which assesses a number of project-specific risks, and can vary widely from project to project.

To date, no VCS projects have been implemented and registered in Haiti. However, unlike the CDM which requires that a DNA to be in place to approve carbon projects, the VCS maintains no requirements regarding governmental as approval, beyond any government approvals for project actions, as a precondition for project development. Haiti would be an ideal candidate for implementation of an AFOLU project under the VCS, provided that sufficient in-country support from NGOs and governmental authorities could be procured in support of a project. The preconditions for carbon project development are discussed in detail in Sections 3.1 and 3.2.

2.4.3 Gold Standard

The Gold Standard is an independent standard for creating emission reductions projects in the Clean Development Mechanism (CDM), Joint Implementation (JI) and Voluntary Carbon Market. It was designed to ensure that carbon credits are not only real and verifiable but that they make measurable contributions to sustainable development worldwide. Its objective is to add branding, a label to existing and new Carbon Credits generated by projects which can then be bought and traded by countries that have a binding legal commitment according to the Kyoto Protocol. The Gold Standard for CDM (GS CER) was developed in 2003 by World Wide Fund for Nature (WWF), SouthSouthNorth, and Helio International. The Voluntary Gold Standard (GS VER), a methodology for use within the voluntary carbon market, was launched in May 2006.

Eligible projects must: (1) be an approved Renewable Energy Supply or End-use Energy Efficiency Improvement project type; (2) reduce one of the three eligible GHG CO_2, CH_4 and N_2O; (3) not employ Official Development Assistance (ODA) under the condition that the credits coming out of the project are transferred to the donor country; (4) not be applying for other certifications, to ensure there is no double counting of Credits; (5) demonstrate its 'additionality' by using the UNFCCC Large Scale Additionality Tool and show that the project is not a 'business-as-usual' scenario; (6) make a net-positive contribution to the economic, environmental and social welfare of the local population that hosts it. The Gold Standard is headquartered in the BASE (Basel Agency for Sustainable Energy) offices in Basel, Switzerland, with offices in Geneva, Rome and San Francisco.

The GS VER does not include a methodology on forestry or other land use change projects. However, it is currently the only standard with a methodology on fuel efficient stoves, which makes it relevant for some of the Haiti carbon project opportunities discussed in this study.

2.4.4 Climate Action Reserve

The Climate Action Reserve (CAR), which evolved from the California Climate Action Registry (CCAR) which started in 2001, is a national offsets program in the United States which maintains a set of requirements and guidance, similar to the VCS, for implementing carbon projects. Currently the CAR Forest Project Protocol, finalized in September 2009, is only applicable to projects in the United Sates. Eligible AFOLU project categories under CAR include Reforestation, Avoided Conversion and Improved Forest Management. It is expected that CAR, with its robust standards for carbon accounting, will become a model for how carbon projects are implemented in the United States under a regulatory cap-and-trade system. Unlike the VCS, which requires that a methodology be created to quantify emissions reductions for each project, all information on quantifying GHG reductions and removals and project monitoring are contained within the protocols. The CAR issues offset credits known as Climate Reserve Tons (CRTs) and maintain a transparent system to allow for the tracking credit transactions.

As the CAR Forest Project Protocols are currently only eligible for projects within the United States, no carbon projects in Haiti would be eligible for registration using these standards. However, as there is evidence in the emerging climate change legislation in the United States that the CAR protocols could be used as a model for how AFOLU projects are implemented and accounted for in a Federal cap-and-trade system, the CAR protocols should not be discounted. It is worth noting that the CAR was the first GHG program in the United Sates to be approved by the VCS. Additionally, there are some synergies between the CAR and VCS, as CRTs can be converted to VCUs for use under the VCS (but not vice versa).

2.4.5 Climate, Community and Biodiversity Standards

The Climate, Community and Biodiversity (CCB) standards aim to promote AFOLU projects that provide measureable co-benefits (in addition to GHG benefits) that support sustainable development, improved livelihoods, and conserve biodiversity. The CCB standards are often implemented alongside the VCS or CDM standards, and the addition of CCB certification is often attractive to carbon buyers, resulting in a higher price per ton for CCB-certified projects. CCB-certified projects have been implemented or are undergoing validation in many Latin American countries (Panama, Nicaragua, Brazil, El Salvador, Peru, Costa Rica).

3 Carbon Readiness & the Carbon Development Process

While each of the standards and regimes discussed in Sections 2.2 and 2.3 maintains their own criteria for how a project must be developed, there are a fairly consistent set of procedures required to develop an AFOLU carbon project. However, before a project can even consider or engage in seeking carbon revenue, there are a number of preconditions that must be present in-country both at the government level and project level. Lacking these preconditions, AFOLU carbon projects, no matter how well conceived or intentioned, are bound to fail.

3.1 Carbon Readiness at the Government Level

A key component of carbon readiness is government awareness and support of in-country carbon projects. It is the responsibility of the project-developer to ensure that appropriate local and/or national level government agencies and authorities are made aware of project activities and provide the necessary approvals. For CDM projects, the main governmental agency that must be notified is the DNA. For voluntary projects, it is often more ambiguous. To date, Haiti does not have a registered CDM project, or a voluntary market project, in part due to a lack of governmental capacity.

3.1.1 Role of the Designated National Authority

The establishment of a DNA is a key component of participation in the compliance market shaped by the UNFCCC and the CDM. To date, although Haiti has ratified the UNFCCC's Kyoto Protocol, and has a national focal point in the Ministry of Environment, Haiti does not have a DNA operational as required to generate CDM credits. In countries with an operational and well-functioning DNAs, the DNA typically performs the following functions: 1) market in-country carbon opportunities, 2) provide valuable introductions between implementing partners within the country, 3) set procedures and processes for projects to gain necessary DNA and other government approvals, 4) have standardized costs for providing support to carbon projects, 5) have tracking systems to manage the oversight of carbon project within their country, 6) setting forest definitions under the Good Practice Guidance for Land Use, Land-Use Change and Forestry, and 7) in some cases they have some level of technical expertise to support the carbon development process (see next Chapter).

This support gives organizations working in-country that have potential carbon projects the ability to efficiently gain the required approvals and begin the carbon development process. Voluntary projects are not required to consult with the DNA before implementation, but the infrastructure and functions provided by the DNA makes the development and implementation of a voluntary carbon project significantly less cumbersome. Even for credit sales to the voluntary markets, host country government approval is normally required by buyers. Regardless of the specific role of the DNA and how the responsibilities for carbon are shared among other governmental agencies, to successfully generate carbon revenue from AFOLU projects, the country must have a minimum level of capacity to support project approvals and land tenure security. Laws and regulations regarding ownership of resources and usage vs. ownership rights must be in place and enforceable.

The role of the DNA versus other governmental agencies tends to vary by country, as do the organizations which make up its structure. Some countries maintain a DNA that is purely composed of governmental authorities (for example El Salvador, Argentina, Bolivia and Paraguay in Latin America), while the DNA in other countries (Costa Rica, for example) is composed of both public, private and NGO interests (Figueres 2002).

A further issue that must be decided at the government level is the rules for carbon ownership, and how these rules interact with current land tenure and usage rights schemes. Some countries, most notably Indonesia, have created guidelines that establish ownership, set approval procedures, and specify rules for the sharing of revenues from AFOLU carbon projects between the project developers, communities and government. A key benefit of these rules is that they help to increase the transparency of projects.

In many countries, the government capacity has been built in a 'learn by doing' manner. Due to the expected rapid growth in the carbon markets, the development of some pioneering Agriculture, Forestry or Other Land Use projects under DEED would greatly advance Haiti's ability to capitalize on the carbon markets as they expand. However, in order to take advantage of these potential revenues, Haiti will need to ensure its projects comply with expected outcomes from the meetings in Copenhagen, Denmark in December 2009 on a post-Kyoto treaty and the proposed U.S. federal legislation.

3.1.2 Towards a Haitian DNA

Haïti signed the United Nations climate change convention in 1992 and ratified it in 1996; it entered into force on 26 December 1996. However, Haiti's Designated National Authority for the UNFCCC (DNA) has been under preparation for several years. It was already heralded by some sources as one of the accomplishments of the Environment Ministry's first 100 days in November 2006 (Trofort 2006), announced as soon coming at the thematic session of the United Nations General Assembly in January

2008 (Germain 2008), and reported as established by a World Bank mission in July 2008 (Thioye 2008). However, in discussions with the climate change focal point (Jean-Pierre Moïse 2009) it appeared that the necessary decree had not yet been passed by the Environment Minister and the Prime Minister. The World Bank team seemed to have found in place or provided all necessary elements of a DNA, representation of relevant institutions, and technical understanding of the focal point secretariat. The final step in establishing a Haitian DNA is the signature of the Haitian Minister and Prime Minister. A coordinated offer of support by USAID, IaDB, and World Bank could possibly help to attain the required signatures and effectively create a DNA before the UNFCCC conference of the parties COP-15 in December 2009.

A list of the main functions of a DNA has been provided in Section 3.1.1. While this is not an exhaustive list, it provides a good overview of the tasks and responsibilities that a Haitian DNA should work towards in order to maximize its effectiveness. These key competencies should be developed to provide assistance to carbon projects Haiti including:

- *Market in-country carbon opportunities*: Carbon projects are being developed in many countries throughout the world, and attracting developers and investors to projects will become increasingly competitive as the carbon market continues to develop and as AFOLU projects become more attractive. Projects and countries which can distinguish themselves in the market will have a distinct advantage. Haitian authorities, and ultimately a Haitian DNA, should attempt to attend as many international conferences and workshops as possible to advertise their entrance into the carbon market. Similarly, the hosting of in-country workshops is a good way to promote a national carbon program. The marketing and promotion of projects that have been approved is also a key step in demonstrating that projects based in Haiti have successful and the necessary infrastructure for developing a successful project is in place. If necessary, the DNA can help market credits and find buyers for credits from projects.
- *Provide introductions between in-country implementing partners*: The DNA should act as hub through which introductions can be made between various potential carbon project partners and collaborators. A DNA should actively work to facilitate these connections as it can help lead to the implementation of additional projects and create additional capacity to develop projects.
- *Set standardized procedures and processes for projects to gain necessary approvals*: Establishing the process that projects must go through to gain approval from various government agencies is one of the key functions of the DNA. Standardizing these rules and providing clarity and transparency on all of the steps required to complete the approval process can significantly reduce the time required to bring move projects through the start-up stage and into development. Procedural steps and processes should be published and readily available and accessible in all necessary languages. These procedures can be easily imported from existing international criteria and adapted to the specificities of a national Haitian carbon program. Among the important criteria to consider when assessing whether or not projects should be approved is project type, additionality of project activities, land tenure and credit ownership issues, compatibility with national policies and technical capacity to implement the project.
- *Set standardized of government fees for providing support to carbon projects*: Similar to the above requirement, a set of standardized government fees for approval should be created to provide clarity up-front what it will cost for project developers to attain the required approvals and support from the DNA. These cost structures could be adapted from international equivalents.
- *Maintain tracking systems to manage the oversight of in-country carbon projects*: Some form of a tracking system, preferably internet-based and transparent, should be developed to track projects

as they move through the approval process and subsequently the carbon development process. This will aid not only the DNA in keeping track of projects, but help potential carbon buyers keep track of projects as they develop.

- *Develop a minimum level of technical expertise to support the carbon development process*: It would be prudent for the DNA to possess at least a working knowledge of GIS systems and remote sensing analysis. These capabilities will be necessary if a national carbon accounting system (discussed in Section 3.1.3) is to be developed for Haiti.

3.1.3 Development of a National Level Accounting System

One of the key aspects to emerge from UNFCCC negotiations and the proposed U.S. legislation effecting the future of AFOLU, particularly REDD, is that projects in the regulatory market will likely require that in time the country must establish a national-level carbon accounting systems to participate. The purpose of a national carbon accounting system is to determine total national carbon stocks, and assess historical deforestation rates to predict future land-use and set reference scenarios. There are a number of benefits provided by a country-wide accounting system.

Approaches to REDD that quantify emissions increases/decreases with reference to a national baseline of emissions are likely to prove most attractive to investors and minimize leakage. Leakage is the displacement of emissions from one area to another as a direct result of project activities; the shifting of illegal logging from a forest protected by a REDD project to an area remaining unprotected is the most obvious example of this. The Bali Action Plan, a product of COP-13 in 2007, emphasized the importance of creating national level accounting systems, but was unable to achieve clarity on how to define baseline and reference scenarios.

Haiti should not wait until it has received full technical assistance support, or full clarification from UN negotiations to begin development of a national carbon accounting system, before initiating the pilot offset activities recommended here for the AFOLU sector, and by Almeida et.al. (2009) for the bio-energy sector. Experience has shown that such national GHG inventories become more accurate and function better as they engage in the pursuit of specific, project-based offset earnings. By the same token, the cost and inaccuracies of project-based accounting systems can be reduced as national inventories become more comprehensive, reliable and user-friendly.

As guided by Haiti's DNA, and its Ministry of Environment, CNIGS should perhaps be endowed with the responsibility for developing and maintaining these inventories. As DEED is already working with CNIGS on land use inventories for its watershed, perhaps this technical assistance relationship could be expanded to cover country-wide AFOLU archives and inventories. In their work with local partners the DEED and WINNER projects could provide support towards strengthening of non-governmental entities, such as a Haiti Environment Foundation to become centers of competence for carbon measurement and monitoring, backstopping for project implementation, etc.

This crucial process could be significantly accelerated if USAID could authorize the DEED and WINNER projects to provide the following kinds of short-term capacity building support to this DNA evolution:

Initially, USAID assistance should train and guide the DNA team to structure a streamlined clearance process for expediting Project Development Documents (PDDs) and, subsequent to registry certification, Emissions Reduction Purchase Agreements (ERPAs). Other donors are planning to intensify their assistance to Haiti's UNFCCC negotiating team and to the promulgation of its National Adaptation Plan of Action (NAPA) to the UNFCCC Adaptation Fund at Copenhagen. Haiti's climate diplomacy has also

received support for its role within CARICOM and with the "small island states" within the UNFCCC. But, to date, no comprehensive donor strategy to assist Haiti in realizing its mitigation revenue comparative advantage has been covered. This report constitutes an initial step in that direction.

3.2 Carbon Readiness at the Developer Level

The technical knowledge and integration of multiple stakeholders required to develop a successful AFOLU carbon project requires that project developers and their project partners have a specialized skill-set. Project developers can be private entities, NGOs or governments, and should at minimum possess a strong level of experience developing projects in-country. Project developers without significant in-country experience should find partners with knowledge of local customs, land-use practices, social hierarchies, government structures and relevant laws and regulations and possess the ability to implement planned project actions. Similarly, project partners working closely with local communities should have their trust and confidence. An effective project developer must be able to efficiently manage all of these stakeholders.

A unique aspect of AFOLU carbon projects, as compared to other carbon project categories, is that these projects have a typical lifespan of 20-30 years, requiring a long-term commitment on the part of project developers. The capacity of a project developer and all project partners to implement a project for an extended timeframe should be fully demonstrated. Ongoing monitoring of carbon stocks requires not only this dedication to long-term management, but the technical capability to design, manage and implement sampling and monitoring programs including GIS analysis, biodiversity assessment and biomass measurements.

For a project to begin the carbon development process, it must possess a certain level of readiness. This includes the basics of what the project activities are, why they are being implemented it, where is it being implemented and have identified all stakeholders. To meet these criteria, the project must have or create a comprehensive plan detailing the actions being implemented, and should have a defined rationale for implementation based on past land-uses and why these land-uses are being changed. This should include social appraisals including and documentation of historical land-use practices. The project should have clearly identified spatially boundaries for proposed project actions, which can in some cases be refined and added to as the project develops. It should also have an assessment of all stakeholders and the identification of implementing partners and technical carbon development partners. In addition, the approvals from the stakeholders, who through land tenure own the credits, must be gained to support the carbon development process.

3.3 Carbon Development Process

The carbon development process for AFOLU projects varies depending on the standard selected, but can be summarized in a few key steps. The following steps are based largely on the process required by the VCS and CDM to develop a carbon project, and serves as a representative overview of the development process for all standards.

- *Project idea*: Rough size, location, stakeholders and project type has been preliminarily defined. At this stage, carbon market standard may or may not have been identified. Documents demonstrating that the project meet all "carbon-ready" requirements should be available.
- *Feasibility*: The feasibility stage is when project details, inter alia, eligibility criteria across various carbon market standards, project activities, exact project coordinates, and all involved stakeholders are summarized. Typically this information is synthesized and presented in a feasibility report which

is used as the basis for decision making on project implementation. This study will contain preliminary estimates of carbon revenues and costs and present an initial project management plan.

- *Standard and methodology selection*: Once eligibility criteria have been examined in the feasibility stage, a choice of market standard with which to pursue project registration can be made. For projects seeking registration under the VCS and CDM, it is necessary to determine if a new methodology must be created for the project or if an existing one can be used or adapted. There are a handful of VCS and CDM methodologies currently approved and undergoing validation.
- *Methodology development*: The development of a new methodology requires considerable technical expertise and resources. Methodologies describe the processes for project GHG accounting, including carbon pools, process for ex-ante quantification of baseline and project emissions, determination of leakage potential, and process for ex-post (ongoing) quantification of emissions reductions.
- *Project Document development*: A further requirement for projects is the development of a Project Document (PD), which synthesizes all project information, inter alia, biomass inventory measurements, results of participatory social appraisals, remote sensing analysis, biodiversity assessments, baseline carbon projections, and ex-ante carbon estimates. The PD also contains the procedures for conducting ongoing measurement and monitoring of carbon stocks for the project.
- *3rd party validation*: Methodologies and PDs must both undergo a dual third-party validation process, including a public commenting period. Validators must approve these documents before the project can begin. This process can be time consuming as there are currently a limited number of approved validators. Validators conduct both a desk review of these elements as well as a project-site visit which includes random checking of sampling plots and interviews with local stakeholders.

At this stage, projects are typically ready to begin implementation. The process to this point can take anywhere from 6-24 months, depending on need for new methodologies, readiness on the part of government and project developers, complexity of project design, speed of the validation process, and a number of other potential factors. Once projects have achieved these milestones, they become registered projects that are eligible to receive carbon offsets. Before offsets can be issued, however, the following steps must be followed:

- *Ongoing monitoring*: The collection of all required data under the market methodology or standard plus document of the information required the document the management effectiveness of overall project.
- *Calculation of ex-post credits*: Based on the collection of data during the on-going monitoring, the calculation of actual credits is performed and the verification report is prepared for the verifier.
- *3rd party verification:* The body responsible for verifying all the monitoring data included in the verification report completes the assessment and provides an approval to the standard's body for the project credits for the vintages that were verified.
- *Issuance of credits:* Once verification is complete, credits are issued and represented in the registry that has been approved under the market standard used.

4 Local Organizational Conditions and Constraints for Carbon

Given Haiti's tempestuous history of slavery, revolution, and complex ties to its colonial rulers, it does not have a long tradition of transparent local government that capably represents the interests of its citizens. Therefore, a critical question that surrounds the viability of creating carbon credits in Haiti is this: Can the tangible incentive of AFOLU carbon revenue motivate a reasonable level of coherence and effectiveness for local governance, at least with respect to land stewardship, once and for all? Without national government facilitation to support the necessary institutions and institutional arrangement that facilitate the creation and sale of carbon credits, Haiti will be unable to perform in the market. Carbon standards and buyers demand that the carbon rights to be transferred are secured at least with the following four land tenure criteria: (1) land rights must be spatially defined, (2) legally recognized owner or user are clearly identified, (3) if the owner is an entity or community group, it has to be identifiable with a transparent governance structure, and (4) the borders are generally uncontested. If such arrangements can be made, then the carbon market will have a chance to develop and provide benefits to Haiti's rural population.

4.1 Land Tenure and Usage Rights

In rural Haiti the key constraints on peasant investment are poverty, political and economic uncertainty, and the growing scarcity of productive land. Fortunately, there is growing evidence that tenure is not an insurmountable constraint for adopting technologies with long time horizons such as tree planting or grafting on the majority of parcels in Haiti. This is so because approximately 60% of all agricultural parcels are purchased or divided inheritance plots (Smucker et al. 2000), and most of the remainder are based on well-established customary arrangements. Still, there is significant insecurity as these land access categories do not distinguish statutory from customary forms of land purchase or inheritance. The remaining 40% are even less secure in terms of a desirable long-term management by farmer self-interest: at least 20% are legally undivided family inheritance, while about 10% of all agricultural plots are accessed via rental agreements, and the remaining 10% via sharecropping agreements.

Studies (see an overview in Smucker et al. 2000) estimate that 95% of land sales in rural Haiti avoid the formalities prescribed by Haitian law. Farmers make every effort to avoid, diminish, or postpone notarial fees, survey costs, taxes, and other charges for land registration and updated title. Most striking from a legal perspective, are the legally undivided inheritance land and a general reluctance to update title for land transfers. From a statutory perspective, undivided family inheritance retains its legal status as a single block of land even when subdivided by custom. Once divided by custom, these shares are readily bought and sold informally among heirs.

In sum, legally documented land tenure, perceived land tenure security, and land conservation initiatives are not well coordinated in Haiti (Smucker et.al. 2005). Reliable markets for land restoration and more sustainable perennial crops can help land conservation initiatives that work with farmers looking for reliable returns on customarily held land. But for AFOLU offsets to become one such revenue-earning, perennial "crop", clear tenure and usage rights will need to be documented and enforceable. Fortunately, this will not require formal titles to be situated in a cadastre template, contested, and cleared. In Haiti, such a requirement could delay mitigation revenues by a decade. But there must be a mechanism to ensure that these rights are legally recognized and uncontested.

Precedents already exist in Haiti for water users associations and conservation management groupings to take on a quasi-legal status for specific economic purposes. This is happening in a variety of ways in the DEED project (e.g. DEED's first 12 partner producer groups in the DEED Feb. 2009 newsletter). Turning this patchwork of local associations into a legal aggregation that can take responsibility for land

management over a delimited perimeter for, initially, at least twenty years, but not an insurmountable, development challenge. Fortunately, the DEED project, several NGOs, and some large landowners, working with the surrounding smallholder populations in selected parts of the country, have taken significant steps which can support the establishment of land tenure and management recognition.

Nevertheless, for these local initiatives to be able to stabilize an entire catchment area and turn it into a marketable carbon sink to meet the requirements of the carbon markets, they have to be given some formal authority over ambiguous-held, common, and even public land.

4.1.1 Land Tenure Security and Tragedies of the Commons

In areas where local organizations have been unable to protect their watersheds from degradation it is not because of land tenure uncertainty, or lack of formality, but rather a "free rider" problem. No matter what the legal status is of these lands, participants in the local "commons" do not have the capacity to control those who are from outside of the participating group. These outsiders drive much of the destruction of the commons, as they treat it as if it were public, rather than common.

As a counter example, in the West African Sahel, when local organizations band together to sustainably manage common land, they are empowered to block access from non-members, the natural resources management (NRM) impacts can be startling. As Haiti explores its A/R GHG offset opportunities, a legal format for so empowering these local land management coalitions will have to be devised. It will not only have to allow for effective governance of the "commons", but have sufficient juridical clarity to meet the ERPA requirements of offset buyers. This is a central issue in encouraging the growth of the offset market from Haitian projects.

4.1.2 Food Security and other Shorter Term Necessities

As every NGO working in rural Haiti knows, without 1) food, 2) school fees and 3) school lunches, a farm family will not invest any time or land into anything else. A/R will take some of both away from these survival imperatives, so, if it is to happen, the participating families need to be confident that, long before their new trees begin to produce revenue, that they will have steady access to these three requirements. Food for work alone has not been shown to induce such families to take such longer term risks, even where their tenure of these future orchard lands is relatively secure.

Based on Smucker et. al.'s (2005) emphasis on using Haiti's *Fonkoze* micro-finance programs, the DEED project is using them to meet these three critical requirements. DEED consultant Yvrose Joseph (2009) identified several promising local banking options, that, once this A/R project has had its PDD validated, and carbon offset revenue begins, can be used to reward the responsible farmer for successful seedling and tree stewardship. But in the meantime, donor funding may be necessary to close this gap between project identification and such carbon payments from the offset buyer.

4.1.3 Agreements with Downstream Beneficiaries of Upstream Watershed Stabilization

Careful management of relationships between upland and downstream land users is essential; both must benefit from any proposed intervention. One owner of irrigated land in Montrouis mentioned that wherever possible outside labor from other watersheds was hired to dig out silted-up canals, because, otherwise hillside farmers from the catchment feeding that irrigation system might have an incentive to cut even more trees if they could benefit from employment created by the siltation from their denuded uplands. In both of its watersheds, the DEED project is trying to get farmers to organize more between altitudes, rather than just by commodity producer associations which, do not necessarily cut across the same altitude. If properly integrated with local institutions guiding the process, the prospect of carbon offset revenue can make this job easier for them.

This sort of upstream, downstream co-operation will be crucial in forming the local organizational basis for a credible A/R offset perimeter that reaches sufficient scale and sustainability.

4.1.4 Coordination between Government, Commune, CASEC, NGOs & Gwoupman

Rural Haitian communes[2] have had elected mayors for less than two decades. The two that we met appeared well-educated (one was a trained lawyer) and had a professional bearing. They expected, and were expected, to lead the *chefs section* and the Communal Administrative Councils (CASEC) in the co-ordination of watershed-wide interest groups. They both recognized the need for government of Haiti (GoH) authority to be able to declare some sort of eminent domain for conservation or sustainable management across neglected hillside land. Without the authority to insinuate such land use co-ordination across an entire catchment area, when and where technically determined and transparently monitored, it would be difficult to stabilize any watershed. Yet without such governance authority at a watershed-wide level (but, if possible, at no higher level) it will be difficult to optimize the carbon stock storage capacity of that watershed, and, therefore, to find offset buyers.

Using the concepts outlined above, the DEED project is already on its way to, perhaps for the first time in Haiti, find a practical solution for the intractable land tenure problems and meet the minimum criteria outlined at the beginning of this Chapter. Working with the user associations and local government institutions, (1) the land rights and their borders can be spatially defined on maps and in the field, (2) the owner groups or community users groups can be created and legally registered with the government, (3) If the owner is an entity or community group, and it lacks a transparent and functioning governance structure this can be developed and (4) no-contest-statements can be signed with at least the last known owners and neighbors with borders around the project areas (except for a manageable number of potential legal cases for which however a clear and transparent reconciliation process can be defined).

[2] Although Haitian peasant villages generally lacked a sense of community and civic-mindedness, some civic-action groups had emerged over the years. After the 1960s, wealthy peasants led rural community councils, which were supervised by the government. These councils often served more to control the flow of development resources into an area than to represent the local population. In the 1980s, a countervailing movement of small peasant groups (gwoupman) emerged with support from the Roman Catholic Church, principally in the Plateau Central. The gwoupman discussed common interests and undertook some cooperative activities. Both the Duvalier governments and the succeeding National Council of Government, headed by Lieutenant General Henri Namphy, took steps to curb the activities of these peasant groups. (Library of Congress Country Studies/Area Handbook)

5 Haiti's Landscapes and the Potential for Carbon

The deforestation of Haiti has been driven by a number of key factors including: inappropriate farming particularly on marginal lands, population pressure on land, lack of woodlots to meet the demand for timber and particularly charcoal, a lack of coordinated land use planning, global market price decline for key high-value cash-crops (sugar, mangos, coffee), and a lack of land tenure security leading farmers to short-term exploitation rather than sustainable land management for the long-term. For Haiti to reduce deforestation, re-establish tree cover and develop sustainable resource management practices so that land cover is not excessively cleared for household charcoal needs and national maize-based staple food requirements, five things have to change:

- Haiti's remaining charcoal requirements have to be met from sustainably managed woodlots and multi-use tree plantations such as those suggested in the Chapter 6.1 on Montrouis below
- Conversion of more perishable biomass litter directly into charcoal must be established (see discussion of bio-char stoves, in Chapter 5.3 below)
- Economically viable charcoal substitutes, such as bio-diesel oils, have to be produced, processed, and utilized (see Chapter 6.1.2.2)
- Haitians have to rely more heavily on perennial food crops (e.g. breadfruit, yams, taro, and manioc) and gravitate less regularly towards rain-fed annuals such as maize and sorghum

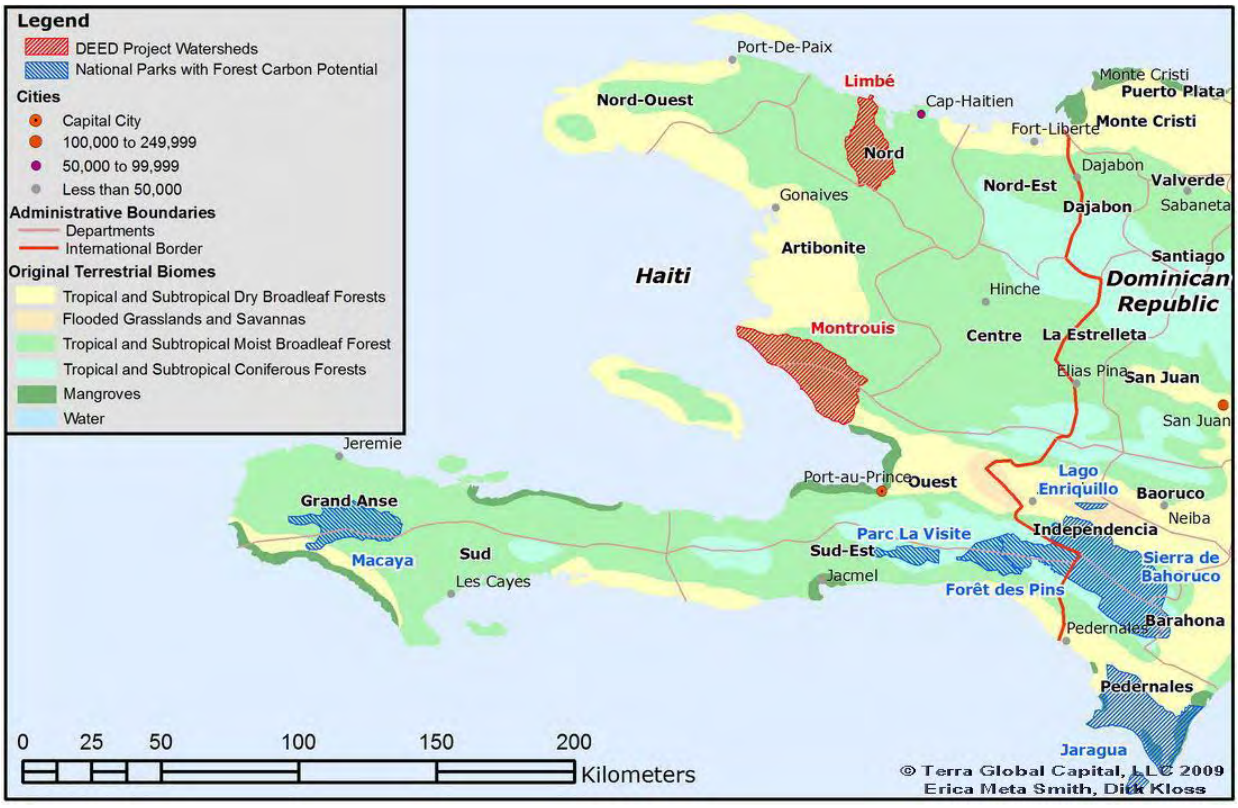

Figure 1 DEED project watershed locations and national parks with forest carbon potential on a relief map showing the original vegetation biomes of Haiti

- High value-to-volume agro-forestry export crop production must be increased for which Haiti has an exceptional comparative advantage: coffee, cacao, fruits etc. (see Chapters 6.1.2.5 and 6.1.2.6) so that more of the land-intensive staple food can be imported rather than produced on limited productive land.

The work needed to put these objectives in place requires funding sources but after initial start-up and establishment costs can be met, projects like those implemented under DEED have an opportunity to develop carbon credits from multiple sources including: A/R, sustainable woodlots, avoided deforestation, fuel efficient stoves, and biochar stoves. Each of the carbon opportunities is discussed in general in the following Section and then covered in detail for the specific watersheds of Montrouis and Limbé.

5.1 Afforestation/Reforestation Potential

Haiti has an enormous potential for reforestation, given its deforested condition. If the distribution of land suitable for reforestation or revegetation on average in the country is similar to the suitability in the Montrouis watershed, forest management and its products could become a major economic factor in the country. Assuming that the legal and socio-economic conditions in Montrouis make a project possible, this could eventually make about a quarter of the land suitable for carbon projects (15,000 of its roughly 60,000 ha). If this could be scaled up to include as much as a quarter of the total country size of 27,751 km^2, this would represent about 700,000 ha countrywide.

Given the socio-economic, legal land tenure, and institutional challenges in Haiti, this estimate of national A/R potential is only indicative; it would require substantial investments to overcome these obstacles in some areas. The most difficult obstacles include the establishment of land-tenure security, availability of seedlings for community and smallholder-based reforestation on a sufficiently large scale, and support to market access for high value-to-volume agro-forestry cash crops. The DEED project and its sister USAID projects, particularly MarChE and WINNER, have already put in place the strategies to overcome some of these key obstacles. DEED, for example, is addressing land tenure insecurity with contracts between large (often absentee) land-owners and individual farmers or communities, has established partnerships with nurseries as providers of quality seedlings and extension services, DEED and WINNER are developing Jatropha growing, biodiesel processing and marketing, and MarChE is assisting cooperatives and small/medium enterprise development (DEED 2008, 2009 a, b, c, d, e). If these agro-forestry based value-chains can be made sustainable, some with the help of additional cash-flow from carbon revenue in a number of sites, e.g. within the DEED watersheds, it would send a strong signal. Both for the viability of forestry-based sustainable land management, as well as for the potential of climate change mitigation revenue in the poorest countries.

The team found the most promising solutions with which DEED activities can harness the carbon potential is the reforestation of upland and hillsides in the Montrouis watershed with multi-purpose trees like Moringa and fruit trees, Jatropha, and potentially shade-grown coffee (see Chapter 6.1.2.5 below). In the Limbé watershed these could be even surpassed by the carbon revenue opportunities from shade-grown cocoa groves, (ideally organically) managed by smallholder farmers, cooperatives, and agro-enterprises.

Figure 2 Haiti land use map (1998) showing the miniscule (dark green) patches of remaining forests (CNIGS)

5.2 REDD Potential

There are only few remnants of forest in Haiti, it may be that none of them big enough for a viable project from Reduced Emissions from Deforestation and Degradation (REDD). Furthermore, there are almost no forest remnants outside of protected areas. Officially, the Haitian Government had identified a total of 35 protected areas covering about 6% of the national territory and waters, according to the national biodiversity strategy and action plan NBSAP (CBD 2008; some are listed in UNDP-GEF 2009: 6-8). However, only four areas of notable size have actually been created, together covering about 13,000 ha, and the percentage of effective protected areas is evaluated at no more than 0.3% of the overall surface of the country. With this the Haitian Republic stands far behind other Caribbean countries (IUCN 1994), such as Jamaica (8.2%), Cuba (14.3%), the neighboring Dominican Republic (21.7%), and Martinique (66.3%), some of which have similar population densities. The Ministry of Environment has signed a Memorandum of Understanding (MOU) with The Nature Conservancy (TNC) to complete the National System of Protected Areas of the Country. The Haitian government, through the Ministry of Environment, has also taken concrete steps to submit to the Global Environmental Facility (GEF) a Project to establish, with the Dominican Republic, an International Biosphere Reserve, including a Biological Corridor along the Mountains of Massif de la Selle and Sierra de Bahoruco for conservation and economic purposes (CBD 2008). Haiti would like to capture some of the benefits of the tourism trade in the Dominican Republic ($2 billion in revenues per year and 45,000 jobs created), but also avoid reliance on large-scale resort based tourism. The Ministry of Tourism of Haiti has identified sustainable

tourism as priority areas for development, incorporating conservation and sustainable development concepts from the beginning, and recognizing that sustainable development through tourism is possible only if the conservation and restoration of biological diversity is insured, if local stakeholders are guaranteed participation, and if benefits are equitably shared.

Table 1 Natural National Parks (NNP) in Haiti (World database on Protected Areas)

Name	Terrestrial	Wetlands	Legal Status	Status + Interest or Habitat Type	Size (ha)	Year Estab-lished	IUCN categ-ory
Fort Jacques and Fort Alexandre	X		NNP	Historical	9	1968	No data
Fort Mercredi	X		NNP	Historical	5	1968	V
La Citadelle, Sans Souci, Ramiers	X		NNP	Historical site Mountainous	2,200	1968	V
Sources Cerisier et Plaisance	X	X	NNP	Hot spring	10	1968	
Sources Chaudes	X	X	NNP	Hot spring located 20 km north of PoP; medicinal qualities	20	1968	V
Sources Puantes	X	X	NNP	Hot spring	10	1968	V
Lac de Peligre			NNP	Man made lake	100	1968	V
Parc La Visite	X		NNP	Tropical moist forest & Pine forest	3,000	1983	II
Parc Macaya	X		NNP	Tropical moist forest & Pine forest	2,000	1983	II
Forêt des Pins	X		NNP	Pine and Mixed forest Reserve currently no legal harvest	5,500	1937	II

Apart from a few isolated patches, a thorough land use analysis (see land use map in Figure 2; CNIGS 1998) shows just four small forest areas, each less than a couple of thousand hectares of mostly fragmented forest: one in the North near Cap Haïtien, the three others on the southern peninsula. These forest fragments in the South are what is left of three National Parks (PN) around PN Macayá near Jérémie, PN de la Visite in the hills just south of Port-au-Prince, and PN Forêt des Pins south-east of the capital near the DR border. The latter two forests straddle the Massif de la Selle, are within a few kilometers of each other, and were connected at some point several decades ago. These parks were gazetted in the 1980s (Fôret des Pins was a reserve since 1937) without exactly defining their borders. While the World database of national parks identifies the largest of these, PN Forêt des Pins, at 5,500 ha in two areas (see Table 1; some local sources consider these were nominally about 15,000 ha large each) in each of them less than 2,000 ha actual forest remain, for a total of perhaps up to 4000 ha (Jean and Myriam Duret 2009, pers. com.).

Given the limited amount of extant forest in Haiti, there is very little potential for 'avoided deforestation' projects. The only area potentially large enough could be created by combining the forests of PN de la Visite and PN Forêt des Pins with the forests of the Bahoruco National Park across border with the D.R. Bahoruco has about 100,000 ha with vegetation ranging from dense forests to deserted drylands. The exact forest area would need to be identified. Taken together, these pieces of forest could reach a size which could be an economically viable REDD project.

If a possible cross -border REDD project were to be designed with 50,000 ha, assuming a dry biomass figure for the unique Hispaniola *pinus occidentali* forest of 175 MT/ha, and assuming a 2% annual deforestation rate can be reduced to 1% annually for a 30 year duration, then the total carbon revenue potential would be $24 million based on a price of $5/ $MTCO_2e$ (gross before any project activity costs,

carbon development costs, fees, etc.). The price assumption of \$5/MTCO$_2$e does not take into account the buyers risk perception of Haiti. In this cross-border REDD project, Haiti would only receive the proportion of this potential revenue that is attributable to their small participating forest area. This estimate does not take into account that the actual deforestation rate in the project areas in Haiti versus DR are likely to be quite different.

There are several small initiatives under way protecting the two parks in Haiti that could be instrumental in moving this idea forward. **PN de la Visite** is targeted by the Fondation Seguin, named after the little village and municipality at the south side of the park, created about five years ago in 2003. The somewhat larger Forêt des Pins is targeted by a coalition of small local and international NGOs, including Helvetas, ARN Foundation, Lutheran Church, and others. Besides engaging in environmental education and awareness generation with the local population and direct conservation of the remaining forest, these groups work to restore the previously forested slopes, many of them very steep. Some efforts circle around natural regeneration by limiting the access and active use of land, while most are pursuing various kinds of replanting efforts (Fondation Seguin/Helvetas 2009, and pers.com.).

In the **PN Forêt des Pins,** the ARN Foundation, which in Montrouis collaborates with DEED, is setting up a nursery, mostly for pine seedlings, to be planted inside the park where the pine trees have been cut by local population in need of fuel and farmland. Like ARN's other 9 planned or started nurseries (see Section 6.1.2.1 below on page 41) annual seedling production is scheduled at about 1 million, combined with various fruit trees.

Paul Duret (related to the ARN's Duret family, head of Agricorp SA and a former Minister of Planning) is a central figure in two emerging projects with farmers near the Forêt des Pins (pine forest reserve), one centered on dairy production and the other on sawmill operations (Smucker et al. 2007). The combination of reliable private sector investment, powerful political connections, and a broad based support from capable aid agencies and development NGOs can make this a promising initiative.

Figure 3 Map of National Parks 'La Visite' and 'Forêt des Pins', less than half of these areas are still forested (Fondation Seguin/Helvetas 2009), but connect to the adjacent Bahoruco National Park in the DR.

Other REDD Initiatives in Haiti:

A recent IDB study (Mugnier& Cassagne 2009) concludes that a project to define the as yet undefined boundaries of the **Pic Macayá** National Park and protect the forests in and around the park, could easily generate carbon credits by developing efforts to comply with a carbon standard.

The Macaya Project zone of interest covers 7,500 ha in Southern Haiti (Nippes and South Regions) and includes the entire Macaya National Park as mentioned in the 1983 decree. This decree loosely described an approximate area of 2,000 ha around the peaks Formont and Macaya. Carbon revenue could allow for a valorization and an alternative source of income to manage the project. Mugnier & Cassagne (2009) estimate that the project could avoid emissions of 251,089 t CO_2e over 25 years, generating potential revenue of US$2-2.5 million (at US$8-10/tCO_2). They recommend this amount could either be mobilized to cover administrative costs or to provide more incentives to the local population in order to avoid further deforestation/degradation. Support for the underlying project activities is being established: IDB has proposed to the Global Environmental Facility a sustainable forest management project for the Macaya-region in which GEF grants about $3 million to IDB's $17 million co-financing from a $30 million disaster-prevention program (Damais et al. 2009).

The GEF has just approved US$ 3 million funding for a UNDP project (with $5 million in kind co-financing from GoH and others) for establishing a financially sustainable National Protected Areas System in Haiti. It is also charged with exploring REDD and potential emerging voluntary and compliance markets for REDD-related carbon credits as a funding source for stimulating the creation of new PAs on private lands and also for increased management effectiveness of existing protected areas. This will include specific analysis of the potential for REDD-related revenues from different forest types in Haiti as well as a suite of capacity building activities to prepare relevant NPAS-related stakeholders to better negotiate, secure and monitor the payment in the midterm for provision of such services (UNDP-GEF 2009: 38).

5.3 Reducing Deforestation Caused by Unsustainable Fuelwood and Charcoal Production: A Comprehensive Solution

The creation of marketable GHG offsets can involve either the Jatropha "tree" or another perennial bio-diesel feedstock, as a carbon sequestration and an emissions reduction project. Ethanol from an annual crop would have little to offer in this capacity, so its limited GHG offsetting potential puts it beyond the scope of this report.

In the UNFCCC, Kyoto CDM, and, therefore, with the World Bank carbon funds, these two perennial bio-diesel impacts would have to be filed under two different protocols. The woodlots sustainably producing feedstock for charcoal- could be included as an A/R project. And the fuel-switching from petrol to renewable Jatropha diesel, and any wood fuel efficient stove technologies could be submitted to the CDM or Gold Standard as separate offset projects.

5.3.1 Fuel Efficient Stoves

Different stove technologies are being tried by different NGOs across Haiti. Haiti's Bureau of Mines & Energy's Sector Development Plan (2006) accords them, on the average, 10% greater efficiency than the locally available alternatives. Yet proven successes with some stoves (e.g. CARE's) has not driven their expanded adoption as much as might have been expected. Further comparison of best practices from other fuel-wood and charcoal burning economies and renewed experimentation across Haiti may be necessary. But the potential local environmental, and global climate, benefits of this sort of technology favor its further pursuit. Meanwhile, the further GHG offsetting possibilities of the new biochar stove provide another fuel-efficient alternative.

5.3.2 Fuel Efficient Wood Stoves that Produce Biochar

Of the universe of cook stoves, one option that should be considered is the LuciaStove, produced by WorldStove Corporation of Italy, which already has a project in Haiti. Their solution is an efficient cook stove that requires 50-90% less fuel than other stoves with the same capacity and they produces biochar as a valuable by-product. It can also be produced locally to regional specifications. Part of the roll-out of the product entails offering micro-financing options. The biochar that is produced by stove can be used as a soil amendment, which sequesters carbon as well. The production of heat for cooking is thus carbon negative, as the carbon from the fuel is being locked up in the biochar, which has a very long half life when put into soil. The sequestration capabilities of biochar translate into a carbon offset credit, albeit a small one. The stoves are low cost, and since they can be manufactured locally, they create jobs, and make it possible to provide cook stoves sustainably.

A company based in Haiti, HSSA Group, has been in contact with WorldStove, and has access to a supply of biomass that could be pelletized for fuel in the cook stoves. The agreements are in place or will be shortly that ensure the supply of biomass-grasses from about 20,000 ha of land. HSSA already has the necessary processing equipment and the capacity to pelletize the grass (pers. comm. Joel Ducasse 2009). Making use of this biomass would provide a ready source of fuel for the cook stoves, which could replace a significant number of tons of sustainably wood-produced charcoal that is now being used. It would help sequester carbon in the biochar, providing a carbon negative fuel source.

Questions of additionality need to be addressed with regard to the potential for carbon offset credits from the production and use of the biochar. WorldStove has had experience with generating voluntary offset credits from their projects in Africa, under the Gold Standard for the fuel efficient stoves without the biochar benefit. The economics of this opportunity need to be explored more fully, but it seems the necessary conditions are in place—a locally based company has access to biomass, they have the capacity to pelletize the biomass, WorldStove is already operating in Haiti, and there is a dire need to have more sustainable sources of cooking fuel. Other advantages are:

1. Biochar can be utilized by the households using the stoves, so there is no transportation cost
2. This promotes lower fuel use
3. The stoves provide better indoor air (fumes from traditional stoves are associated with respiratory diseases and cancer)
4. The use of biochar can provide improved soil fertility which leads to better crop yields and nutrition.

Given that WorldStoves is already active in Haiti, and HSSA Group has capacity there, this is an activity that can be undertaken almost immediately. The risks are relatively low in that biomass is evidently available, stoves can be provided in a relatively short amount of time, and there is already some level of acceptance for this cook stove. The DEED project could potentially undertake this dimension of development to in Montrouis, which is just to the north of HSSA's current area of operation.

5.3.3 Woodlots for Sustainable Charcoal Production

Most rural Haitians know how to produce charcoal sustainably and that it can be generated more efficiently. But these known efficiencies will not be adopted on a large scale until identifiable rural groupings are given exclusive control, for a given land area, of everything from planting (or natural regeneration) production, processing, and marketing. "Outsiders" cannot be allowed in to do any of things on their own reconnaissance unless on behalf of such a land "owning/managing" *groupe*.

As the DEED project is intimately engaged in empowering a variety of local institutional formations into such "rights and responsibilities" frameworks, we will review some best practices in this regard in the next Section.

6 The DEED Watersheds

DEED works in two watersheds: Montrouis on the central-western Arcadins coast, partially in the Artibonite and partially in the Ouest department, and in Limbé, on the northern coast near Cap-Haïtien (see Map Figure 1 above).

6.1 Montrouis

The Montrouis watershed encompasses about 63,000 ha. A valuable large portion are well-irrigated lowlands near the coast (about 6,000 ha), these include banana cultivation, high-intensity subsistence and cash food cops. In the upland (covering most of the area), two thirds are unsustainably farmed, used for grazing, or are being degraded from unsustainable fuelwood collection. Based on preliminary land-use assessments with DEED staff and local partners, at least 15,000 ha are estimated to be suitable for commercial or community-based reforestation. A number of agro-forestry activities that would qualify as A/R carbon projects that were identified, including: plantations of Jatropha, Benzolive (*Moringa oleifera*), Macadamia nuts, altitude shade-grown coffee, mangoes, and sustainable woodlots for fuel needs and charcoal production. In addition, there are other activities that could lead to agricultural land management carbon project including: Vetiver and other essential oils such as citronella, various flowers, and aloe vera. These following Chapters present a first assessment of the agronomics and carbon opportunities of each of these options and suggest which of these merit further examination for carbon revenue potential.

Table 2 presents categories and areas of land use. Suppositions about carbon development potential are based on the possible conversion of some portion of this land to other more carbon intensive and environmentally sustainable activities.

Table 2 Land use classes in the Montrouis watershed (based on DEED data 2009)

Land use class	ha	%
Grazed Shrub and Brush Rangeland	15,447	*24.7%*
Grazed Herbaceous Rangeland	1,197	*1.9%*
Sparse Canopy Agro-forestry	3,100	*5.0%*
Medium Canopy Agro-forestry	180	*0.3%*
Dense Canopy Agro-forestry	413	*0.7%*
Cultivated Annuals	38,005	*60.8%*
Barren Land	658	*1.1%*
Cultivated Non-woody Perennials	1,607	*2.6%*
Non-forested Wetland	9	*0.0%*
Inundation Agriculture	3	*0.0%*
Mangroves	19	*0.0%*
Urban or Built-up Land	641	*1.0%*
Water	89	*0.1%*
Unclassified (cloud or cloud shadow)	1,187	*1.9%*
Total	**62,554**	***100%***

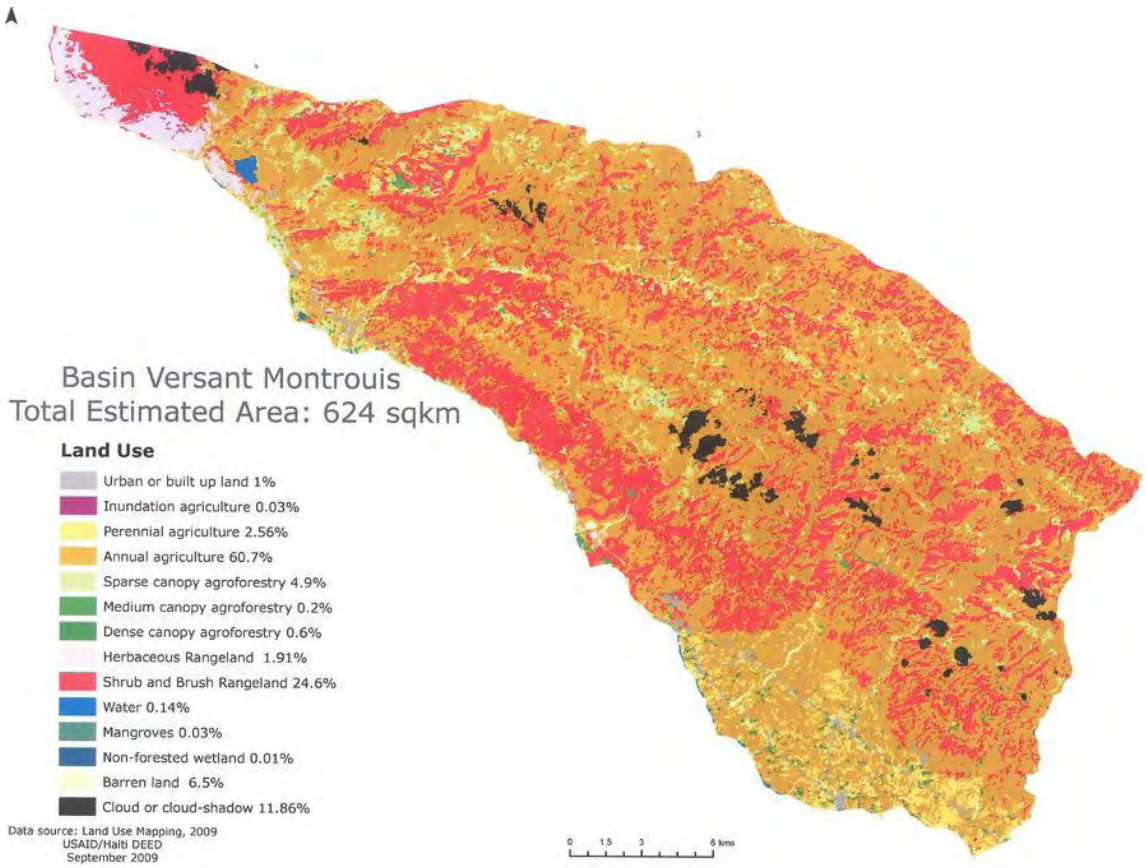

Figure 4 Land use types in the Montrouis watershed

6.1.1 Land-Use Organization in Montrouis

Up the Chaine de Mathieu mountains above Montrouis, the barren hills are testament to a serious tragedy of the commons. The visible desolation of the landscape is due to its proximity to Port-au-Prince and its rampant urbanization with an insatiable demand for charcoal. Such degradation is not just a result of a local institutional failure, but a seemingly unavoidable economic imperative. In fact, as the DEED project has rediscovered (Smucker 2009), this socio-economic imperative has forced those surviving it, to create a new set of local institutional innovations. Local "co-operatives" (such as CODEP, COLUC & CUPEC) are showing increasing vitality as they press the mayor's office for more land management rights and responsibilities. Hillside residents, in preference to outsiders, have found employment as irrigation systems have expanded on the plain – both under DEED and an AFD-funded program at Arcahaie (cf. APKA). The Haitian Environment Foundation (FHE) was pleasantly surprised to find smaller and landless hillside farmers readily incorporated by the larger, too often absentee, land holders into Jatropha and benzolive outreach planning discussions. These links were perhaps under-reported in the Montrouis Jatropha feasibility study (Damais et.al. 2007), and the PIN (#7), submitted by FHE to the World Bank (Thioye 2008), that it led to.

Unfortunately, these inspiring and positive developments have not been reflected in any mandate from the central authorities to allow them to over-ride this patchwork of local arrangements and link up dispersed initiatives into a set of "conservation easements" that would allow entire catchment areas to be stabilized as an integrated effort. Some activities have clearly benefited from these new informal

initiatives, such as reducing canal-cleaning costs of the expanding irrigation systems downstream. But more needs to be done to coordinate efforts on the official level that would recognize the importance of this over-ride, particularly in the short-term. The fact that it is not being implemented is attributed to:

- Lack of participatory planning leadership, as well as anarchic charcoal pressure, from Port-au-Prince;
- The short-term food security and other survival requirements of all local farmers upstream and downstream.

This vicious cycle needs to be turned into a virtuous one. This Chapter explores opportunities for carbon projects to help in this regard.

6.1.2 Carbon project opportunities in Montrouis

The opportunity in the Montrouis watershed for carbon projects derives from potential activities around: establishment of plantations with Moringa, Jatropha, vetiver, bamboo, shad coffee, various fruit trees, and sustainable charcoal.

6.1.2.1 Moringa oleifera (local name: benzolive)

The ARN (Agro-forestry Regional Nurseries) Foundation of Haiti was created by the Haitian/American Duret family and the U.S. architect James Kishlar. ARN Foundation is developing 10 tree nurseries in deforested watersheds of Haiti and has started to stock *Moringa oleifera* trees along with Jatropha, Hass avocado and various fruit trees. The main products from Moringa that benefit local farmers are: consumption of *Moringa* leaves, seed oil, seed cake, as well as selling or processing the seed oil for producing biodiesel or for utilizing pure vegetable oils as fuel for generators and tractors. Each of the nurseries, at an initial set-up investment of about a US$ 1 million has the capacity to produce about 1 million seedlings per year. One of the first three nurseries being established is in the Montrouis watershed, a few kilometers inland from Arcahaie. *Moringa oleifera* is the major element in that nursery stock. The ARN Foundation has scientific associates at Florida International University, and has engaged successfully with the Haitian Prime Minister, local leaders, and communities. They have begun cooperating technically and financially.

The DEED project and ARN share and complement each other's objectives in terms of stabilizing the upper watersheds through sustainable land use that protects the soil and water resources for the upper watershed and the downstream system by creating economically attractive and lasting production systems.. The nursery and plantation are only one of several activities of the ARN Foundation. Its main source of core funds is the Duret Family, which is investing in the preparation of organic hydroponic greens with which to supply the southern US markets, fish-farming/aquaculture, production of organic Neem-based pesticides, and biofuel processing, all part of an integrated organic production cycle (Duret 2009, pers. com.).

With an annual production of 1 million seedlings, assuming a planting density of 1,500 to 2,000 seedlings per hectare, at least 500 to 750 ha per year will be planted with seedlings from ARN's first nursery alone. The basic concept is to establish an attractive outgrower-model to the farmers currently engaged in short-term shifting agriculture in the upper watershed. These landless farmers would be provided with seedlings for free, get trained/informed about the short-to-long-term revenue potential (and environmental stabilization services) of the *Moringa* oilseeds, as well as the co-planted fruit-trees (avocados, mangoes, macadamia, etc.). In exchange for delivering the seeds they collect from the *Moringa* plantations, farmers receive a share of the seed harvest and can harvest and market the *Moringa* leaves, animal feed from the seedcake after oil-extraction, and revenue from the sale of fruits on the local markets.

Another use of benzolive would be the production of fresh biomass for highly nutritious food and fodder. The effects of different planting densities (250,000, 500,000 and 750,000 plants per ha) and cutting frequencies (45, 60 and 75 days) on the biomass production and chemical composition of *Moringa oleifera* was studied in Nicaragua. The 75 day cutting frequency produced the highest fresh matter yield, and dry matter (DM) yield, during the first and second year, respectively. These data suggest that Moringa forage could be an interesting protein supplement for ruminants, which is important to keep farmers from letting livestock out for free grazing on degraded hillsites.

Figure 5 Moringa oleifera pods

Figure 6 Moringa oleifera and other seedlings in nursery

The carbon storage potential is hard to estimate without knowing the planting density, growth conditions, and harvesting methods. Assuming a very general dry biomass average in a 20 to 30 year old plantation of 100 t/ha from the IPCC Good practice guideline (IPCC 2003) tables , would indicate roughly 188 t/CO_2 equivalent per hectare, which at a price of 5$ and after development and marketing costs would be worth about $800 per ha. According to this very rough and preliminary estimate, a project area of 10,000 ha could thus yield about $8 million over a 30 year project duration.

6.1.2.2 Jatropha

Another component of a potential solution to Haiti's national energy problem, being a net importer of fossil fuels, can be *Jatropha curcas L.* As a supposed "silver bullet", Jatropha has received much optimistic analysis (Damais et.al. 2007) and promotion (Pressoir 2008, 2009) for Haiti and the Dominican Republic (Almeida 2009).

The agronomic conditions in Montrouis (Damais et.al. 2007) and its proximity to the Port-au-Prince market, where it could displace both fossil fuel imports and massive amounts of charcoal consumption, may justify its production there on an investable scale. Jatropha can be planted on poor or marginal land, thus it would not directly displace food crops. As part of a broader set of recommendations of this

report to encourage production of higher value crops over unsustainable perennial food crops currently cultivated on degraded or depleted hillsides, Jatropha could be seen as a viable alternative. Because the leaves and pics are toxic, it has an advantage for use as a living fence for livestock. Toxicity risks in the processing of the seeds and the oilseed cake (Jongschaap et.al. 2007) may limit some export of Jatropha products, but for the domestic bio-diesel, and other local byproducts markets, varieties available in Haiti are deemed (Ray & Cardell 2008) safe enough – if handled properly.

Figure 7 Eroded hills and mudstreams in Montrouis watershed destroy farms and kill villagers every year

Thus, not only as a renewable energy source, but as a CO_2-fixing tree, Jatropha offers an attractive GHG offset opportunity. Combined with woodlots for sustainable charcoal management on the same landscapes and fuel efficient stoves for cooking with both, a sizeable GHG offset balance sheet could be developed – and sold to voluntary and/or (non-CDM) compliance buyers.

Several partnership opportunities with the private sector exist for DEED to explore further. The Haitian NGO, Caribbean Harvest, is operating a project near Arcahaie in a mountain village called Ti Bwa. A focus of interest is the production of biodiesel fuel from Jatropha. In 2007 project personnel have written two proposals ($366K and $600K) to fund this activity. The objective is to create a profit-making enterprise that benefits small farmers (Smucker et al. 2007: 23; DEED 2009).

Biocarburants d'Haiti SA, a Haitian Corporation established in 2007, is currently producing biodiesel on an experimental basis from used vegetable oil collected in local restaurants. Within the next three years, the company is developing Jatropha plantations in two phases. In the first phase Jatropha will be planted on about 1200 hectares of land located in the central plateau and owned by one of the major

stakeholders. In the second phase small farmers are encouraged to participate in a Jatropha plantation program (with the help of USAID's WINNER project) (pers.com. Reginald Noel 2009). The company expects biodiesel sales to be economically viable at current petro-diesel prices.

Other groups, e.g. CHIBAS and Jatropha Pepinyè, also use biodiesel for local decentralized consumption but at current prices see more benefit in concentrating on the other products of Jatropha. These include: pure plant oil for lamps, glycerin for soap and higher-end consumer products, and biochar for soil fertilization (pers. com. Pressoir and Fisher 2009). CHIBAS is a research center on bio-energy and sustainable agriculture (www.chibas-bioenergy.org). It is a not-for-profit organization founded Haiti with the goal of establishing a Regional Bio-fuels Technical & Knowledge Center that will contribute to developing and acquiring the technologies needed for the development of the bio-fuel sector in Haiti.

Jatropha Pepinyè is a nonprofit Haitian business that grows and sells transplant seedlings of *Jatropha curcas* for renewable energy, rural economic development, and the re-vegetation of devastated landscapes. The nursery is located in Terrier Rouge in northeastern Haiti on the newly improved Route Nationale.

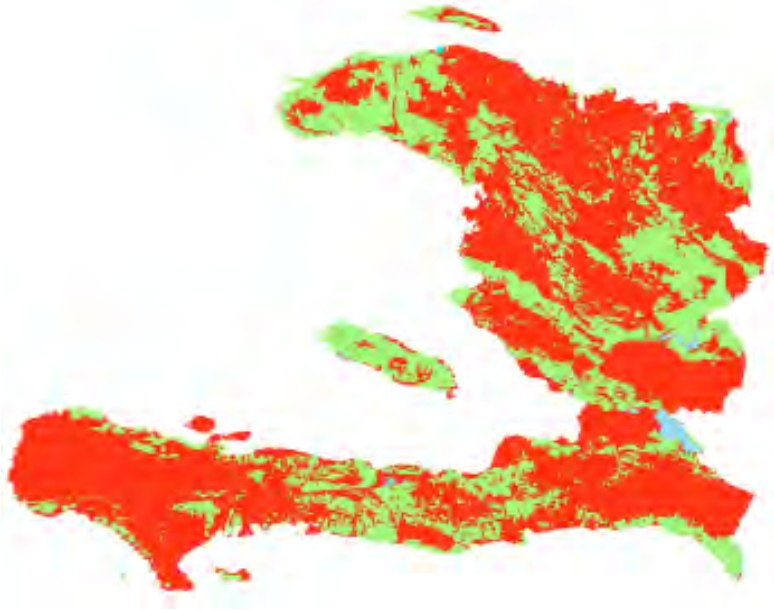

Figure 8 Land suitability map for Jatropha cultivation in Haiti after excluding environmental, agricultural and social limiting factors and risk areas (Pressoir 2009)

CHIBAS estimates that between 500,000 and 800,000 ha of land are suitable for Jatropha cultivation in Haiti, after excluding land use limits (altitude, soils, etc.), environmental damage risks, areas suitable for food crops, other socio-economic risks, etc. (Pressoir 2009).

A study commissioned by IDB (Damais et al. 2007) distinguished three potential markets for products derived from Jatropha in the region of Montrouis in the short-term: the oil sold as bio-diesel fuel for diesel generators of the Club Indigo resort (about 2,000 gallons per year after trans-esterification), soap for local markets (25,000 pounds per year after saponification by adding caustic soda), and meal used as fertilizer in vegetable crops (20 MT of press residue cake per year). The latex, which contains an alkaloid called jatrophine, leaves and stem are also valued in some countries (secondary use). In total, for each of these three markets, demand exceeds 3 to 4 times the supply of seeds currently available.

By exploiting the three identified opportunities (fuel oil sold at HTG 105/gallon, soap sold at HTG 24/pound and cake sold at HTG 100 /bag), the proposed project has a rate of return of 35% with

most of the value added generated from agricultural diversification facilitated by the proliferation of Jatropha living fences. The project will directly benefit more than 500 peasant families in the Montrouis Watershed and generate an equivalent of 250 new full time jobs (Damais et al. 2007).

Table 3 Investment and return estimate of the project based on a 1000 ha Jatropha plantation *without* considering carbon revenue

Year	1	2	3	4	5	6	7	8	9	10	Total
Investment	167 667	161 167	71 167	0	5 000	5 000	12 500	5 000	0	0	427 500
Total value added	36 872	49 217	61 588	34 050	80 973	246 026	269 098	298 845	298 845	298 845	1 674 358
Cash flow (net)	-130 795	-111 949	-9 579	34 050	75 973	241 026	256 598	293 845	298 845	298 845	1 246 858
IRR	**35%**										

(Damais et al. 2007)

Besides its economic impact, the Jatropha plantation will have a positive environmental impact by reducing erosion risks (development of living fences and tree crops), and contributing to carbon sequestration if planted on bare land. The study suggests setting up a project in two phases, starting with a pilot phase lasting three years to test the identified markets, develop products and processes, and to create conditions for large-scale expansion culture, followed by an expansion phase that would either set up a semi-industrial or industrial oil production unit to cover increasing demand.

Such a three-year project would aim at a diversification and development of crops, including Jatropha, that protect the environment, at intensification of agricultural production (increased density of fruit trees, tree size) and livestock (alternative livestock free by feed intake), and increasing local value added through processing products. It is based on the following activities:

i) the establishment of a processing unit for Jatropha seeds with building and manual press manufactured in Haiti (adapted castor press)
ii) support the extension of the production of Jatropha (nursery for cuttings, maintenance of shrubs)
iii) supporting economic diversification (incubators, training, grafting, pruning, processing and packaging of products)
iv) organization of the marketing of products (search for potential buyers, contracting)
v) rehabilitation of road between Freta and Montrouis (12 km, establishing community maintenance)
vi) support for professionalization of community organizations (administration, management)
vii) evaluation of the Jatropha industry, with the aim to create references on the process (collection of data on yield, oil content, prices, etc, ...).

The project would be implemented by a team of two people, a project manager and an agricultural technician, supported by a consultant (Damais et al. 2007).

Jatropha offers potential as a renewable energy source that can provide some limited carbon sequestration capacity, and provide a source of fuel switching credits. The methodologies for calculating GHG emissions under the EU Renewable Energy Directive and the UK government Renewable Transport Fuel Obligation assume that on average fuel switching from fossil to biodiesel reduces CO_2 emissions by about 66 to 68% respectively (Romjin 2009: 12).

The offsets created by the sequestration of CO_2 in afforestation of degraded land with Jatropha vary significantly depending on the prior vegetation, growth conditions, and management (planting density, pruning, etc.). If planted on bare land, the carbon offsets from A/R with Jatropha would be equivalent to all the carbon accumulated in a plantation, while if planted on grassland or bush land the carbon in the vegetation baseline would have to be subtracted from the carbon in the Jatropha plantation to calculate the carbon benefits.

The height of Jatropha plants is between 3 and 4.5 m in plantations and nature, respectively. A DNA can define minimum tree heights between 2 and 5 m, so it depends on the forest definition of the DNA whether Jatropha, without taller trees interplanted, would be eligible under CDM A/R rules. The definition in the neighboring DR, which would currently be used as a proxy, has chose 5 m for the minimum tree height definition (http://cdm.unfccc.int/DNA/ARDNA.html?CID=63).

The following table presents preliminary estimates of the value of the carbon from A/R with Jatropha on 1,000 ha. It is based on two sources (Henning 2003:17; Strujis 2008: 28) estimating biomass over the lifetime of a plantation with 1,600 to 1,667 trees per hectare (a spacing of 2 x 3 m), which equals about 83.3 t biomass/ha (dry weight AG and BG) or about 40 t C/ha. This, like most tree-based projects, assumes that C is about half the biomass, equivalent to 145 t CO_2 stored per hectare (Strujis 2008). As Benge (2006) notes, Jatropha carbon density is probably closer to 0.37. Assuming this more conservative carbon density estimate the total GHG stored per hectare would be about 31 t C/ha, equivalent to 113 t CO_2e/ha. Assuming a plantation life of 30 years, this translates into an average annual sequestration rate of approximately 3.76 t CO_2e/ha/yr.

Estimates on project areas with better soils, irrigation, or other growth conditions often assume a planting density of 2500 plants or more per ha (including a very detailed Jatropha project financial assessment made for IDB in Haiti) and examples from projects in Haiti (Jatropha Pepinyè 2009, Pressoir 2009 pers.com.) and other countries (GEXSI 2008; Bioenergywiki 2009; Jatropha.de 2009; 5000 plants per ha in India: Prueksakorn & Gheewala 2006, etc.), together with carbon density assumptions of more than 0.37, would result in carbon sequestration rates of 5 to 20 t CO_2e/ha (Bioenergywiki 2009) and can lead to excessive expectations.

Based on preliminary assessments made for the sites considered by the DEED project in the Montrouis watershed a conservative potential gross revenue for a 1000 ha plantation would be about half a million dollars before costs for carbon development, registration, marketing etc. Scaling this up to larger areas, and adding fuel switching carbon revenue will make such a project more profitable.

Table 4 Carbon estimates for Jatropha A/R on bare land in the Montrouis watershed

Estimates:	Assumptions:
	- carbon credit price \$5/MTCO_2e - 30 yr duration - Conversion: 1MT C = 3.664 MT CO_2e - CO_2 stock in plants at start of plantation =0
1,000 ha * 3.76 t CO_2e * 30 years * \$5 = \$560,000 gross revenue	- 1667 trees per ha - 37% of dry biomass weight constitutes carbon - 3.76 MT C storage per year per ha

6.1.2.3 Vetiver and Other Essential Oils

During and after World War II, when the international perfume industry lost its access to Indochina, vetiver became the biggest export success in Twentieth Century Haitian agriculture. Vetiver still grows prolifically in Haiti, and in the Montrouis watershed, but its export success has been recently compromised by political instability at home and renewed competition from both Vietnam and Madagascar. There is no need for this downturn to remain permanent. As his principal political rival (Louis DeJoie) was the agronomic father of this vetiver revolution, Francois Duvalier (1957-1971) sabotaged Haiti's essential oil sub-sector, but it recovered strongly under his son's, Jean-Claude's, rule.

After approximately 18 months of growth, vetiver is harvested by pulling up the roots, from which the oil is distilled. Even though it is a tenacious perennial, it is rarely viewed as a particularly robust soil conserving alternative. But during its first 18 months of growth, it holds the topsoil in place effectively. Techniques of planting vetiver on the contour (using A-frame levelers), in alternate meter-long strips each planted, and harvested, at six-month intervals, have been successfully used to conserve hillside topsoil. In addition, some researchers have estimated that vetiver can potentially sequester up to 10 t C/ha per year, under certain conditions. (Lavania and Lavania 2009).

Under the VCS protocols for Improved Grassland Management Activities, enhancing soil carbon stocks through planting of vetiver could well qualify as a carbon credit. The cost of planting vetiver, its return as an oil producing plant, along with its carbon value, need to be looked at systematically. Its perceived ecological benefits, and its seeming carbon potential, need to be seriously considered as one of many options as a comprehensive re-vegetation scheme for the Montrouis watershed. It is not clear what the extent of the potential is for the area that could be planted with this fast growing grass.

Vetiver grass might be able to sequester up to 10 MT C/ha, so depending on the acreage planted, this could serve as an important carbon sink, and a source of biomass for many different purposes. However, reliable data have yet to be established. As an erosion control solution, vetiver can be quite effective.

6.1.2.4 Bamboo

Non-invasive bamboo would be another hardy plant, with charcoal and bio-char producing uses, that might thrive on Montrouis hillsides. The non-invasive, or Sympodial bamboo species, are very productive and can produce up to 280 t/ha of aboveground biomass. It grows very fast, averaging about 48 Mg/ ha of new AG dry biomatter per year, sequestering up to 149 MT C/ha. Harvesting is done annually of 15-20% of the aboveground biomass, with no loss of the carbon sequestration capacity. This plant could offer carbon credit potential for the Limb area as well.

6.1.2.5 Altitude Shade Coffee

The upper reaches of Montrouis' Chaine de Mathieu mountains were once known for a specialty coffee that has virtually disappeared. That coffee's shade trees were consumed by Port-au-Prince's timber and charcoal demand. In the open sun, without fertilizer, these Arabica trees wilted. There is no reason why production of this coffee in these highlands cannot be gradually revived, once future shade trees are allowed to grow again. The land-use planning for this kind of transformation, like that for sustainable charcoal woodlots, must begin at the local institutional-level where the DEED project has already made much progress. While this would appear to be a much longer term process than the rival of shade coffee in the Limbé watershed (see below) where enough of the trees are still there, recent developments are encouraging: DEED has received a public private partnership (PPP) proposal from Cafe Selecto (an in-country brand) which desires to produce superior coffee, better than the previous branding attempt of the "Haitian Bleu" brand, on substantial areas on the 1100-1400 m highlands of the

Montrouis watershed, combined with shade trees such as sucrin and bananas, and protective tree belts in the watersheds above the coffee plantations.

6.1.2.6 Avocados, Mangoes and Other fruits

Haiti's export of grafted mango varieties introduced that fruit into countless American supermarkets over the past 15-18 years. Today, Haiti's total exports of mangoes to the U.S. are around $1.2 million (USDA, FAS 2008). But Haiti's market share of the mango market in the U.S. has declined, as other Latin American producers have come into the market more strongly. Now many capable players in Haiti appear to be ready to revive the mango export market even though constraints on more competitive farm-level buying exist that need to be better understood and removed. Montrouis proximity to the port should favor it in this regard.

Agronomists continue to note that where mangoes thrive so can avocadoes, and yet Haiti's comparative advantage for avocado exports remains relatively dormant. This tree could also contribute towards Montrouis' reforestation and its rural incomes.

Fruit trees and hardwood trees are complementary farm enterprises and should not be thought of as mutually exclusive activities. Smucker et al. (2007: 34) observed that small container hardwood trees distributed by projects tend to be planted in larger numbers and at a greater distance from the home; fruit trees are typically grown in plastic sacks (because of the large seed size) or are direct-seeded and planted in fewer numbers closer to the home. In contrast to hardwood trees, there is some scope for selling fruit tree seedlings at a subsidized price to farmers. Nurseries can sell their seedlings already while they still grow in the nursery to local people; mangoes e.g. at HTG 10 per seedling ($0.25). Alternative modes of production include distributing plastic sacks for farmers to grow seedlings in smaller numbers close to their residence, or training farmers to graft bud wood of export-quality fruit on established low-value fruit trees (see the photo on the following page). In this way the whole crown of the tree is replaced and the trained grafter also gains a saleable skill.

The most commonly planted fruit trees include coffee, mango, cacao, citrus, and avocado. These have been linked to marketing projects with varying degrees of success such as creation of the Haïtien Bleu brand of gourmet coffee for export. Other locally popular fruit trees such as *Melicoccus bijugatus* ("kenèp", mamoncillo, or Spanish Lime) also have potential for export to the Haitian Diaspora.

Trends in fruit tree culture observed by Smucker et al. (2007) show that some individuals and projects are applying for organic certification, e.g., the HAP project for mangos and the Mevs project for plantains (see Section 7.1.2 below). Also, new arrangements between large landowners and farmers allow for planting fruit trees in orchards instead of just a few trees located near the house. Smucker et al. (2007) quote an example from a mango exporter in Dubedo who planted more than 25 hectares of mangoes intended for export. He has a sharecropping arrangement with local farmers: they grow annual crops (maize, sorghum, peanuts) and give one-third of the harvest to the landowner on condition that the farmers take care of the mangos. When the mangoes are ready to harvest, the planters gain the benefit of the harvest on condition that they sell them only to the landowner, who will develop a brand name and sell the mangoes as organic produce. Several similar schemes have been developed by the DEED project in Montrouis, where agreements have been signed with landowners, e.g. of 200 ha areas, and farmers, who will take care of the trees to be planted on the 200 ha in exchange for the right to live and produce subsistence crops on 2 ha areas.

6.1.2.7 Sustainable charcoal

Charcoal demand in Haiti, especially near Port-au-Prince, is overwhelming and the ANR (assisted natural regeneration) technology to sustainably produce it is known by every Haitian. If it is not happening, it is because of the "tragedy of the commons", better known as what the 2009 Nobel laureate in Economics, Elinor Ostrom, calls a "free rider problem." DEED activities centered on local institutional development, or "social capital", required to govern such "free riders" is based upon an understanding of best practices around the world. But as these new local institutional dynamics serve to solve the "free rider" problem, the mayors, the ministries, and, ultimately, the laws have to support this improvement of land use governance. Without such backup, all this "additional" charcoal-demand driven ANR can never become a certifiable, lower risk carbon credit.

6.1.3 Recommendation for Carbon Projects Opportunities in Montrouis

The opportunities for carbon development projects entail activities that will require land use changes, investments, and market development. Many factors will need to be in place but the payoffs can be significant environmentally, economically and socially. These include:

Jatropha offers potential as a renewable energy source that can provide some limited carbon sequestration capacity, and provide a source of fuel switching credits. The value of the carbon from A/R on 1000 ha could be over $2.9 Million over 30 years.

Benzolive has carbon sequestration potential, though exact calculations are dependent on the number of hectares that can be planted, the density and its sequestration potential under Haitian growing conditions. 10,000 ha plantation area could yield $8 million in A/R carbon credits over 30 years. It also has value as an essential oil. Animal feed can be made from the seedcake, and fodder from its leaves. This can be a valuable crop.

Vetiver grass might be able to sequester up to 10 MT C/ha, so depending on the acreage planted, this could serve as an important carbon sink, and a source of biomass for many different purposes. However, reliable data have yet to be established. As an erosion control solution, vetiver can be quite effective.

Bamboo is fast growing, sequestering up to 148 MT C /ha, and is a prolific producer of biomass.

Shade coffee can offer significant carbon sequestration under a shade production system. Haiti's coffee production and marketing system has fallen into a lamentable state of decline, though with the proper incentives this sub-sector could potentially be revived.

Other tree crops such as avocadoes, mangoes or other fruits, also offer C sequestration potential and should be looked at as integral elements mixed into plantations of the earlier described projects.

6.2 Limbé

According to the Environmental Vulnerability in Haiti criteria applied by Smucker et. al. (2007), Limbé, while still one of the greenest watersheds in Haiti, presents one the highest opportunity costs from continuing pressure from growing, maize-eating, populations. The DEED project has deployed a comprehensive strategy for saving this significant agro-forestry resource for the country, to the point that this watershed, at 327 km^2, may be one of the most carbon-ready opportunities in Haiti.

Limbé's wetter climate has contributed to very different agro-ecological conditions for tree-based permaculture than in Montrouis. It has a richer and more distributed forest environment in which large tracts of tree covered parcels still exist on hillsides or on flat non-irrigated lands. At lower elevations

these are usually cacao-yam based systems while at higher elevations coffee-yam associations dominate (DEED 2008). Whereas the areas under permaculture type systems are quite small in Montrouis, in Limbé they are much more extensive. In more exposed areas, where farmers have already removed much of the original tree cover, DEED promotes the cultivation of bananas to provide short term revenue and shade for the development of longer growing tree crops that will provide the needed shade for the yam-cacao or yam-coffee permaculture system. This Chapter assesses the carbon potential of these systems in principle. A more detailed feasibility study needs to determine the viability and eligibility of the highly disbursed plots in more detail.

Table 5 Land use classes in the Limbé watershed (DEED 2009 data)

Land use class	ha	%
Grazed Shrub and Brush Rangeland	1,336	*4.1%*
Grazed Herbaceous Rangeland	3	*0.0%*
Sparse Canopy Agro-forestry	2,474	*7.6%*
Medium Canopy Agro-forestry	9,032	*27.6%*
Dense Canopy Agro-forestry	280	*0.9%*
Cultivated Annuals	16,495	*50.5%*
Barren Land	335	*1.0%*
Cultivated Non-woody Perennials	638	*2.0%*
Non-forested Wetland	102	*0.3%*
Inundation Agriculture	1,098	*3.4%*
Mangroves	125	*0.4%*
Urban or Built-up Land	256	*0.8%*
Water	225	*0.7%*
Unclassified (cloud or cloud shadow)	279	*0.9%*
	32,677	***100%***

6.2.1 Carbon Project Opportunities in Limbé

DEED has effectively built upon Haiti's current comparative advantage for the global demand for small farmer, more pathogen free, shade-grown cocoa. Up to 500 meters in altitude, this reforestation choice is working well. Carbon offset revenue could offer the "additionality" of inducing it to expand faster over riskier, steeper and more degraded, hillside lands. But higher than 500 meters cocoa will not work well. Currently, this cocoa is being grown in the shade of tropical oak trees which support yam vines, so that however green these "forest gardens" become, they still can produce substantial amounts of food.

While promoting improvements for high-intensity food crops such as yam seed — whose expense and rarity make it a major limiting factor to the productivity of these systems— DEED promotes cocoa and coffee plantings and adding of revenue-producing shade trees such as fruit trees (avocado, mango, citrus) in addition to Haitian oak, mahogany or sucrin trees that produce mainly medium to long-term revenue from wood harvesting. Where local demand and farmer preference still calls for those timber species, the additional revenue from carbon offsets can make these systems economically viable and more interesting than tree-less or sparse canopy plots. In addition, the carbon sequestration capacity of the cacao tree can determine the additional income that can be potentially generated from carbon credits.

The following Table 6 shows C sequestration from different systems of cocoa production for comparison. Though figures have been presented from Ghana and Cameroon, they give a range that corresponds to conditions in Haiti.

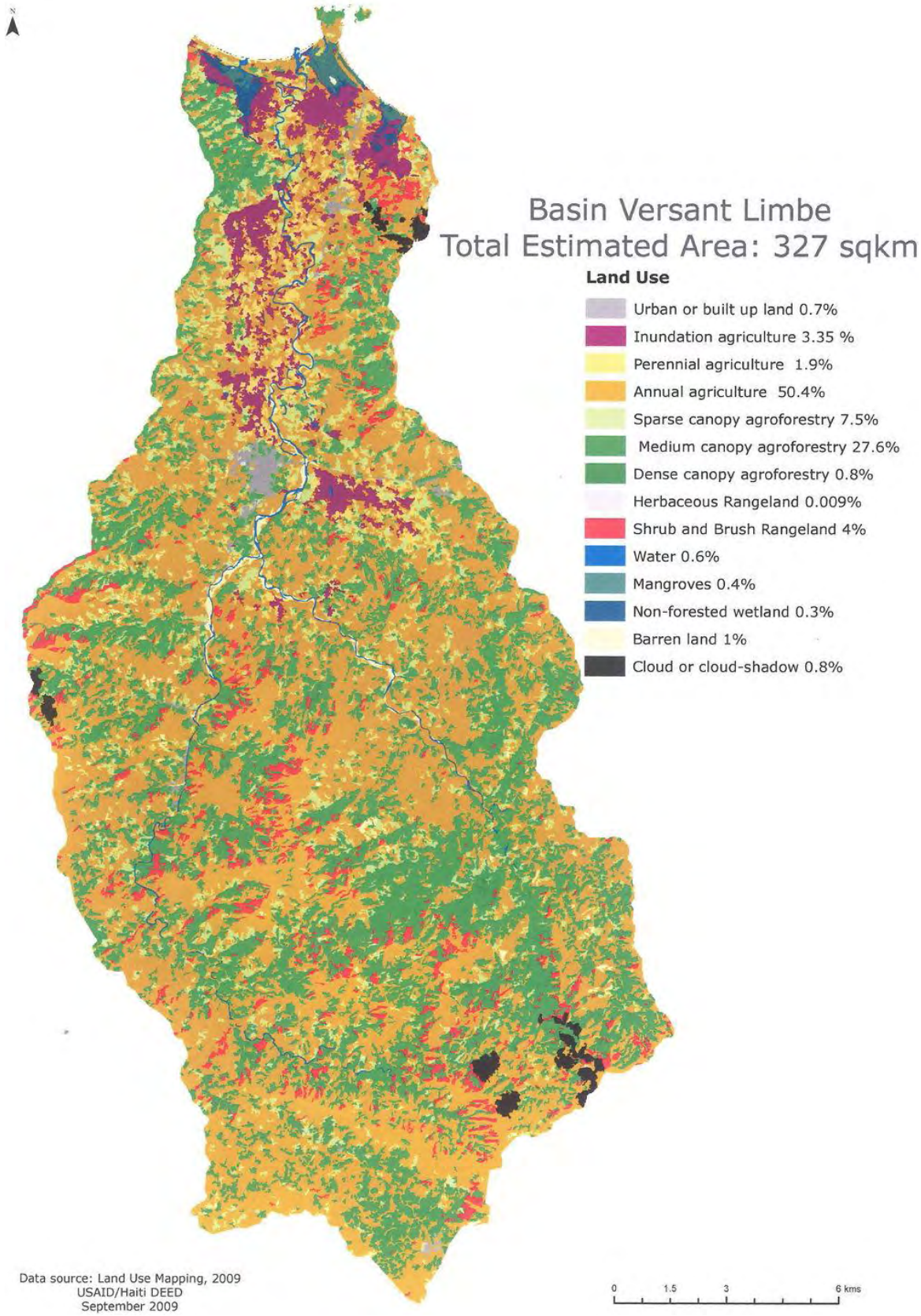

Figure 9 Land use map of the Limbé watershed

Table 6 Carbon Stores from Different Cocoa Farming Methods (C t/ha)

System	Ghana	Cameroon
Shaded	160	201
Unshaded	79	60

Source: Norris 2008; Sonwa 2008.

Therefore, it might be reasonable to assume a level of 100 MT C/ ha for shade cocoa production in Haiti (conversion rate of 1 MT C = 3.664 MT CO_2e). If some portion, e.g., 3,000 ha of the roughly 11,500 ha of sparse or medium canopy forest can be planted in shade cacao, this could sequester 1.1 million t CO_2e. Valued at \$5 /MT CO_2e, this would potentially render gross revenue of about \$ 5 million from carbon sequestration (before development and marketing costs, validation fees, etc. and without regard to an adjustment to the price based on a buyer's risk assessment of carbon offsets from Haiti). Detailed site measurements have to be made for all values estimated here.

Figure 10 Shade-grown cacao in Limbé

Coffee is more suitable for areas above 500 meters. However, the glory days of Haitian Arabica are over. The scale of the new, replanted Brazilian Arabica has, for over a decade, driven world prices down. DEED's predecessor project, HAP, showed how only specialty coffee, "Haitian Bleu" in this case, could keep this higher altitude land under trees. However, FACN did not succeed in getting the marketing chain for all producers around traditional buyer blockages, so Haitian Bleu is still struggling. Renewed interest by Café Selecto to invest in the Montrouis watershed is encouraging. The challenge for DEED is to revive this HAP/Haitian Bleu strategy for an even more limited niche: the Marmelade area in the upper Limbé watershed. But to do it, a specialty commodity chain will have to be created to successfully sell to independent coffee roasters baristas in or around, initially, the Haitian communities in Miami, New York, Boston and Montreal.

6.2.1.1 Mangrove replanting

Haiti's Ministry of Environment (2006) has submitted an extensive National Adaptation Plan of Action (NAPA/PANA) to the UNFCCC. It follows the standard UNFCCC design, seeking to garner Haiti's share of the various Adaptation Funds to be consolidated at Copenhagen for those made most vulnerable by climate change. As with other NAPAs from other developing countries, the potential mitigation offset value of any project alternative was not factored in by Haiti's NAPA as adaptation funding priorities were set. Nevertheless, mangrove replanting still received a laudably high priority, so, eventually, there should be some compensatory funds available for strengthening Limbé's coastline. This A/R, C-

sequestration can be usefully added to what is being proposed in considering a mix between shade coffee or shade cocoa agro-forestry.for the creation of a mitigation offset.

6.2.1.2 Vanilla

There is commercial interest in reviving a vanilla marketing chain beginning with the middle reaches of the Limbé watershed. Some business people see this as a promising prospect. (David Gardella, pers. Communication). With the current export marketing problems for vanilla from Madagascar, there may be a small opening for Haiti in this regard. This initiative could be backed to some extent, with revenues from carbon offsets that these vanilla trees, combined with the more extensive areas of shade cocoa or coffee could offer.

6.3 Recommendation for Carbon Projects Opportunities in Limbé

Over half of the Limbé watershed, or 16,500 ha, are devoted to erosion-inducing annual agriculture (maize). Roughly 36%, or 10,900 ha, are under agro-forestry cultivation or some perennial agriculture. If some portion of the land now devoted to annual crops, which take a very heavy environmental toll on the land, could be converted to more perennials or tree crops, this could be beneficial in terms of sustainability and carbon revenue generation. If say 3,000 or 5,000 ha could be converted to shade cocoa, shade coffee, other tree crops, or some amount of vetiver, this reversal of the land use described in this Section could have a significant impact on the environment of the region. One organizational prerequisite for the success of such a "classic" A/R offset initiative will be of course the enthusiastic participation of the principal beneficiaries, the Limbé land managers. This enthusiasm would be built on the following four foundations:

- *Transparency of carbon payments*, and, therefore, *tree tenure rights* and tree stewardship responsibilities based on the monitoring system validated into the projects' approved measurement methodology. This allocation of rights and responsibilities can be handled between the farmers, their organizations (that are already being mobilized by DEED), the CASECs and the elected mayor. Land tenure in Limbé is no less ambiguous than elsewhere in Haiti, but this sort of transparency could be an important step towards clarifying it in practice.
- *Co-operation of the MOE/DNA and MARNDR without* too high a percentage of the revenues being *"taxed"* away from the tree-managing farmers such that the interest of the latter is compromised. Without sufficient farm-level incentives, there will be no offset revenues for the GoH to "tax". At the same time, without this incentive to the GoH, it might be bureaucratic "business as usual" and the PDD and ERPA authorizing documents would never be expedited efficiently through the established approval process.
- *Coffee and cocoa processing and marketing effectiveness*. In Limbé, the Novella Corporation (Zephir brothers) appears to have the cocoa value-chain well in hand with a solid understanding of the producers' extension and revenue requirements. FACN's coffee processing and marketing infrastructure in the town of Marmelade will have to be built on a new basis with niche specialty buyer participants identified ahead of time. The vanilla commodity chain will have to be built from scratch, but world market conditions look promising.
- *Watershed stabilization.* Even if the cacao producers associations chose to launch a separate offset perimeter from that of their upstream coffee producing neighbors, in the interests of overall watershed stability (also a concern of potential buyers of these credits), the two projects should be undertaken simultaneously. Furthermore, if so separated, each project should be of sufficient scale, preferably no less than 5,000 ha each, not only to justify the asset development costs but also to ensure that enough of the upper watershed is being sufficiently re-planted with perennials.

7 Carbon Opportunities in Areas with Other USAID Funded Projects

In addition to the opportunities for carbon offset revenue available in the project areas DEED is currently active in, the team was invited to look into opportunities in areas where other USAID funded projects are active. The development of carbon projects in the DEED watershed would be valuable for – and can benefit from – the experience and knowledge sharing with other projects in the country, and for synergies in technical issues, institutional facilitation at the village as well as national governmental level, and market development. The main projects, and their local private sector or NGO partners, visited in this first visit were WINNER, MarChE, as well as WorldVision, CARE, and AgroAction Allemande.

The team also talked with a large number of other organizations active in land use change projects, including ACDI Voca, Lanbi Fund, AfD, and various church based organizations and private companies investing in relevant agro-industries.

7.1 WINNER's Cul de Sac

The recently started USAID WINNER project is, among other areas, active in watersheds in the Cul-de-Sac, whose watersheds draw partly from the de Selle mountain range. There, the project is also exploring work with ARN Foundation or others in restoring the forests in the Fôret des Pins and Morne La Visite parks, which protect and supply the hydrology for large watersheds downstream to the North, passing near the capital, and South, down to the coast.

7.1.1 The Mountains: Morne La Visite and Forêt des Pins REDD

Working in and around these two parks with some of the last remnants of a timber industry offers socio-economic benefits, with jobs that helps keep unsustainable numbers of subsistence farmers off the land, and offers considerable potential for reforestation and production of the fast-growing pine trees native to this area. While the nursery and planting activities of the ARN foundation currently targets restoration for conservation, the timber production in buffer zones will be a crucial element in a strategy to alleviate pressure on protected areas, and, taken together, might create a reforestation area large enough to warrant the development of a carbon project, which can help pay for the reforestation efforts. The ARN nurseries are initially designed to produce a million seedlings per year, and can conceivably be scaled up.

As described in Chapter 5.2 above, the forest area available for conservation activities in these two parks is too small to create a viable REDD project, at least if the carbon development and start-up project costs are not financed by a donor such as USAID or the EU. However, designing a carbon project around these rather small remaining forests does make economic sense if combining them with a cross-border VCS-REDD avoided deforestation project, connecting Haiti with the Sierra de Bahoruco Park across the Dominican border. This would offer any Haiti Climate Initiative (HCI) five co-benefits:

- Covering over 100 km^2, this trans-boundary conservation initiative, if successful, could earn, in 25 years, both countries over $100 million each in offset revenues, putting, on the Haiti side, some of WINNER's Port-au-Prince area water conservation objectives on a sustainable financing basis;
- The forest protection so financed could provide an employment alternative for the surrounding populations currently encroaching on Haiti's last forest in order to survive;
- These trans-boundary mountain ranges, and their remaining forest, harbor one of the most significant, and most endangered, biodiversity hot spots in the Caribbean – biodiversity corridors can be most efficiently protected in more sparsely populated border areas ("Peace Parks") where both countries are co-operating;

- The symbolic value of both saving Haiti's last forest and collaborating with the neighboring Dominican Republic's own environmental protection aspirations could reinforce the island-wide investment promotion effort President Clinton is leading on behalf of both countries' Presidents and the UN Secretary General; and
- The considerable greenhouse gas emissions anticipated from the continued deforestation of this border region will have been abated.

There are strong, local conservation NGOs on both sides of the border anxious to co-operate in just such an effort. Fondation Seguin on the Haiti anticipates citing most of the above co-benefits in seeking a relationship with USAID's new WINNER project.

7.1.2 The Plain: Organic Bananas A/R

Gregory Mevs, a leading Haitian industrialist, is pursuing several sustainable agricultural projects that can have carbon offset benefits, and looks for public-private co-financing to make this switch away from common practice economically possible. One enterprise for which he has meanwhile brought together the necessary co-investment from other private sources, land, processing, packaging, and shipping facilities, are shade-grown organic bananas. His intent is to realize an A/R carbon sequestration offset benefit from converting sugar cane land into a shaded plantation for organic bananas. As an ACP country, Haiti is eligible to access the EU's preferential, WTO-approved, import window for bananas. At the same time, he would seek additional GHG offset benefits by composting the banana cuttings to capture, and utilize, the methane from their decomposition.

Smucker et al. in 2007 (23) reported that Mevs has a 200 hectare block of land formerly in sugar cane. This cane land was formerly a large plantation operated by the Haitian-American Sugar Company (HASCO), long since acquired by the Mevs family. The land abuts the Cité Soleil slum district, and the landowner was confronted with the prospect of losing control of his land through occupation by squatters. An objective of this project is to prevent squatters from building on the land by creating a business partnership geared to make money for small farmers working the land, as well as the landlord. The business partnership is based on raising organic bananas for export. Mevs calls this partnership a "productive alliance," and it has social development as well as business objectives. Mevs (pers. communication 2009) has now been able to expand this land area to over 1000 ha, which is the economically critical size to reliably fill a container for regular shipping.

Mevs is looking to carbon finance as an opportunity to fill the missing long term cash-flow gap that can make this shade-grown banana model competitive. However, as we explained, unless he could integrate at least another thousand hectares of smaller surrounding plots into the proposed, overall land-use change, the A/R value of the effort might not attain sufficient scale to be reliably marketable. Also, banana trees themselves contain as much water as they do carbon.

Nevertheless, as already recommended by Smucker in 2007, USAID/WINNER should encourage these types of projects in targeted watersheds because they are based on economic enterprises that generate employment, and they focus on perennial crops. These initiatives are also potential models for a long-term strategy. Carbon finance can provide the critical additional long-term revenue to make such project sustainable long beyond the duration of an initial USAID project support.

7.2 World Vision's Artibonito

The world's largest international NGO, World Vision, has several area development projects in these upper reaches of Haiti's largest watershed, the Artibonite, on both sides of the border with the Dominican Republic. Like the WINNER REDD prospect, this cross-border possibility should attract the

attention of President Clinton's island-wide energy investment promotion efforts (Almeida 2009). Like the DEED Montrouis prospect, it will feature a Jatropha production and marketing chain as well as fuel efficient stoves (see Damais 2007). Unlike Montrouis, however, it will be more costly to transport these products, especially, the bio-diesel down to the Port-au-Prince market and its port. In compensation, the Artibonite central plateau does offer much more Jatropha production space once the technology and varietal choices have proved themselves at Montrouis (and Ft. Liberté). The German Cooperation Agency GTZ is pleased with the results of its pilot work on Jatropha technology in the central Plateau. Should additional MYAP resources be available to World Vision, USAID should encourage World Vision's interest in this opportunity.

7.3 Co-ordination with Agro-Action Allemande at San Raphael

Agro-Action Allemande (AAA, Deutsche Welthungerhilfe) is a German NGO active in Haiti mainly for rural development and agricultural productivity enhancement; AAA implemented a large program for improvement of irrigation systems. AAA is currently working to re-vive a €10 million KfW financing potential for reforestation in watershed management in Haiti, in which Terra's carbon development approach could provide the leverage by securing long-term carbon revenue (Kühn 2009, pers. com.).

7.4 CARE in the North-West

If CARE got back on its feet in northwest Haiti, they have a thirty year legacy of local organizational relationships and proven agro-forestry technology extension that, between Gros Morne and Port de Paix, could quickly be turned into an A/R offset on an adequate scale. However, the proven tree planting combinations in this region would not have the export marketing co-benefits of the coffee-over-cacao approach being proposed here for Limbé.

7.5 MarChE's Dame Marie

The Dame Marie valley on Haiti's southwestern tip offers, albeit on a smaller scale, comparable 'coffee up the hill-cacao down the hill' prospects to that of Limbé. While, the consulting agency CNFA, implementing USAID's MarChE project, is newer to the area than DAI/DEED to Limbé, there are strong local organizational developments, led by the Oblate Fathers backed by CRS, for them to build upon. The southern peninsula cannot yet offer the container export infrastructure available to Limbé at Cap Haïtien, but with Mars Corp.'s commitment to the cocoa supply from Dame Marie, a solution to this transport constraint could be found. Mars' involvement might facilitate CNFA's partners' access to the new IDB business loan facility that is prioritizing Haiti, particularly if that facility also supported one of the global container shipping enterprises that has expressed interest (Almeida et.al. 2009).

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9 ANNEXES

9.1 Annex 1: Schedule of Terra Global STTA meetings in Haiti: September 8 - 22

Sep. 8: PM	John Lewis arrival (AA from DC via NYC)
Sep. 9: AM (Wed) PM	finalizing targeted appointments (based upon your reactions to these suggestions Dirk Kloss arrival (AA from San Francisco via Miami). Meeting with project team leader Mike Godfrey, Dinner with available DEED personnel
Sep. 10: AM (Thu) PM	roundtable discussion with DEED project managers; lunch: Tanguy Armand, Haiti Env Foundation introductory session with USAID (Chris Adams, Gregory Groth, et al.), Courtesy call to Ministry of Environment and/or Agriculture dinner: Jean-André Victor (ex UNDP, HEF, carbon PIN)
Sep. 11: AM (Fri) PM	meeting with Jean-Pierre Moïse, MdE's UNFCCC (Copenhagen) delegation and "Designated National Authority" for the UNFCCC/CDM) Emmet Murphy, Mathieu Lucius, ACDI Voca MARNDR courtesy visit featuring Forest Service and Ag/NR offices Reception at Gregory Mevs', meetings with Finnish ambassador for Mexico, Lutheran Church Aid, EU coordinator, owner of Club Indigo resort (Montrouis), etc.
Sep. 12: AM (Sat) PM	Field visits to Montrouis and Limbé watersheds 9:00 agro-forestry nursery, ARN Foundation, interviews Miriam Duret, nursery managers; 11:00 mayor of Arcahaie 2:00 Limbé watershed transect, mtg w Nick Hobgood, DEED 4:00 mayor of Limbé 6:00 shade-grown cacao sites 7:00 cacao and coffee processing and exporter, Daniel & Nonce Zephir, Novella (night in Limbé)
Sep 13: AM	Travel to PauP (air); Mtg with James Rhoads (Food Meds for Kids) Coast visit near Arcahaie, Montrouis watershed
Sep. 14. AM (Mo) PM	Roundtable discussion with CBNRM NGOs; UN Film crew Agro-Action Allemande (Michael Kühn) Targeted meetings - 12:30 G. Mevs / V. Laborde 2:30 Donald Joseph, and MARNDR Forest Service team (ean Thomas Ferdinand, Jean Serge Antoine, Joubert Sénat, Jean Yves Mesian, Marie Eunide Alponse, Pierre Karly Jean Jeune) 5:00 Serge Cantave Jr, et al., Yves-André Wainwright, Fondation Seguin 7:00 Haitian Environment Foundation, HEF Board (dinner)
Sep. 15. AM (Tue) PM	targeted meetings continued: 9:00 IADB, M. Lumas 10:30 World Vision: Lionel Isaac, Frank Williams and Julie Tanaka 2:00 USAID-WINNER project team 4:00 Paul Rodney Henry, Fon Lanbi pou Ayiti

Sep. 16. AM (Wed) PM	10:00 CNIGS, Ms. Gina Porcéna Méneus, Bobby Pirard 14:00 CARE: Yves-Lauren Régis and Gary Philoctète 16:00 CRS: Greg Elder
Sep. 17. AM (Thu) PM	7:30 Bétonus Pierre (World Bank carbon advisor, ex. Mining Dpmt) 9:00 MarChE: Maurice Wiener and Cédric Brandt (CNFA) departure John Lewis Martin Bush, DEED Gael Pressoir (CHIBAS BioEnergy Haiti, Jatropha Centre) Joel Ducasse (President, HSSA Group) BioEnergy Podium (Fr. Ebert Foundation/ Centre Pétion Bolivar (a Haiti Pol. Fondation)
Sept. 18 AM (Fri) PM	10:00 Audubon Society: Philippe Boyard 2:15 IaDB, Gilles Damais
Sept 19 (Sat, Sun) Sep. 20	Jatropha Pepinyè /Biochar (Arlan LeCorps, Robert Fisher) Foundation ARN / SIGNA (Jean Duret, Miriam Duret, James Kishler …) Hubert LeBlanc report writing
Sept. 21 AM PM	10:00 call: Valentin Abe, Caribbean Harvest call: David Gardella, Miami 6:00 Patrick Salles, AfD director
Sept. 22	Departure Dirk Kloss

Targeted meetings included:

1) other donors (BID, UNOPS, AFD, ACDI, EC, etc.);

2) principal perennial crop (coffee, mangoes, vetiver, avocadoes, cacao) producer/exporters;

3) Haitian volunteer organizations, Haitian Environmental Foundation, . . .

Other institutions and individuals met are also listed on page 11.

9.2 Annex 2: Terms of Reference, Terra Global Capital, September 2009

Assessment of Carbon Trading Opportunities for DEED and other Watershed Management Initiatives in Haiti

Background: Haiti's environmental resource base continues to deteriorate rapidly in the past decades. Before Europeans arrived 500 years ago, more than 65% of the island was covered with forests, which was slowly reduced to about 40% by the early 20th century. Today, forest cover accounts for just 3% of the land area, diminished significantly because of inappropriate farming and a lack of coordinated land use planning. The most productive lands are not used to their full potential and are often lost to housing, salinization or land tenure conflict. The unstable hillsides are exploited intensively and haphazardly by peasant farmers for erosive annual crops. Coupled with population pressures, this led to the exploitation of more and more unsuitable lands with unsustainable land-use practices. Haiti has the highest population density in the western hemisphere and one of the highest population growth rates; it is heavily dependent on imports even for basic staple food. Even agro-forestry based tree cover has been lost when mangos and then coffee became unprofitable and thus were cut down in favor of marginally profitable annual crops. Haiti's forests and biodiversity remain extremely degraded. Protected forest areas account for just 21,000 hectares (0.7% of land area).

A stable environmental resource base is a prerequisite for economic and political stability. The USAID Haiti Strategy Statement FY 2007-2009 in 2006 based its approach to Haiti's environmental fragility and vulnerability to natural disasters, notably floods (which regularly kill several thousand people, most recently in 2004 and 2008), on the new Environmental Threats and Opportunities Assessment (ETOA) and the Tropical Forest and Biodiversity (a.k.a. Section 118/119) analyses. On this basis the USAID Mission selected degraded, but potentially productive, watersheds as one of two key areas of geographic focus. The Section 118/119 analysis concluded that the greatest threat to the remaining biodiversity is continued clearing of lands for agriculture, resulting from poverty and depleted soils. The ETOA notes that, while important, the primary reasons for environmental degradation are not land tenure insecurity or charcoal production, but (1) the sheer pressure of hillside farmers and their reliance on the production of annual food crops that cause soil erosion, (2) extensive de-capitalization of the rural sector which leads to low productivity, and (3) the overall absence of viable production or livelihood alternatives. Opportunities to address these issues include the use of market-based incentives that connect soil and water conservation measures to improvements in farmer incomes at a scale large enough (e.g., within a major watershed) to have measurable positive impact on landscape level change.

The U.S. Agency for International Development's (USAID) Economic Development for a Sustainable Environment project (DEED) provides an alternative to the previous models of natural resource management (NRM) projects. DEED envisions a market-based approach that integrates improved management of lands and other natural resource assets with expanded enterprise and job opportunities in the production of suitable high-value crops, creating livelihood options for hillside farmers currently trapped in continued poverty. Linking the management of natural resources to sound conservation while simultaneously offering livelihood options will provide the essential stimulus for promoting sustainable watershed management. The project will target two watersheds initially to complete this work – Limbé in the North Department and the river systems around Montrouis in the West Department

DEED will create these linkages by introducing livelihood improvements into all aspects of watershed and natural resource management. DEED will establish a collective vision, facilitate participatory planning, and build partnerships in its communities that deliver results through concerted action. It will employ innovative approaches to mobilizing target communities and producer groups (PGs) and enterprises, and will help them develop land-use and business plans that not only help protect fragile natural resources but also create employment and business opportunities. DEED will unlock the potential for growth in the two target watersheds by delivering the technical services, training, and business support needed to build the local skills and capacity to sustain growth.

Justification: Examine opportunities for Haitian farmers, the private sector and public agencies to engage in "carbon positive" activities and receive financial benefits for their efforts are a reality but the mechanisms for implementing such schemes in Haiti remain unclear. Several challenges are evident:

(a) Indeterminately "owned" and poorly capitalized landscapes force the rural majority, in its quest for food security (FS), to encroach unsustainably upon more and more of the vegetation that stabilizes erosion and conserves soil and water in the surrounding watersheds (WS).
(b) Lack of alternative incomes (high value to volume agro-forestry, sustainable forestation management & non-timber forest products) to incentivize the requisite revegetation of these eroding watersheds and to compensate people for giving up farming on unsuitable areas. Incentives for these watershed management efforts could include (1) food for work linked to WS performance by commune (elected mayors) and by NGO-supported "groupements" within each commune, and (2) AFOLU carbon credits.
(c) Lack of a decision support system (DSS) for identifying and implementing agro-ecologically AND socio-economically optimal land reclamation technical options. Without it, the optimal combination of incentives for any given watershed farming system may be difficult to identify.
(d) Obstacles for generating income from environmental services (carbon credits), including: lack of local monitoring, reporting & verification capacity, insufficient enabling/oversight capabilities within the key government areas to act as a functioning designated national authority or approval focal point for carbon projects. Without this no local initiative can reach a global offset market.

This assignment will begin to address these unknown factors and provide an assessment of the viability (and potential benefits) of carbon trading opportunities.

Funding from the sale of carbon credits coupled with donor funding of initial project actions can be used to: (i) convert suitable hillside farms to sustainable agro-forestry systems (a large enough scale must eventually affect several hundred thousand hectares), and (ii) compensate land-users on unsuitable land for stopping agricultural exploitation and converting the areas to forests (through plantations or assisted natural regeneration).

To successfully generate carbon revenue from AFOLU projects, the country must have a minimum level of capacity to support project approvals and land tenure security. In addition, carbon development expertise should be brought in early in the designing of potential carbon projects to ensure the design and capacity of the implementing organization can support the successful creation of carbon credits.

This is particularly true for countries in which the environmental and social circumstances are so challenging, and where the institutional framework and capacity are missing or weak.

Scope of Work: The purpose of this assignment is to evaluate the potential and scope the design elements for developing carbon offset projects from land use change with a focus on institutional capacity and the DEED funded project actions.

Work covered under this proposal will include an in-country assessment and review with a visit to the governmental agencies and implementing partners in Port-au-Prince and field visits to a selection of the targeted DEED project areas. The Consultant(s) will interview relevant government agencies (ministries, local offices, extension staff), representatives of local population, non-governmental organizations and others.

Tasks:

1. Meet with national governmental agencies and assessment of the role of each departmental unit as it relates to forestry, land use planning, and carbon enablement and approvals.
2. Identify the DEED grant/PPA initiatives and other implementation activities that have potential AFOLU carbon benefits.
3. Meet with the DEED implementing partners and technical partners in Port-au-Prince and in the project areas targeted by the identified AFOLU components.
4. Assess the necessary capacity within the government to support carbon projects and establish an effective Haitian DNA; this will include recommendations on how local governmental agencies would be involved in the process.
5. Develop a set of procedural guidelines that can be used by the government to support the approval and tracking of carbon projects within the country.
6. Outline the land tenure and land use laws that are in place to support carbon development, and identification of areas where lack of tenure clarity within the DEED project areas will limit the carbon viability.
7. Draft a list of all the possible projects and carbon offset project types connected with the land-based activities in the selected watersheds. In addition to the main project types (improved agro-forestry and A/R) this could include, if appropriate, fuel-efficient stoves, and others.
8. Provide recommendation on how to move forward with developing carbon for DEED project actions.

Deliverables: All deliverables will be presented in English unless otherwise stated.

1 - A brief report summarizing the finding of the assessment including:

a) Procedural guidelines that can be used by the government to support the approval and tracking of carbon projects within the country.
b) A list of all the possible projects and carbon offset project types connected with the land-based activities in the selected watersheds.
c) Recommendations on how to move forward with developing carbon for DEED project actions.