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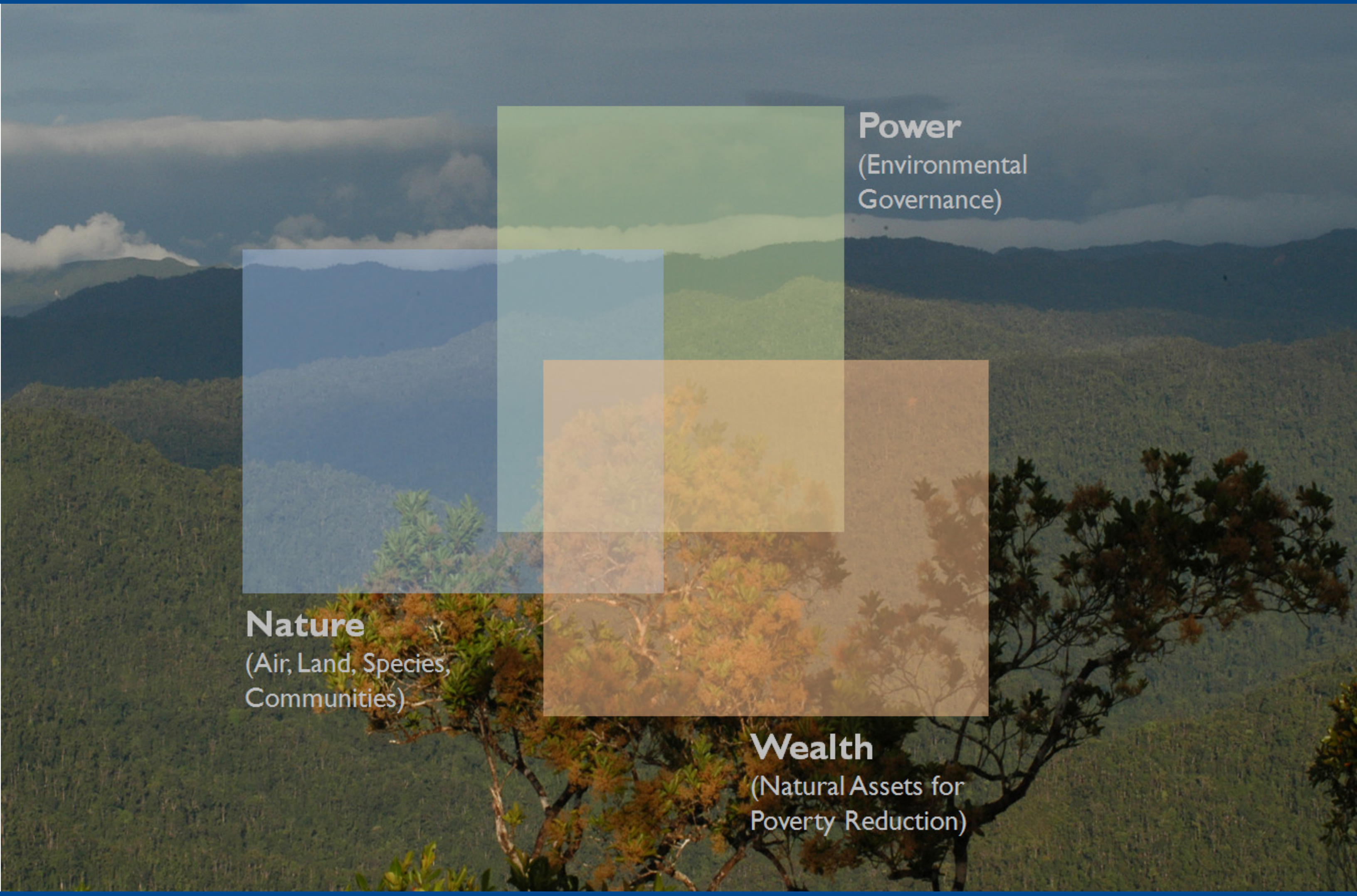
by Linking Nature, Wealth and Power



Case Study:

Forest Carbon Financing for Biodiversity Conservation, Climate Change Mitigation and Improved Livelihoods: the Makira Forest Protected Area, Madagascar

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TransLinks is a 5-year Leader with Associates cooperative agreement that has been funded by the United States Agency for International Development (USAID) to further the objective of increasing social, economic and environmental benefits through sustainable natural resource management. This new partnership of the Wildlife Conservation Society (lead organization), the Earth Institute of Columbia University, Enterprise Works/VITA, Forest Trends, the Land Tenure Center of the University of Wisconsin, and USAID is designed to support income growth of the rural poor through conservation and sustainable use of the natural resource base upon which their livelihoods depend.

The program is organized around four core activities that will be implemented in overlapping phases over the life of the program. These are:

1. **Knowledge building** including an initial review, synthesis and dissemination of current knowledge, and applied comparative research in a number of different field locations to help fill gaps in our knowledge;
2. **Identification and development of diagnostic and decision support tools** that will help us better understand the positive, negative or neutral relationships among natural resource conservation, natural resource governance and alleviation of rural poverty;
3. **Cross-partner skill exchange** to better enable planning, implementing and adaptively managing projects and programs in ways that maximize synergies among good governance, conservation and wealth creation; and
4. **Global dissemination** of knowledge, tools and best practices for promoting wealth creation of the rural poor, environmental governance and resource conservation.

Over the 5-year life of the program, TransLinks aims to develop a coherent, compelling and, most importantly, useful corpus of information about the value of, and approaches to, integrating Nature, Wealth and Power. To do this, TransLinks is structuring the work around two core issues – 1) payments for ecosystem services and 2) property rights and resource tenure.

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Case Study

Forest Carbon Financing for Biodiversity Conservation, Climate Change Mitigation and Improved Livelihoods: the Makira Forest Protected Area, Madagascar

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August 2008

Acknowledgements

This work was supported by the United States Agency for International Development (USAID) through the Leader with Associates Cooperative Agreement, No.EPP-A-00-06-00014-00. The contents of this report are the responsibility of the author and do not necessarily represent the views of USAID.

Front Cover: David Lees, AMNH

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Acronyms

ANGAP	Association National pour le Gestion Des Aires Protegees
CCB	Climate, Community and Biodiversity
CCBA	Climate, Community and Biodiversity Alliance
CDM	Clean Development Mechanism
CELB	Center for Environment and Leadership in Business
CI	Conservation International
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide equivalent
COBA	Communauté de Base
COGE	Community Management Committee
COS	Comité d'Orientation et de Suivi
Dbh	Diameter at Breast Hieght
GCF	Gestion Contractualisée des Forêts de l'Etat
GELOSE	Gestion Locale des Ressources Naturelles Renouvelables
GHG	Greenhouse Gas
IRG	International Resources Group
IUCN	World Conservation Union
MCC	Makira Carbon Company
MEFT	Ministry of the Environment, Forests and Tourism
NEAP	National Environmental Action Plan
PAGE	Projet d'Appui a la Gestion de l'Environment
PES	Payments for Ecosystem Services
PDD	Project Design Document
PSI	Population Services International
REDD	Reducing Emissions from Deforestation and Degradation
TdG	Transfert de Gestion
USAID	United States Agency for International Development
VCS	Voluntary Carbon Standard
WCS	Wildlife Conservation Society
ZOC	Zone of Controlled Occupation
ZSP	Zone of Strict Protection
ZTdG	Zones de Transfert de Gestion
ZUC	Zones of Controlled Use

Summary

High levels of species endemism, across multiple taxa, and high degrees of habitat loss, particularly deforestation, of the biologically rich Eastern Rainforests biome of Madagascar make the island nation a biodiversity hotspot. The island nation's biological richness stands in stark contrast to the economic privation afflicting most of the country's 18 million people. Greater than 70% of the population lives below the poverty line and 75% live in rural areas dependent solely on natural resources for meeting basic household needs. This dependence on forest resources for subsistence coupled with high rates of population growth, inadequate policy and weak rule of law has resulted in widespread deforestation, fragmentation and general environmental degradation. Since people first inhabited the island, Madagascar has lost 85% of its native forests. Any measure to conserve Madagascar's forests and forest resources, for biodiversity protection and maintenance of critical ecosystem services, must address the economic constraints and challenges that drive deforestation and forest degradation across the country.

The sale of carbon dioxide (CO_2) emissions reductions from avoided deforestation through the growing carbon market may represent a unique opportunity to reconcile natural resource conservation and poverty reduction in Madagascar. The funds generated from this market can be used to fund protected area creation and management to conserve biodiversity and safeguard critical ecosystem services important for human livelihoods. These funds can also provide financial incentives for community led land stewardship.

With this in mind, the Wildlife Conservation Society, the Government of Madagascar and other partners have been working with local communities living in the Makira plateau in north-eastern Madagascar to establish a protected area which will be financed by the marketing and sale of CO_2 emissions reductions credits. The funds from carbon sales, generated through the avoided deforestation of the Makira forest, will be used to finance the long-term conservation of the forests, improve community land stewardship and governance, and support sustainable livelihood practices leading to improved household welfare. This report outlines the process and key steps that have been taken to develop this novel and innovative approach towards forest conservation and poverty reduction in one of the world's most biologically rich and economically poor countries.

Introduction to Payments for Ecosystem Services and Reducing Emissions from Deforestation and Degradation (REDD)

Payments for Ecosystem Services (PES) have attracted increasing interest as a mechanism to translate external, non-market environmental values into real financial incentives for local actors to insure their provisioning (Engel et al. 2008). In places where biodiversity is rich but poverty and dependence on natural resources is high, these arrangements may provide the necessary financial incentives to decrease unsustainable use of natural resources. Five key criteria have been identified as necessary ingredients for a functional PES program: (a) the mechanism must involve a voluntary transaction where (b) a well-defined environmental service (or a land use likely to secure that service) (c) is being 'bought' by a (minimum of one) service buyer (d) from a (minimum of one) service provider and (e) if and only if the service provider secures service provision (conditionality) (Engel et al. 2008).

One of the most rapidly developing forms of PES is the global carbon market associated with forestry in developing countries. Cur-

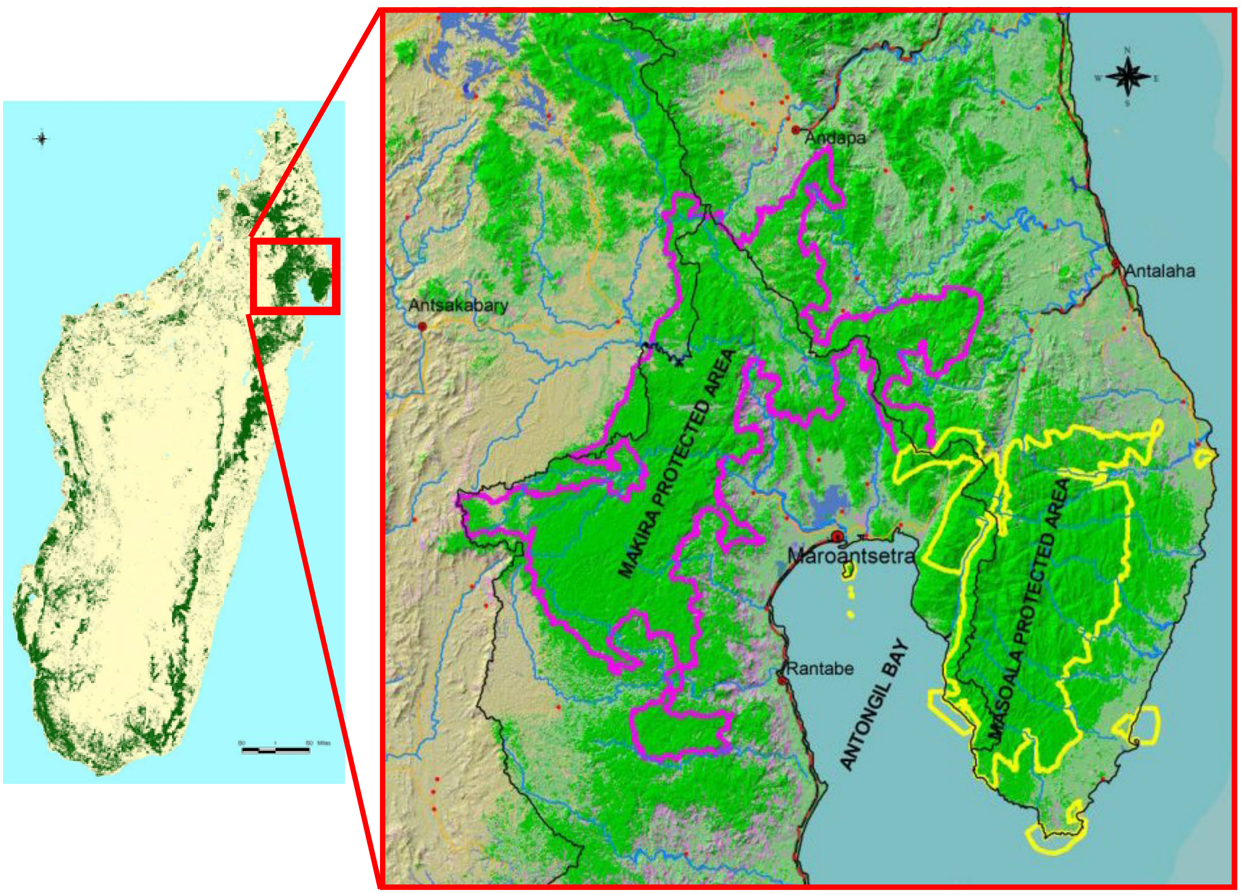

Figure 1: Makira in northeastern Madagascar

rently, the market for forest carbon consists of a regulated and a voluntary market. The regulated carbon market evolved from the Kyoto Protocol and the Clean Development Mechanism (CDM), which permits marketing of emissions credits from forestry activities including reforestation and afforestation, but not from activities that avoid deforestation. The CDM allows a Kyoto signatory country to pay an individual/group in a developing country to plant trees as a way of meeting their emissions targets. However, emissions reductions through forestry related activities permitted within the CDM have not been very successful to date due to high transaction costs to develop projects and complicated restrictions on project eligibility (Luttrell et al. 2007). For this reason, most of the sales of emissions reductions from forest related projects (e.g., avoided deforestation, reforestation and/or afforestation efforts), have occurred within the voluntary carbon market, which has grown enormously in recent years. Although, the voluntary market is significantly less regulated than the market associated with CDM, both are based on the five fundamental principles of PES (as outlined above). A policy known as Reducing Emissions from Deforestation and Degradation (REDD) is currently being negotiated under the United Nations Framework Convention on Climate Change that would allow avoided deforestation to be included as a credible source of emissions reduction units within the post-Kyoto international climate policy regime after 2012. The rules and regulations of this potential policy are being widely debated and elaborated upon as REDD pilot projects are being established around the world in anticipation of REDD being implemented in a post-Kyoto framework. Some of the key issues and questions un-

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derpinning debates around REDD include: how to insure credibility of emissions reductions from forests; how to establish representative baselines of deforestation; how to prove additionality (i.e., emissions are reduced as a result of implementing the project); how to insure permanence of emissions reductions; and how to prevent leakage (i.e., a failure to reduce emissions because deforestation is simply displaced from one site to another location). These issues must be addressed in REDD projects, but as the rules of REDD are still unclear and continue to evolve, little guidance exists and few models have been established on how to implement successful REDD pilot projects .

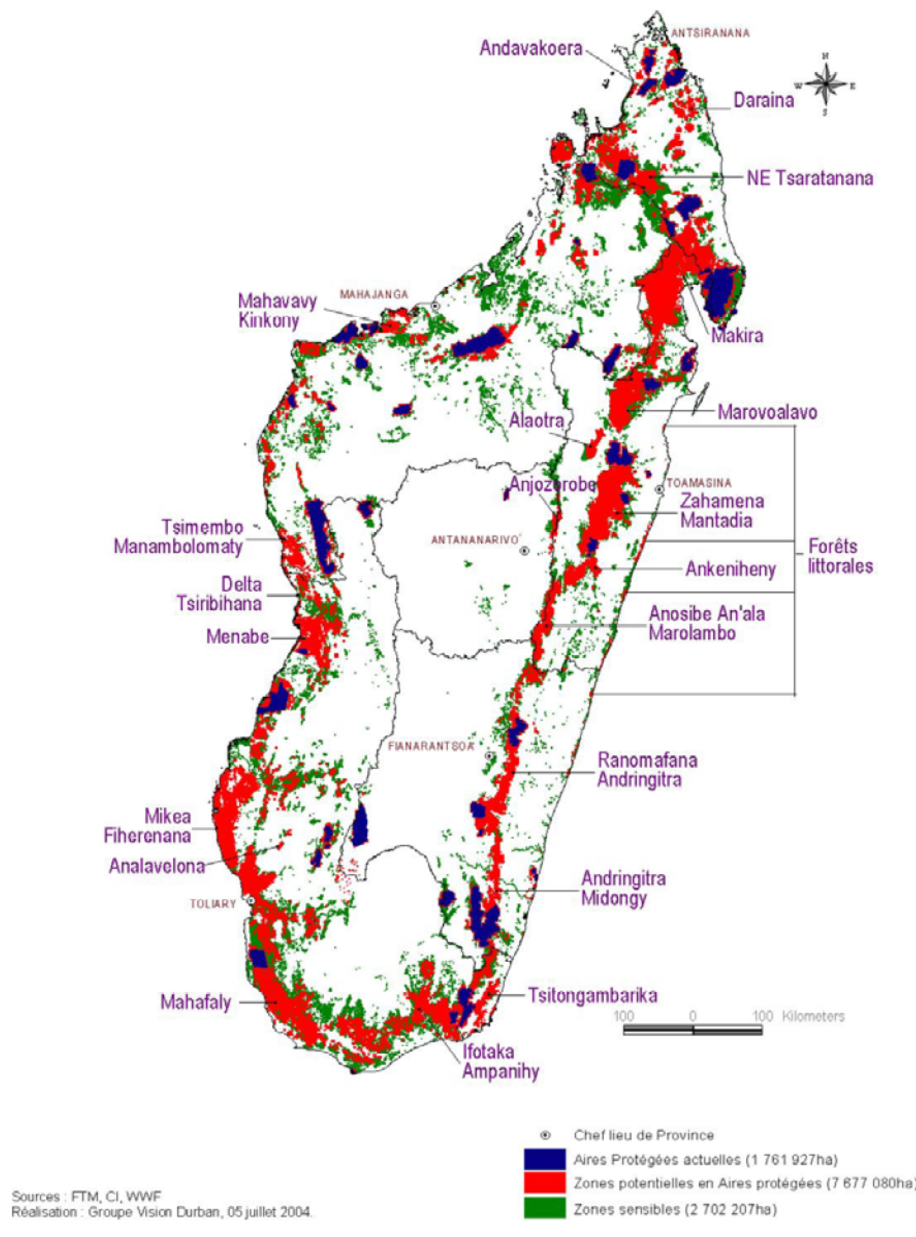

Figure 2: Present and proposed protected areas

This paper will review the process of developing one of the world's first REDD projects and will describe how critical PES and REDD issues have been addressed. The project, located in the Makira forests of north-east Madagascar, has been established by the Government of Madagascar and the Wildlife Conservation Society in collaboration with Conservation International and the communities surrounding the Makira forests.

Madagascar: A Biodiversity Hotspot with Widespread Poverty

Madagascar is the world's fourth largest island, with an area of approximately 590, 000 km2, extending 1, 570 km from 11057'South to 25032'South and 560 km from 43014'East to 50027'East (Figure 1). The island's isolation from the African continent, combined with its size and variations in topography and climate, have created ideal conditions for the evolution of unique species and ecosystems. The island is a rich biological reservoir, possibly possessing more biodiversity per unit area than anywhere else on earth (Hannah et al. 1998). Estimates of the number of vascular plant species on Madagascar range from 10,000 (Phillipson 1994) to 12,000 (Schatz 1996), of which approximately 90% are thought to be endemic to the island (Schatz 2000). The island also boasts a high richness and endemism in vertebrate taxa (Ganzhorn et al. 2001) harboring a diverse array of lemurs (a distinctive group of primitive primates), and more than half of the world's species of chameleons (Culotta 1995).

The island's biological richness stands in stark contrast to the country's extreme socio-economic poverty. Madagascar is ranked as one of the world's least developed countries (UN, 2008). Approximately 80% of country's 19 million people live in rural areas and are highly dependent on natural resources, such as forests, for food, fuel and shelter. The lack of infrastructure throughout the country, isolation of many rural populations and lack of income generating activities in these locations, has resulted in extreme pressure on natural resources for subsistence in many areas. For these reasons, PES may be ideally

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Silky Sifaka, Propithecus Candidus

suited to certain parts of Madagascar as a mechanism for generating a sustainable source of income for remote, rural communities who utilize biodiversity and ecosystem services for their livelihoods. In the country's biodiverse Eastern Rainforests, for example, deforestation is driven by subsistence rice cultivation. In a rapid analysis of the rate of forest loss around Makira, it was estimated that approximately 1500 hectares of primary forest is converted each year to agriculture and ultimately degraded hillsides (Meyers 2001). In such human dominated landscapes, the potential to establish payments from forest carbon projects to reduce dependence on natural resources seems promising.

The Makira Forests: Ecological and Socio-Economic Conditions

Physical and Ecological Context

The Makira forests lie within the Antongil Bay landscape of northeastern Madagascar and represent one of the largest expanses of humid forest left in the biologically rich Eastern Rainforest Biome of Madagascar. The forests are located on the Makira plateau about 40 km west of Maroantsetra (Bayliss and Hayes, 1999). The ~401,000 hectares of forest that comprise the area are a key, intact biodiversity stronghold and a vital bridge maintaining connectivity across protected areas in the region: the Special Reserve of Anjanaharibe-Sud in the Northwest; the National Park of Marojejy in the North; the National Park of Masoala in the East; and the National Park of Mananara-Nord, the Special Reserve of Marotandrano and the Special Reserve of Ambatovaky in the South (Figure 2).

The Makira forests encompass a variety of geological formations and bioclimatic zones, which contribute to the high richness and endemism of flora and fauna species. Across Makira climate is more humid on the eastern side and sub-humid to dry on the western side. Average rainfall in Makira is ~3500 mm per year with precipitation highs occurring from December to April and a pronounced dry season from September to November (Razafimahatratra et al., 2004). The area, particularly the north, is also prone to periodic cyclones during the rainy season (Ramanandriana, 2004). The strong winds and flooding associated with cyclones have, in recent years, destroyed crops, housing, and roads, caused severe soil loss on erosion prone hillsides, and contributed to the impoverishment of rural families.

Makira forests are characterized by two vegetation zones: eastern humid low altitude forest (0-800m) and mid-altitude forest (800 to 1800m) with Makira's forest reaching a maximum of 1300m and forest structure and composition varying along an altitudinal gradi-

[1] Illegal settlements are not recognised by the Ministry of Interior as official villages.

ent. Tree heights at low altitudes can reach 20m while at high altitudes may only reach 2-5 meters (Meyers 2001, Razafimahatratra, 2004).

Until 2001, few biological inventories had been conducted throughout Makira, however, studies from surrounding areas indicated that the Makira landscape could contain close to 50% of Madagascar's endemic biodiversity. As of 2001, inventories had been conducted on birds, small mammals, carnivores, bats, fish, reptiles and amphibians, primates and butterflies (Raheriarisena et al. 2001). Additional floral and faunal inventories, carried out in 2003 recorded 222 forest plant species , 114 amphibian species, 62 reptile species, 101 bird species, 35 mammal species, as well as 14 lemur species and 5 chiropteran bat species (WCS, 2004). Other more recent studies have shown that as many as 21 of the 71 currently identified lemur species and subspecies are found in Makira – which is the highest diversity of lemurs found within any of Madagascar's protected areas (GERP 2006).


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Collecting wild yams—Dioscorea spp.

The main threats facing the Makira forests are swidden agriculture, bush meat hunting, collection/exploitation of timber and non timber forest products, burning of forest land for cattle grazing, illicit commercial exploitation of the forests' hardwood species, and illicit commercial mining of quartz and precious stones (Jaozandry and Holmes, 2005). These threats are driven by both subsistence and economic pressures. Of these threats, the most ubiquitous and destructive to forests is swidden agriculture, or tavy. Tavy stands for rain-fed rather then irrigated rice cultivation and is primarily practiced in upland forested areas, after bottomlands have been fully exploited for paddy rice fields (Meyers 2001). Though tavy requires clearing and burning of forests, it can be a sustainable form of agriculture in tropical forests and does not require clearing of old growth trees as long as fallow periods are long and human population density low. In Madagascar fallow periods should be at least 15 years (Ferraro, 1994), however, limited land availability and increasing human population pressure have resulted in ever decreasing fallow periods and increased clearing of old growth forests.

Opportunistic as well as targeted bushmeat hunting is driven by

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Rice is important to local livelihoods

both subsistence and market demand. Research has found that 21 forest mammal species, including 4 carnivore, 3 bat, and 11 lemur species, are common hunting targets and hunting is largely unsustainable. Secondary effects of hunting include damage to forest structure as traditional trapping techniques, particularly for lemurs, require clearing forest areas of up to 10x200m for a single snare (Golden 2005, GERP 2006).

An additional on going and well organized threat is illicit commercial extraction of quartz from Makira's southern forests, organized by wealthy buyers paying an average of $2 per kg. Quartz mining by locally hired laborers uproots trees and fragments the forest at numerous excavation sites. Extraction typically occurs in remote pristine forest, and mobility of the operation makes monitoring very difficult (Dokolahy, 2004).

Social and Economic Context

The Antongil Bay landscape has always been important for the regional economy. The forests protect, in large part, watersheds critical to the predominantly agricultural economy of the region. In 2003, 95 % of the revenue generated in the landscape came from agriculture, including 41 % from rice and 27 % from cash cropping. Makira's forests also regulate water supply to lowland areas, and prevent erosion during cyclones thus reducing sedimentation and reef damage in Antongil Bay.

The Human Landscape

Approximately 150,000 people live around the Makira Protected Area and directly depend upon the forests for ecosystem services and land for their livelihoods. The majority of the population of 150,000 individuals are distributed across 120 villages that are situated in a 280,000 hectare belt of mixed forest and agricultural lands (Holmes and Crowley, 2007) bordering the protected area. However, 932 inhabitants are located in four pre-designated zones of human occupation within the limits of the protected area (WCS 2008).

Two primary ethnic groups are represented in the area: the Betsimisaraka (42.7%) and the Tsimihety (53.9%). The remaining 3.4% of the population is represented by Makoa, Sihanaka, Antaimoro, Sakalava, Merina and Betsileo populations. The coastal agrarian Betsimisaraka, whose dominant livelihood practices include farming and fishing, are the principle inhabitants of the greater Makira landscape, and live mostly in the eastern zone, while the semi-pastoralist Tsimihety, live predominately in the high western plateau of Makira (Ramanandriana 2004,).

The Local Economy

The region of the Antongil Bay landscape is relatively poor in comparison to other parts of Madagascar (Meyers 2001). Generally, poverty around Makira is thought to have increased since 2000 and has been exacerbated by recent cyclones (Ramanandriana 2004), and is driven by poor market access, low levels of education, and high population growth rates, estimated at 3.2% per year as of 2001 (Meyers 2001). A lack of roads means that most goods are traded using small ocean going boats, significantly increasing transportation costs and commodity prices. Makira's isolation means social services are limited, further exacerbating household poverty.

Among school-aged and adult individuals surveyed in 24 villages bordering the Makira forests in 2005 (n=4,746) an average of 63 % reported no formal education; this average ranged from 91% in the most isolated Fokontany of western Makira to just over 46 % in the Fokontany of eastern Makira and western Masoala (Holmes 2007). During a 2006 health survey of 892 households in 21 villages around Makira, 70 % of households reported to have been in moderate to poor health during the past thirty days with 79 % of respondents reporting poor health as having a moderate to severe impact on their work productivity. Of these, only 29 % sought treatment from a health clinic, while 62 % either sought no treatment or treated themselves and 9 % sought traditional treatments (Holmes 2007). Access to potable water is almost non-existent. The Antainambalana River, which bisects the Makira Forests, serves as a latrine despite the fact that it is the primary source of fresh water in the areas (Ramanandriana 2004).

Within the Atongil Bay landscape, individual household economies center on subsistence cultivation of irrigated paddy rice and rain-fed hillside rice, tavy, with varying degrees of investment in cash cropping of vanilla, clove and coffee and cattle herding by the the Tsimihety of western Makira. A 2005 socioeconomic survey of 1,075 households in 24 villages surrounding the Makira forests found 56 % of households (n=606; Table 1) cultivated tavy plots


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Drying vanilla and economically important NTFP in Makira

and 77 % (n=829) cultivated irrigated rice fields. Vanilla was also an important cash crop for 65 % (n=694) of households. Revenue from cash crop sales of vanilla, clove and coffee in 2005 was approximately $250 per household and the reported average annual expenditure on basic household necessities, health and clothing for these households was just over $150.

Rice is an important part of the Malagasy culture and economy. On average, households cultivated 0.80 ha of tavy rice and 0.72 ha of irrigated rice annually, with yields of 319 kg and 561 kg respectively. With reported average household sizes of 6.4 individuals and a national average annual consumption of 120 kg of rice per person, a household would need to produce at least 768 kg of rice annually for household consumption. Based on the 2005 survey, neither tavy rice nor irrigated rice was sufficient alone to sustain households; a mixed cultivation of rice was, however, sufficient to meet household needs, with a reported sellable average surplus of 112 kg. Thus, the importance of tavy rice production as a supplement to a household's food stores is critical to keep in mind when considering alternative economic and agricultural activities to reduce deforestation.

A tight relationship exists between subsistence and market activities in the Atongil Bay Landscape, which has important implications for projects seeking to support alternative livelihoods. For example, during the height of the 2000-2001 vanilla market, when vanilla was being purchased for up to $120 per kilo, a considerable drop in tavy activity in the landscape was observed – based on measurements of smoke associated with tavy fires and evidence of new forest clearings. In 2004 and 2005, however, when vanilla prices decreased dramatically to approximately $5 per kilo, tavy again increased. However, in 2006, tavy activity was again reduced as a result of a high clove production coupled with high market prices (Holmes, 2007). The relationship between an individual, or household, investing in tavy cultivation and the variable market prices of cash crops suggests that tavy, and the resulting deforestation, can be reduced by providing economic alternatives. However, as the crash of the vanilla market illustrates, agricultural commodity markets are volatile. Thus, if alternatives are to provide a robust and longer-term incentive not to expand tavy, they need to generate a more reliable stream of revenue – carbon markets may be one such alternative, if leveraged effectively.

Table 1: Relative Investment by Crop Across Surveyed Households

Land Use	Number of Households	Percent of Households	Total Area (ha)	Percent Total Area	Average Area by Household	Total Production (kg)
Subsistence						
Tavy rice	606	56.37	483.08	19.44	0.80	319,628
Irrigated rice	829	77.12	597.00	24.02	0.72	561,337
Cassava	845	78.60	212.20	8.54	0.25	276,655
Potato	745	69.30	169.43	6.82	0.23	170,335
Beans	96	8.93	29.71	1.20	0.31	16,810
Cash						
Vanilla	694	64.56	203.45	8.19	0.29	34,325
Clove	309	28.74	141.24	5.68	0.46	29,021
Coffee	390	36.28	267.09	10.75	0.68	27,755
Other						
Banana	729	67.81	381.90	15.37	0.52	227,500

National and Local Conservation Efforts

National Conservation Context

In 1989 – six years prior to signing the Convention on Biological Diversity – the government of Madagascar developed Africa's first National Environmental Action Plan (NEAP). Arguably, it has been the most ambitious and comprehensive environmental program of any African country to date and has been implemented in three phases over 15 years (Razafindralambo and Gaylord, 2006).

The first phase of the NEAP (1991–97) aimed at creating an official environmental policy, regulatory, and institutional framework. It sought to promote conditions that would foster ownership of the environmental agenda by the country rather than donors. The second phase (1997–2003) consolidated first-phase programs by putting national institutions more firmly into leadership positions. The third phase (2003–08) aimed at mainstreaming environmental thinking more broadly into macroeconomic management and sector programs, including mechanisms for sustainable environmental financing (Razafindralambo and Gaylord, 2006).

At the beginning of the third phase of the NEAP, in 2003 at the Worlds Parks Congress in Durban South Africa, the recently elected President Ravalomanana stated his dedication to natural resource conservation in Madagascar by declaring his commitment to expanding Madagascar's protected area from approximately 3% (1.7 million hectares) of the total land area to cover approximately 10% (6 million hectares) of the total land area (Norris 2006). This pledge, now integrated into national policy, has driven a process of protected area expansion over the past five years. In combination with a focus within the third phase of the NEAP of mainstreaming the environment into macroeconomic management and developing mechanisms for sustainable environmental financing, an emphasis has been placed on identifying ways to generate sustainable funding streams for new protected areas while promoting the livelihoods of rural populations.

Local Conservation Context: The Makira Forest Protected Area Project

In light of the NEAP and the Durban Vision, it is not surprising that the large, government owned (based on national laws) expanse of the Makira forests has become a recent focus of conservation interests. However, interest in managing Makira's forests dates back to 1958, when approximately 221,410 ha were designated as a classified forest: forests identified to have some importance in terms of ecosystems and biological diversity and, therefore, afforded a 'classification' by the government (Raheriarisena et al. 2001). Although, Madagascar's Ministry of Environment, Forest

WCS helping local communities to zone land use

and Tourism (MEFT) has held legal authority over most of Makira's forested area for the past fifty years, the ministry has had inadequate resources to effectively manage the forest estate. Inadequate policies, paucity of financial resources to implement environmental policy, agricultural pressure from an expanding human population and lack of regional land use planning resulted, by the end of the 20th century, in increased threats of deforestation and fragmentation to the Makira forests. For these reasons, in 2001, the International Resources Group (IRG) through the USAID-funded Projet d'Appui a la Gestion de l'Environment (PAGE) project began working in collaboration with WCS and the MEFT to identify ways to sustainably finance the protection and management of the Makira Forests. The PAGE team began exploring ways to sustainably finance forest conservation in Madagascar with a focus on the carbon market, a very new mechanism at the time.

The PAGE team began looking for a site that could generate significant payments from avoided deforestation within the voluntary carbon market while furthering conservation goals. To do this, the site would have to possess a high biomass, face high levels of threat and have a high conservation value. These criteria led the project team to the yet unprotected forests of Makira: with the large extent of lowland forests containing an anticipated high biomass, high biodiversity value, and a high degree of threat from deforestation and fragmentation. Once Makira area was identified as a potential site by the PAGE team, the idea of exploring carbon financing of forest conservation in the area was discussed with the MEFT and other potential stakeholders in the area such as Conservation International and WCS. All parties agreed that it was worth an exploration of project feasibility, particularly since, at that time, so little was known about the Makira area, ecologically or socially. Furthermore, few organizations were actively engaged in conservation efforts in the region: only WCS had a permanent presence through engagement with ANGAP in the creation and management of the Masoala National Park.

Through the support of PAGE a feasibility study was initiated to estimate the amount of carbon stored in the Makira forests, quantify deforestation rates, and propose a project design to create a protected area. When these efforts began, there was much uncertainty as to what would be the role of forests and forest conservation in addressing green house gas emissions (GHG) emissions mitigations within the Kyoto Protocol since, at the time, the United States administration was under the leadership of President Bill Clinton and the Marrakesh accords had not yet taken place. Thus, the feasibility study of generating carbon finance through avoided deforestation in Makira proceeded with the expectation that avoided deforestation would be accepted within the emissions reductions policies on forestry to be decided in Marrakesh. However, these international accords unfortunately excluded avoided deforestation from emissions reductions strategies under the Kyoto Protocol. Despite this outcome, the PAGE team decided to continue to develop a proposal for the project, authored by David Meyers (2001), that would conceptualize an avoided deforestation project in Makira, with the belief that at some point in the future a financing mechanism would emerge based upon emissions reductions from avoided deforestation.

At the end of this study in 2001, the findings on carbon estimates, deforestation and the potential of financing activities in the area were discussed with MEFT. It was agreed that the project was feasible and, thus, a structure was necessary to move this forward. At that point, the MEFT and WCS decided to begin working together to implement the project as outlined by Meyers (2001). CI through the Global Conservation Fund and the Critical Ecosystems Partnership fund and WCS both contributed initial seed funding to begin making the Makira Forest Protected Area a reality (from Keck, personal communication, 2008).

The project design as originally proposed (Meyers 2001) involved zoning the Makira forests and surrounding areas into three different use zones. For the most part, this original design has been adopted into the project as it currently exists. These zones include:


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Typical village in the Antongil Bay landscape

- **Zone of Strict Protection**: The Zone of Strict Protection (ZSP), or "Noyau Dur" encompasses approximately 360,100 ha of forest and is similar to a World Conservation Union (IUCN) Type II or IV protected area. The area is under strict protection with no commercial or subsistence harvests or removals allowed.
- **Multiple-Use Zones:** These areas comprise 40,900 ha and include Zones of Controlled Use (ZUC) equaling 29,301 ha and Zones of Controlled Occupation (ZOC) equaling 11,870 ha. The ZOCs are zones where people are living within the ZSP . People can remain living here but no immigration to the zones is allowed. Within both of these zones, neither commercial mining nor logging will be allowed, but natural resource use for subsistence purposes is permitted, including harvesting of non-timber forest products. Some timber harvest for local use may be allowed in these zones, although, most timber cutting zones will be restricted to the Zones de Transfert de Gestion (ZTdG) (see below). It is important to note that the boundaries of these zones and the resource uses permitted within them were negotiated during a comprehensive participatory process with each community living within or proximate to these areas.

The Makira protected area is managed under the authority of the MEFT, which has delegated management responsibility to WCS. Surrounding the Makira Protect area is a buffer zone of mixed forest and agricultural lands referred to as the zone de transfert de gestion, or community management zone.

[3] A Ministerial-level decree or order.

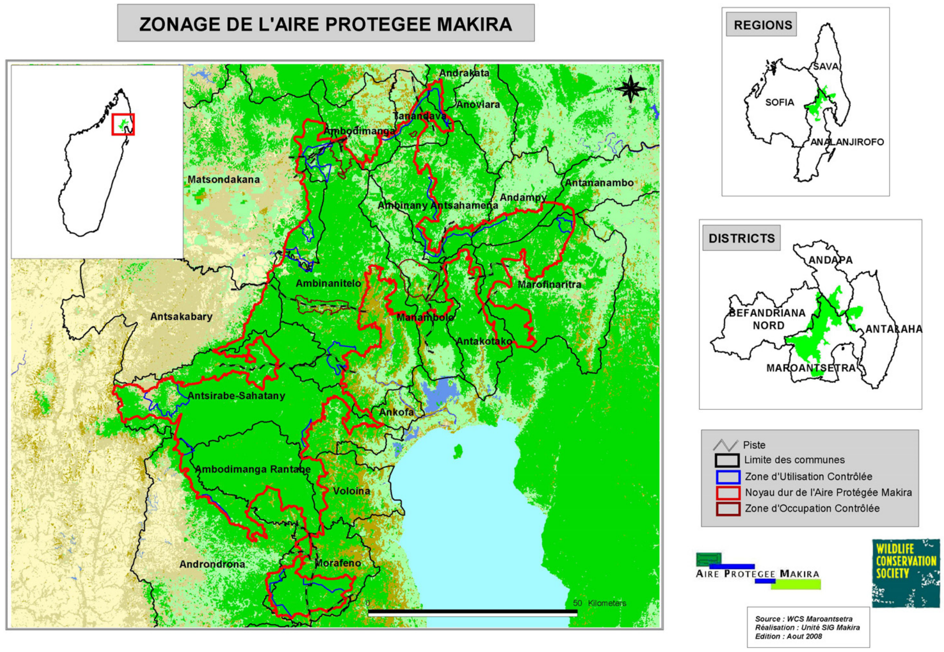

Figure 3. Zoning of the Makira Forests

- **Zone de Transfert de Gestion:** The Zone de Transfert de Gestion (ZTdG) or co-management zones, are the areas where responsibility for resource management has been devolved to local communities, living along the perimeter of the forest, through an agreement signed between the Government of Madagascar and the communities. The current area of the ZTdG is approximately 57,299 ha, and is projected to reach 276,387 ha as more communities negotiate terms with MEFT (WCS 2008). WCS is working alongside the communities in these areas to co-manage their natural resources and to stabilize land use change while securing local natural use rights. No commercial resource exploitation is allowed in the areas. These are areas of very high pressure where most of the deforestation has historically occurred and, thus, where most of the emission reduction credits from avoided deforestation will be generated. These zones will be a crucial part of the strategy to address the potential for leakage of carbon benefits.

Based on this model design, combined with extensive ecological and social work carried out by WCS, the MEFT issued temporary protected area status to Makira, the Makira Protected Area, in December 2005. MEFT and WCS continue to work together to adopt sustainable approaches to create, manage and finance a permanent protected area including further efforts to verify carbon emissions reductions generated from the protected area; officially demarcating the limits of the protected areas agreed upon during community consultations; developing and enhancing sustainable land use practices; developing a management plan for the protected area; and formalizing land use management contracts between communities and the national government in the area surrounding the core forest zone of Makira.

In June 2008, as a result of collaborative work on using sales of avoided deforestation credits to finance the Makira protected area and support local livelihoods, the Government of Madagascar signed an agreement with the Makira Carbon Company (a not for profit, private sector company incorporated by WCS in Delaware, US) to market emissions reductions from the carbon stored by avoided deforestation in Makira.

The next sections will outline the process and key steps undertaken to develop and implement the Makira Protected Area model as a REDD pilot project and will specifically address: quantification and marketing of Makira's forest carbon; working with local communities to zone the protected area, secure communities' forest management rights, and develop more sustainable land use practices; and developing structures for ensuring that carbon payments are equitably distributed to provide tangible economic incentives to forest stewards.

Implementing the Makira Conservation Project

Estimating Carbon Content and Avoided Deforestation

Following on from the carbon estimates derived from the PAGE study (Berner, 2001) and the initial project design of a forest carbon project in Makira, (Meyers 2001), WinRock International was contracted in 2004 to conduct an official feasibility study of an avoided deforestation project in Makira, and to provide training to WCS and MEFT staff on long-term measurement and monitoring of forest carbon (Martin et al. 2004). The study calculated that through avoided deforestation, Makira's forests had the potential to sequester 9.2 million tons of CO_2 emissions over a thirty year period. Based on this estimation, a pilot activity to market CO_2 emissions credits was initiated. As a result, during 2004-2006, 40,000 tons of CO_2 equivalent (CO_2e) were sold at \$5.00/ton for a total of \$200,000. The marketing of the CO_2e was conducted through the CI Center for the Environment and Leadership in Business (CELB), based in Washington, DC, and based on a let-


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WCS Forest biomass inventory

ter of agreement between the Government of Madagascar, WCS and CI. Of the revenue generated from the CO_2e sales, CELB retained 28% and WCS the remaining 72%. The WCS funds were used for the continued establishment and early management of the protected area including continued biological and socio-economic inventories, and working with local communities to develop a management plan for the areas surrounding the forest where a program of carbon payments from avoided deforestation would be put in place.

The rest of the section outlines the steps WinRock International use to estimate forest biomass in Makira and to construct baselines of deforestation. The estimates generated from this study have been used to determine the current amount of credit emissions for sale from Makira. Please note that new assessments methods and approaches are evolving rapidly and the following should be viewed more in a historical context than as a blue print for future REDD projects. WinRock International is a key resource for up-to-date methods on forest biomass assessment.

Measurement of Forest Biomass and Carbon Content in Makira

Carbon content in forests is derived from estimates of above and below ground woody biomass. The most typical and frequently used method for estimating average biomass of a forest is measuring the diameter at breast height (dbh) in plots/transects representative of forest structure and composition and then applying allometric equations, developed for the region, that permit conversion of dbh measurements into biomass. The techniques and equations used to measure carbon content from forest biomass in Makira are described below.

Measurements for aboveground living biomass were obtained from three temporary plots in relatively untouched, dense forest, which was believed to be representative of the forest that would be protected by the proposed Makira conservation project (Figure 3).

At each of the three measurement sites, nested circular plots of 4, 14 and 20 m radius were established. In the smallest plot, stems > 5 cm dbh were measured; in the medium plot, stems > 20 cm dbh were measured; and in the largest plot, stems > 70 cm dbh were measured (Martin et al. 2004). Lying dead wood biomass was measured using the line-intersect method on a transect of 120 m (two 60 m perpendicular lines crossing at the center of the measurement plot). All lying dead wood > 10 cm diameter crossed by the transect was measured and recorded, and each piece was assigned one of three density states: sound, intermediate, or rotten.
From the plot and transect based measurements of dbh, allome-

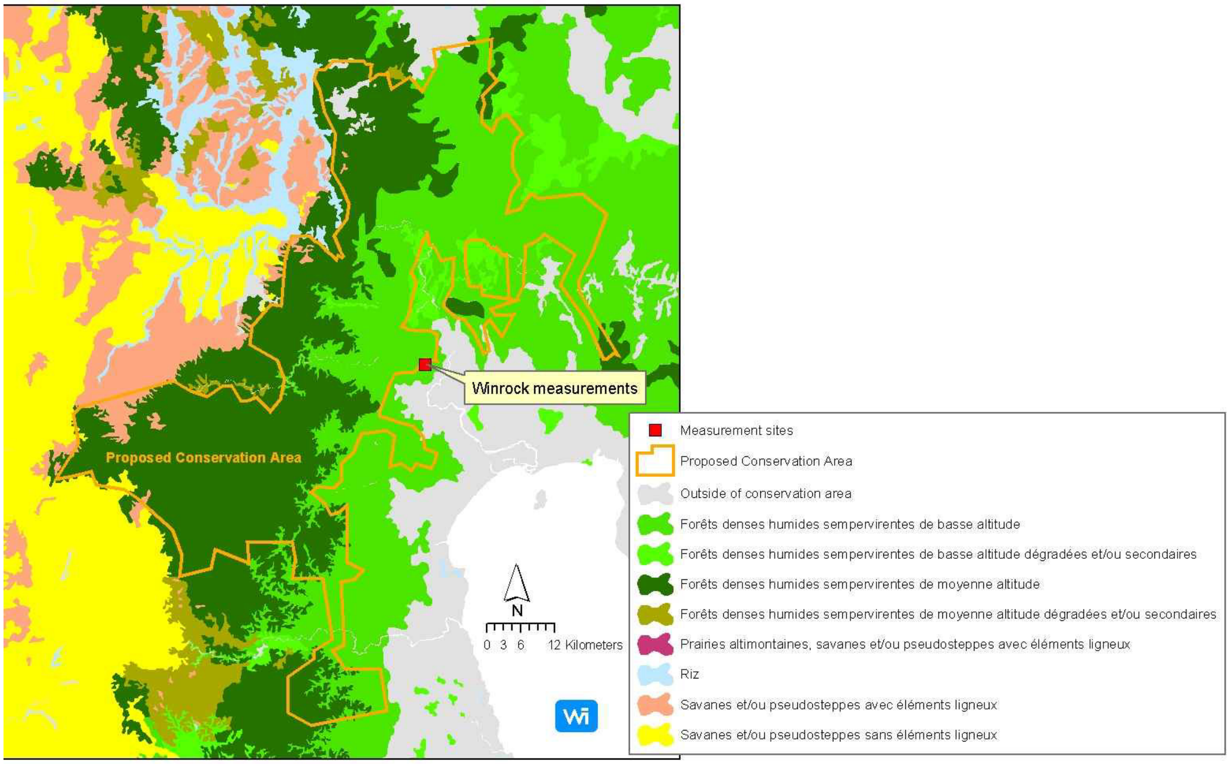

Figure 4. Site of Winrock carbon inventory plots. From (Martin et al. 2004).

teric equations were applied to derive biomass estimates. Aboveground living biomass was derived using a regression equation developed by Brown (1997) for broadleaf trees in tropical moist (1,500 to 4,000 mm annual rainfall) forests (Martin et al. 2004, see Appendix 1 for all equations). From estimates of aboveground biomass, belowground biomass was estimated using an equation developed by Cairns et al. (1997) for application regardless of lattitude, climate or edaphic conditions. Standing dead wood biomass was calculated in the same way as for live trees with a deduction factor of 0.8 applied to the measurements to account for the decomposition/degradation status of the tree. Lying dead wood biomass volume per unit area was calculated using an equation from Warren and Olsen (1964) with density factors of 90%, 70%, and 40% applied for sound, intermediate, and rotten, respectively (Heath and Chojnacky, 1995). Measurements of aboveground, belowground, standing dead and lying dead biomass were summed for each of the respective plots and extrapolated to tons of biomass per hectare using an appropriate expansion factor based on the area of each plot and converted to tons carbon per hectare (carbon = biomass * 0.5) (Martin et al. 2004). Based on these measurements, forest carbon was estimated to be equivalent to 444.7 t C/ha, with a fairly large 95% confidence interval of 219 t C/ha. WinRock consultants combined this estimate with data from another study conducted in Makira by IEFN, where six sites were measured and resulted in a mean estimated of 348.3 t C/ha (95% confidence interval of 51.7 t C/ha). When these two estimates were combined, the mean stock estimated for Makira was 380.4 t C/ha with a 95% confidence interval of 58.4 t C/ha. As a conservative assumption, the primary forest carbon stocks adopted for this study were the lower bound of the 95% confidence interval of the combined Winrock and IEFN inventory data, or 322.1 t C/ha.

Carbon stocks for degraded forest were taken from the inventory data supplied by Justine Dokolahy (Dokolahy, 2004). When the Dokolahy raw inventory data was analyzed for carbon and belowground biomass added according to the same formula noted above (Cairns et al. 1997), the result was 121.9 t C/ha for degraded forest.

At the time of this assessment, there was little information on residual carbon stocks within different landcover types following deforestation in Makira. So, WinRock consultants used inventory plots established by WinRock in cleared hillside lands, savoka and agroforestry systems from the Andasibe-Mantadia region of east-central Madagascar. Combining these savoka and agroforestry plots yielded a mean carbon stock of 13.1 t C/ha for these landcover types, which is the estimate that has been applied in this study.

Estimates of Deforestation

Establishing a baseline of deforestation is an essential precursor to developing a viable and robust international compensation scheme for REDD projects. Baselines provide a benchmark against which emissions reductions can be calculated and are critical for quantifying project performance. There are two types of baselines that are typically used in avoided deforestation projects: historical and business as usual (Olander et al. 2006, Pedroni 2008). In the Makira case, the approach taken for baseline development was to assess deforestation using a business as usual scenario.

Emissions reductions from avoided deforestation were estimated as the difference between the hectares of forest that would remain if conservation activities were pursued and the hectares of forest that would be removed if no conservation activities were undertaken (i.e. business as usual). The difference in the number of hectares deforested between the two scenarios is then multiplied by the difference in carbon stocks, as estimated from the assessments of biomass from the inventories, resulting from land-cover changes.

Without Project Deforestation Rate

It is challenging to define an average without-project deforestation rate, considering the various types of land-use pressures surrounding a forest area as large as Makira. In 2004, WCS staff identified four zones around the proposed protected area which were characterized by different land use pressures (i.e., threats driving land cover conversion):

- **Northern Zone** (northwestern edge to Masoala National Park): tavy is the principal pressure.
- **Eastern Zone** (south to about 20 km north of Rantabe): expansion of lowland rice, vanilla and some tavy being the principal pressures.
- **Southern Zone** (covers all south up to the western edge of the forest): tavy and artisanal quartz mining being the principal pressures.
- **Western Zone** (entire western side of Makira): fire and expansion of pastureland being the principal pressures.

WCS staff generated annual deforestation rates for each zone/ buffer zone from the number of hectares deforested from 1990 to 2000 (based on imagery provided by a national scale deforestation study conducted by CI). The deforestation rate for each zone was then multiplied by the proportion of the total area in that zone to create a weighted average baseline deforestation rate of 0.149%.

WinRock consultants estimated that the without-project deforestation rate would begin at 0.149% in 2004 (baseline year) and would increase at a rate of 1% per year to account for population growth. It was believed that 1% was a conservative assumption when compared to the actual rate of population growth for the region of 2.8-3.2%. The amount of forest that would be lost without conservation activities if deforestation continued at these rates was calculated over a 30 year period (see appendix 2).

With Project Deforestation Rate

The without–project deforestation rates were then compared to the with-project deforestation rates, which were calculated based on how much forest would be present if the proposed conservation and natural resource management activities were undertaken.

The with-project deforestation rate also began in 2004 and uses the same weighted-average deforestation rate of 0.149% as in the without-project case. Between 2004 and 2014, this rate is assumed gradually to decline to 0.07%, the baseline deforestation rate for national parks derived from a study of Mantadia in Madagascar, due to the to the proposed management activities, various improved legal enforcement measures and alternative livelihood activities of the project. The rate is projected to remain at 0.07% for the remainder of the 30-year analysis period due to the assumption that there will be some residual deforestation that cannot be eliminated through project interventions.

An exponential decay function is used to chart the decline:

Ratetime 2 = Ratetime 1 * (1-k)10

Translating Biomass and Avoided Deforestation into Carbon Emissions Reductions

Once biomass and deforestation rates had been estimated, it was possible to calculate the CO_2 emissions reductions resulting from avoided deforestation in Makira. Using the carbon stock estimates of degraded and primary forests derived from the field inventory, a weighted average of carbon amount was created based on the proportion of each forest type and non-forest land cover types in the proposed conservation area as classified from a satellite image from 1996 (as presented in Meyers, 2001). Based on this landuse classification, 83.82% of the study area was identified as primary forest, 9.18% as degraded forest, 2.97% as non-forest (savanna, agriculture and rice paddies, wetlands, and flood plain), and 4.04% was cloud/obscured. After this initial classification, the cloud obscured areas were reclassified as degraded forest, which

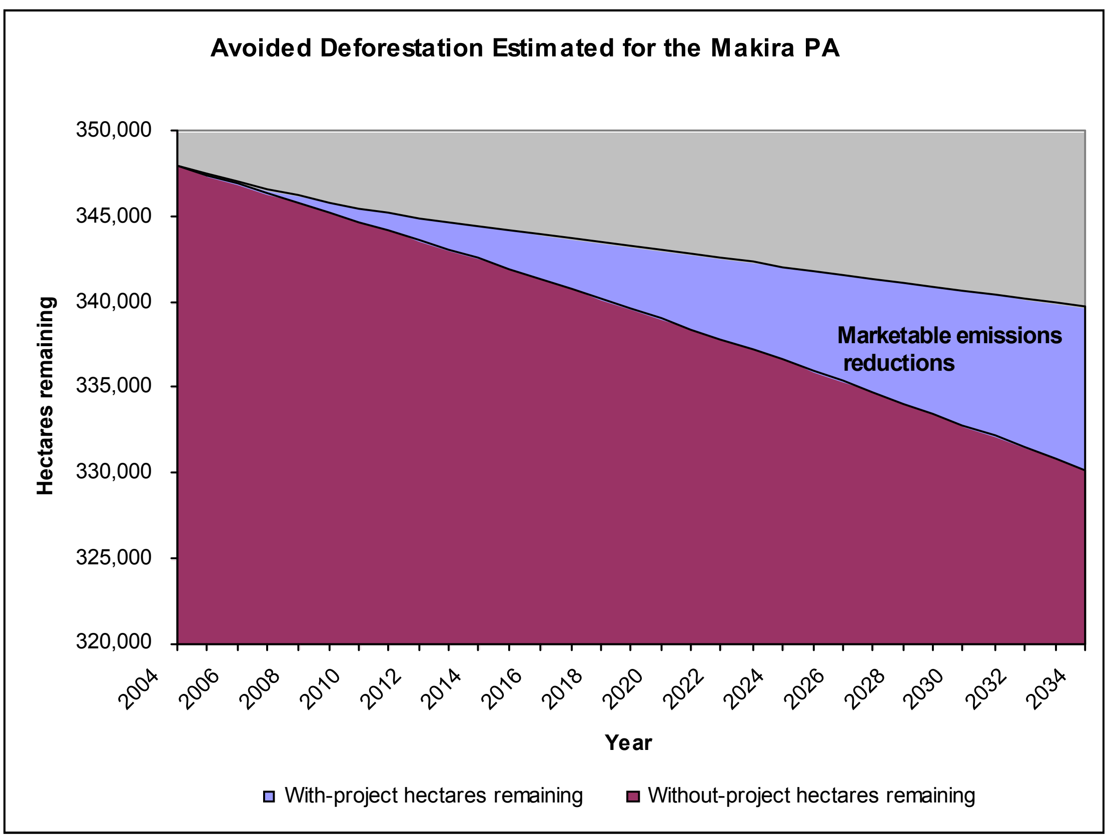

Figure 4. Avoided deforestation (ha) for generating marketable emissions reductions. From Martin et al. (2004).

is a conservative assumption since many of the obscured areas are likely to include some primary forest. Thus, the revised calculations estimated that 83.82% of the study zone was primary forest and 13.22% of the study zone was degraded forest with a resultant weighted-average carbon stock of 286.1 t C/ha.
The emissions on a per-hectare basis are calculated as the weighted-average carbon stocks minus the residual carbon stocks that remain after deforestation:

Per-hectare carbon emissions from deforestation = weighted average carbon stocks pre-deforestation – residual carbon stocks post-deforestation = 286.1 t C/ha - 13.1 t C/ha= 273 t C/ha

Multiplying this difference by the annual difference in area deforested with- and without the Makira project and associated activities gives an estimate of the avoided emissions attributable to the project each year:

*Total carbon emissions avoidance = å(year=2004 to year=2034) [(with-project hectares deforested – without-project hectares deforested) * per hectare carbon emissions from deforestation]*

The calculations and results are shown in Appendix 2. Without the Makira Protected Area project, it was estimated that approximately 18,283 hectares of forest would be lost over a thirty year period. With the Makira Protected Area project, only 8,797 hectares would be lost over the same period. The difference, 9,486 ha, resultants in avoided emissions over a 30-year period of 2,589,898 t C, or 9,496,294 t CO_2 equivalent (Figure 4 and Appendix 2).

Addressing Governance Challenges

Addressing governance of natural resources across spatial scales, or administrative units, is one of the key challenges in developing functional payments for ecosystem service schemes, such as payments for forest carbon. . The Makira Protected Area project's large size and the status of land tenure in the region have posed considerable governance challenges in the development of a mechanism that delivers adequate and equitable incentives to the stewards of the Makira forests.

Madagascar's natural resource estate is managed by 22 Regions; 111 Districts; 1,300 Communes; and 17,000 Fokontany (See Figure 5). The Fokontany are the primary local governance units and are comprised of multiple villages. The administrative head of a Fokontany, "chef du Fokontany", is selected by the administrative head of the district based on a list of candidates proposed by the villages comprising the Fokontany. The Makira forest straddles the three administrative regions of Analanjirofo, Sava and Sofia; the six districts of Maroantsetra, Antalaha, Andapa, Mandritsara, Befandriana North and Mananara North; twenty four communes and approximately 104 Fokontany (Figure 5). Given the complex and overlapping administrative structure of the Makira landscape, determining at which scale payments from forest carbon should be made, who to pay, and how much each party should receive is both difficult and yet to be resolved completely.

Approximately 150,000 people live in the area surrounding Makira, but not all of the villages that comprise a Fokontany have legitimate and prior claims to Makira forest resources, nor are they all users and/or stewards of these resources. Thus, the smallest ad-

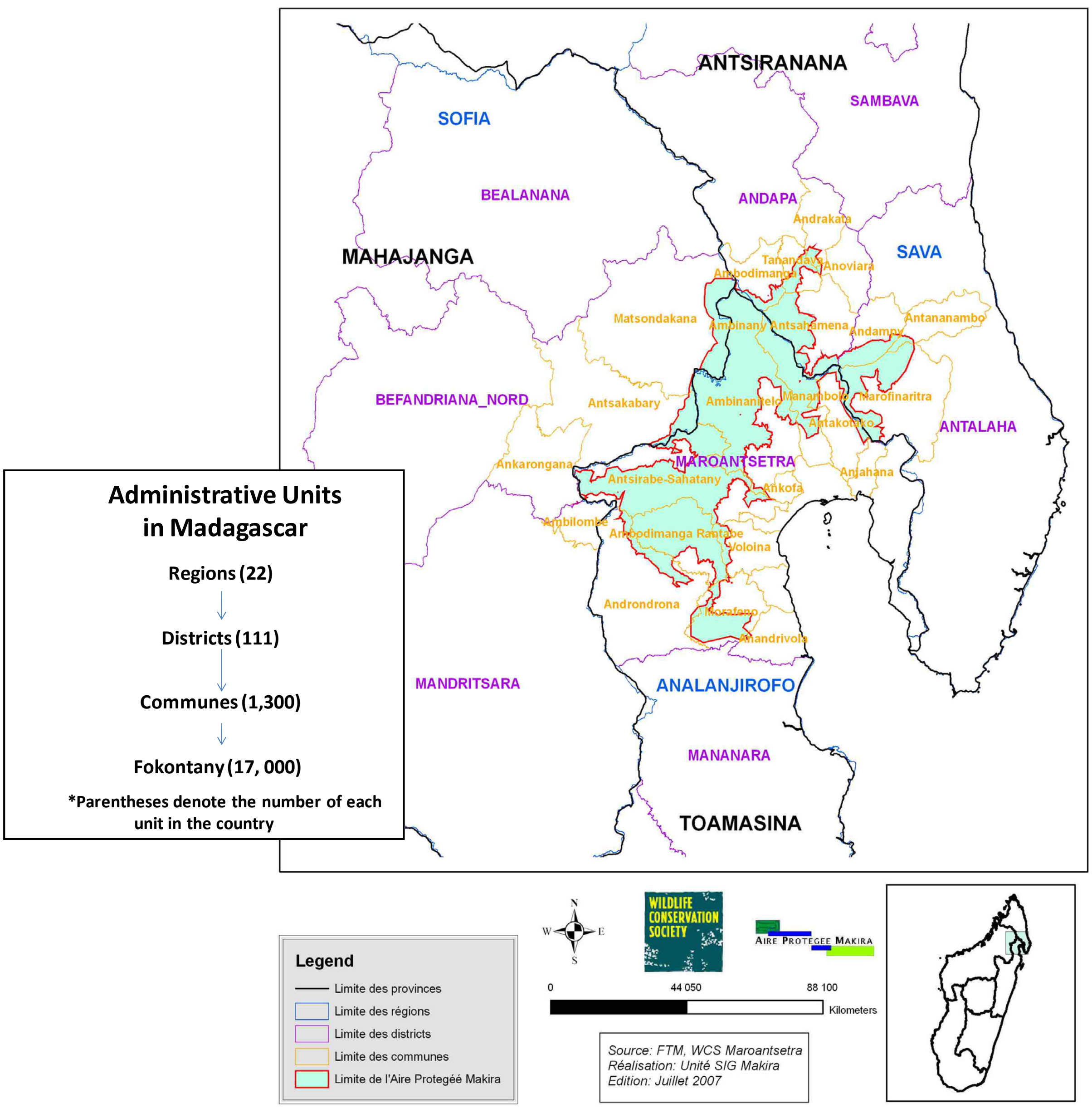

Figure 5. Administrative Units Comprising the Makira Project

ministrative unit (the Fokontany) may represent many people who are not stewards of Makira forest resources and, thus, may not be legitimate beneficiaries of carbons funds generated from altered land-use practices that result in avoided deforestation. That said, WCS is working with district and regional authorities to ensure that forest conservation is integrated into development plans such that a percentage of revenue generated from forest carbon sales will flow to these administrative levels so as to promote sustainable development and improved land stewardship practices more broadly across the landscape and region. In this way those portions of the local community who have not been directly engaged by the project will recognize indirect benefits from forest conservation.

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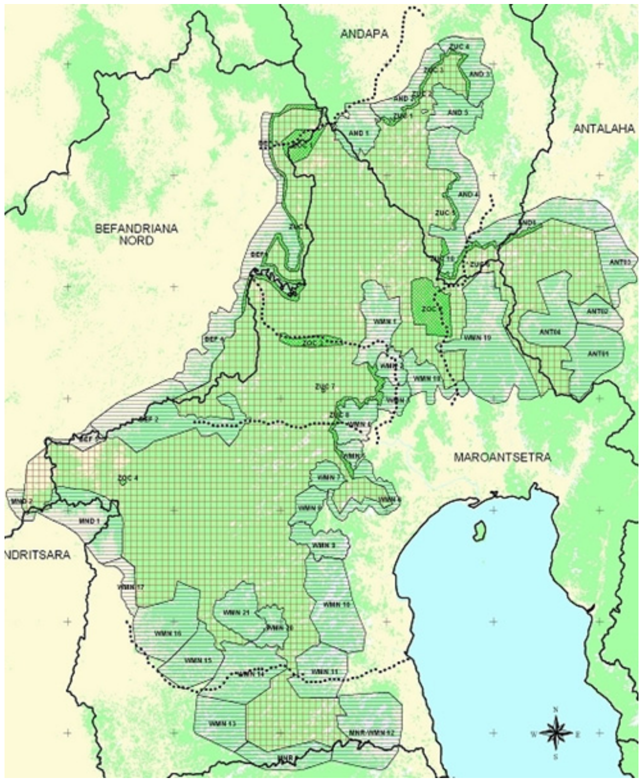
WCS is helping improve rice yields

As with most forests in Madagascar, the forests in Makira are officially owned by the government and managed through the MEFT by the Department of Water and Forest. However, a process of decentralization of forest management has recently been initiated across the country, which devolves natural resource management responsibility from the government to community forest user groups, although, ownership remains with the central government. In 1996, the Government of Madagascar passed legislation (Loi No 96-025) establishing the authority to devolve natural resource management control to local communities. This legislation, Gestion Locale des Ressources Naturelles Renouvelables (GELOSE) has permitted a process, known as Transfert de Gestion des Ressources Naturelles Renouvelables (or simply, Transfert de Gestion) that allows for the delegation of limited tenure and sustainable use rights to a legally recognized local community institution, Communauté de Base (COBA), in exchange for a contractual obligation with the Government of Madagascar to conserve the transferred natural resources. The structure of this arrangement is detailed in a natural resource management plan – specific for each



Community resource management sites

transfert de gestion – that is derived from calculations of human subsistence needs for forest resources. The 1996 legislation was amended in 2001 to allow for forest specific community management contracts: Gestion Contractualisée des Forêts de l'Etat (GCF). Under GCF, contracts are signed between the government and the representative of the COBAs, the Community Management Committee (COGE). The initial contract is for a period of three years, during which the state retains full ownership of the forest and the right to revoke or modify contracts. Following the three year period, the contracts can be renewed for a ten year period if the COBAs are deemed to have managed the resources in a satisfactory manner during the initial period (Hockley and Andriamarovololona , 2007).

In 2004, WCS began working with the MEFT and communities surrounding the Makira forests to catalyze the formation of TdGs (each including a COBA and COGE) within the buffer of mixed forest and agricultural land surrounding the proposed protected area. Regional workshops, were held with these villages to asses and understand local natural resource use practices, discuss potential protected area boundaries and to catalyze the formation of COBAs based on traditional institutions of tenure and land use. Villages whose citizenry comprise a COBA may lie within the same Fokontany, however, not all villages within a Fokontany are necessarily included within a COBA. However, all of the villages with traditional territories that touch or overlap with the limits of the Makira Protected Area will be engaged in the process of transfert de gestion.

Currently, 16 TdGs have been formalized for an area totaling approximately 57,299 ha with five additional TdGs in the process of being established. By 2011, it is anticipated that a total of 42 TdGs will be established surrounding the Makira protected area, which will exceed an area of 276,000 ha (Jaozandry and Holmes, 2007, WCS 2008). Although the TdG contracts are between the Government of Madagascar and the COBAs, WCS is co-managing the TdG sites with the COBAs and the MEFT retains legal authority to enforce rules and penalties associated with infractions of the dina (or law) agreed upon within the TdG contract (Jaozandry, pers. comm., 2008). The COBAs that have already been formed have signed contracts with MEFT to sustainably manage the forests within their zone, which stipulates no commercial forestry and/or tavy. The Plan d'Améngement, the management plans, defines zonation within a GCF site as well as an overview of allowable practices within each zone. This will be enforced locally, as much as possible. WCS has signed a management contract with the Government of Madagascar and is responsible for ensuring the overall management of the protected area and for oversight of the GCF's in collaboration with the Government. WCS and MEFT will put in place the monitoring and management systems within the communities to ensure compliance with penalties established as appropriate. WCS outreach and technical support to COBAs is critical for ensuring that the COBAs can meet their obligations un-

Gestion Contractualisée des Forêts de l'Etat

The structuring of a Gestion Contractualisée des Forêts de l'Etat, or GCF contract involves four principal elements:

Contract: signed between the regional authority of the Department of Water and Forest and the elected President of the Community Management Committee for a GCF site. The contract formally gives forest resource management authority to the community management committee.

Dina (law): signed by the regional authority of the Department of Water and Forest, President of community management committee, Chief of implicated Fokontany, Mayor of implicated Commune, Chief of implicated Region, and Head of Regional judiciary. The dina list all applicable laws pertaining to forest resource management, identifies penalties to be handed down in case of infraction, and clarifies the responsibilities of the Department of Water and Forest, Fokontany, Commune, and Region in up holding the laws.

Cahier des Charges (contractual conditions): signed by the regional authority of the Department of Water and Forest, President of community management committee, Chief of Fokontany, Mayor of Commune. The Cahier des Charge details all allowable resource extraction practices within the GCF site.

Plan d'Aménagement (site development plan): signed by **signed by the regional authority of the Department of Water and Forest, President of community management committee,** Chief of Fokontany, Mayor of Commune. The Plan d'Aménagement is based on evaluation of traditional land tenure systems and evaluation of exhibited and necessary subsistence forest resource use practices. The Plan d'Améngement defines zonation within a GCF site as well as an overview of allowable practices within each zone.

der the dina of the TdG since most of the villages currently do not have the capacity to manage their resources without technical and financial support. To ensure adequate outreach and support to COBAs, WCS plans to employ field agents who will liaise with Makira and the local Department of Water and Forest authorities. As of March 2008, WCS had 6 field agents in the COBAs and were planning to add 4 additional staff members to other COBAs in April 2008.

Within each COBA, members select and vote directly for the leaders who then comprise the COGE. The COGE includes an elected president, vice-president, secretary, treasury, and a 4-person council. General assemblies of the COBA and COGE are held approximately three times annually. During these assemblies, discussions about the natural resource management contract of the transfert de gestion site occur and allow an opportunity for COBA members to raise any issues they wish. Additional to these larger assemblies, the COGE holds monthly meetings during which time individual requests made by COBA members - often to extract resources beyond what has agreed upon within the transfer de gestion site contract and management plan - are considered. This more engaging approach to decision making about resource use stands in contrast to the traditional system of the Fokontany where decisions are made by the Chief of the Fokontany in a more top down approach.

The president of the COGE is ultimately responsible for the management of the resources within the COBA, but if there is a conflict within the COBA for which neither the members nor the COGE can find a solution, they will request the assistance of the Chief of the Fokontany. In principal, the president of the COGE (representative of the community) and the Chief of the Fokontany (representative of the government) should work together in resolving issues of forest resource management. In an issue can not be resolved at this level, the issue would be deferred to the MEFT and/or the Mayor of the Commune. These governance issues underpin a key challenge related to the establishment of PES and payments for avoided deforestation, more specifically: how can systems be designed at a scale that equitably awards and incentivizes the people who are directly responsible for conserving ecosystem services? That said, the legal contracts developed for implementing GCF, which clearly stipulate the responsibility of the different governance structures and local institutions (COBAs) for managing forest resources in a TdG, may help minimize potential conflicts common to PES, such as those associated with “free-riders” and ensuring that incentives reach the people who are bearing the costs of managing the ecosystem services.

The Makira Protected Area Project is curbing forest clearing

The proposed governance structure for the core of the Makira Protected Area will be one of collaborative co-management between WCS, MEFT and the COGEs bordering the protected area. The Makira Protected Area, the zones of strict protection (ZSP), controlled use (ZUC), and controlled occupation (ZOC), will be divided into 6 sectors within which management activities will be organized. The protected area sectors have been established based on i) principle threat to the area, ii) ease and manner of communication between sectors and headquarters, iii) homogeneity of human landscape, and iv) natural features of the landscape. Within each sector WCS will establish a management field station and place a field activities coordinator. Community integration into management decisions and realization of project activities also will be organized through these sectors. Within each sector there will be established a COBA 'platform' with representation from each of the community resource management sites (GCF) existing within the sector. The six platforms together will form a COBA 'federation', which will have representation – one representative per region – on the protected area's Comité d'Orientation et de Suivi (COS). Engagement in management activities will occur at the level of each GCF. Within each GCF the COGE will be responsible for assuring the proper management of the site based on work plans validated by the COS, as well as site-based management plans developed in collaboration with WCS and MEFT through the Comité de Gestion.

The establishment of the Makira Protected Area project has catalyzed the nationally authorized transfer of natural resource management to rural communities in the Antongil Bay landscape and facilitated the formation of governance structures to do this within the communities that border the protected area. Furthermore, these newly created institutions will also be instrumental for collaboratively co-managing the Makira Protected Area. This model of community leadership and partnership in natural resource management is critical for insuring that the stewards of ecosystem services, such as forest carbon storage for climate mitigation, are aptly involved, supported and rewarded for their commitment to conservation. Furthermore, the governance structure of the GCF is not simply an administrative construct, but one that reflects traditional land tenure and land use practices. As such, the physical limits of a GCF site may not correspond to the administratively determined limits of the Fokontany and, thus ,there may be multiple GCF sites within a single Fokontany. This structure means that the transfert de gestion sites and the COBAs formed through the GCFs stand to receive direct benefit from funds generated from carbon financing for avoided deforestation, and have the potential to deliver other long-term benefits to the greater community. For example, the COBAs may provide a vehicle for community development projects and democratic decision making related to natural resources that did not exist previously. Furthermore, with mapping and titling of management authority associated with transfer de gestion, the communities in a COBA now have the ability to exclude outsiders from creating tavy in their area (Meyers, personal communication, 2008).

Key project interventions to improve land-use practices and community benefits

In the areas where most of the deforestation has occurred historically and where most of the emissions reductions credits are being generated, WCS in collaboration with local communities is helping households to adopt land use alternatives that counter the destructive and unsustainable practice of slash-and-burn agriculture. The activities include i) improved intensive rice cultivation, ii) soil fertility augmentation through composting, iii) improved crop rotation practices, iv) village tree nurseries for reforestation, and v) promotion of alternative livelihood practices for dependable revenue flow. Additionally, the WCS Makira Project has recently launched a population and health program in collaboration with Population Services International (PSI). The project will monitor community health and well-being while introducing select complementary health and family planning interventions in the rural communities surrounding the Makira Protected Area.

Alternative livelihood activities include advancing community-based ecotourism efforts and identifying and establishing markets for sustainably produced natural products such as bio-vanilla, bio-clove, and eco-silk. Coupled with these direct revenue generating activities, WCS will also collaborate with development partners and regional banking institutions to establish systems through which low-interest loans are made available to communities for ecologically sustainable enterprises. Money generated from the sale of emissions reductions resulting from avoided deforestation will help finance these activities.

Marketing and Selling Carbon

Pricing Carbon and Marketing Carbon

Ex-Ante and Post-Ante Sales

Market sales occur in two ways: ex-post, and ex-ante. Ex-post sales are sales of emission reductions that have already been generated on an annual basis and according to a specific schedule. For example, between 2004 and 2007 Makira generated approximately 320,000 tons of CO_2e emissions reductions based on the avoided deforestation of roughly 246 hectares over that period. The sale of these emission reductions would be considered ex-post as they have already been generated (Victurine and Holmes, 2008).

Ex-ante sales are those that occur prior to generation of the emissions reductions (i.e., those estimated from projections of avoided deforestation in Makira over a future thirty year time period). Buyers may be willing to purchase expected future emissions reductions if they feel the investment will be secure. However, many buyers may consider such purchases to be too risky. Furthermore, the forward sales put an additional onus on the seller (in this case the Government and, to an extent, WCS) to guarantee the delivery of these services into the future. The farther that future extends, the greater the uncertainty. In addition, future sales would command lower prices as the future risk would be built into the price.

WCS is working with the Government of Madagascar to help provide those assurances to potential buyers. Ex-ante sales should also have some level of protection against future increases in the price of CO_2 emissions reductions credits. This can be achieved by developing an options contract. For example if WCS were able to sell the entire 9.5 million tons of CO_2e to one buyer at $6.00 per ton, it would also negotiate an options contract to buy the same amount of credits back from the buyer in the future at a higher price, for example, $12.00 in 2012. If at that time, the price of emissions reductions credits has increased to $20.00, it would make sense to purchase the credits at $12.00 and then resell them at $20.00, generating a profit of $8.00 per ton. However if the price falls, or

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Forest carbon funds may help support schools


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Forest conversion in western Makira

stays below $12.00 the option would not be exercised and the contract would expire. Options trading is a common hedge in commodity markets to insure against price volatility. Given that new REDD projects are under development, there is a likelihood that prices will fall in the future as supply of emissions reductions outpaces demand. Future price uncertainty argues for considering option contracts with buyers to reduce market risk, if ex ante sales are considered. WCS will work with the Government to manage this price risk (Victurine and Holmes, 2008).

Ex-ante sales also provide an option for sustainable financing. A sale of all Makira emissions reductions at once would generate a large amount of money that could be placed in an interest bearing endowment. Even at a conservative rate of return of 5% a year, sufficient funds could be earned to support PA management and community investments, while maintaining the value of the capital from the sale. Development of a permanent fund adds additional value to the sales of emissions reductions. WCS, as the seller of Makira emissions reductions, will seek contracts with buyers that will ensure maximum price benefits from the sale. Decisions on sales will be taken in coordination with the Government, through the Ministry of Environment (Victurine and Holmes, 2008).

Distribution of funds

WCS has entered into an agreement with the GOM, through the MEFT, to market the calculated emissions reductions credits on the voluntary carbon market. The agreement was signed in June 2008. In this agreement, GOM and WCS took great care to detail the mechanism through which revenue from the sale of calculated emissions reductions credits (carbon revenue) would be managed. Emission reduction sales will be organized by the Makira Carbon

Company (MCC). The Company is a not-for-profit, limited liability corporation created by WCS specifically to act as an agent or broker in transactions involving offsets of CO_2 emissions. In terms of Makira emission reductions, the MCC will act as the agent of the Government of Madagascar for all sales. As an agent, MCC will seek sales with principals, brokers, dealers and other intermediaries both in the United States and abroad who wish to purchase high-quality emission reduction credits delivering multiple benefits. MCC will identify potential sales transactions with the goal of maximizing revenue for conservation and sustainable development, but the terms of any sales will be decided by the Government of Madagascar, which has a final decision on all transactions initiated by MCC. Once sales contracts are finalized, MCC will disburse the funds to both the designated Foundation and the Government, according to the terms of the agreements for disbursement of funds.

The agreement between WCS and the Government of Madagascar stipulates, explicitly that 50% of all carbon revenue would return to the local communities bordering the Makira Protected Area so as to support these communities in their natural resource management, forest conservation and community development initiatives. The funds management mechanism would follow a defined local management structure to be established in accordance with applicable Malagasy law and operated in collaboration and consultation with the delegated manager of the Makira Protected Area, WCS.

Of the remaining 50% revenue from the sale of calculated emissions reductions credits, 25% will go directly to the delegated manager of the Makira Protected Area, WCS, to support management of the PA and the alternative livelihood activities in the sites of TdG.; 15% of the revenue will go to the MEFT to support a range of activities including strengthening its technical capacity for climate change mitigation and supporting the development of a national carbon strategy and national monitoring capacity; up to 5% revenue will go to the Makira Carbon Company in the form of reimbursement for expenses incurred in connection with the marketing and sale of the Allocated Carbon Offsets (and the management of such marketing and sale); up to 2.5% revenue will be used as needed to pay for third party monitoring, verification and certification; and up to 2.5% revenue will be used as needed by the foundation or other similar entity designated by the State (the “Designated Foundation”) for its overhead costs in association with the management and disbursement of funds. Any amount of the marketing (5%), third party monitoring (2.5%), and/or foundation overhead (2.5%) not used will be allocated to the 50% of revenue for local communities.

Challenges and Opportunities of Marketing Emissions Reductions from Avoided Deforestation

At its inception, the Makira Protected Area was designed to demonstrate how a protected area could be established and its long-term financing secured through the marketing of emissions reductions credits generated via avoided deforestation. The ultimate goal of the project is long-term conservation of the Makira forests and local poverty reduction. The challenges and opportunities faced when attempting to participate in a rapidly evolving market are legion and have required substantial, but nimble investments to adaptively manage the project.

Key Events in Generating Carbon Finance from Avoided Deforestation in the Makira Forests

1958	Makira was established as a Classified Forest by Eaux et Foret
2001	The PAGE project was funded by USAID to assess sustainable financing mechanisms for forest conservation.
2001	PAGE consultants conducted feasibility study of using carbon financing to fund a protected area in Makira.
2000-2001	WCS begins a partnership with the Ministry of the Environment to conserve the Makira forests
2002	WCS received seed funding to start the project as proposed by the PAGE project in Makira.
2003	The WCS led Makira project started in 2003 with a technical advisor and project manager.
2004	WinRock International was contracted by CI to prepare a feasibility study estimating the quantity of carbon emissions avoidance that could be attributed to avoided deforestation through the project proposed in the PAGE report.
2004	Finalized contracts for the transfer of management of local forest resources with 10 target communities, which affected 10,500 inhabitants and put 29,117 ha of agricultural land and 20,905 ha of forested land under community management.
2005	Approval by the Ministry of Environment of the first sale of carbon credits, which amounted to approximately $200,000 in funds becoming available for the management of the site.
2005	Feasibility assessments for eleven additional community-based resource management transfers were conducted.
2005-2008	Makira Project Staff began the ground-based delimitation of the protected area by going from community to community with the mayor of each commune to negotiate and verify on the ground what was agreed upon on as the PA boundaries on paper and in meetings with leaders of the COBAs.
Dec 30, 2005	The MEF issued a decree granting temporary status to Makira as a protected area with WCS as the de facto manager.
Oct 2006	4 new community-based resource management transfer sites and 3 zones of controlled human occupation (ZOC) were formalized.
Jun 2008	The Government of Madagascar and WCS signed a contract allowing WCS to market emissions reductions from avoided deforestation resulting from focused conservation and development activities of Makira's forest.

Figure 6. Timeline of the Makira Project

The Ever Changing Carbon Market and Standards

Since the project's inception in 2001, the nature and operation of the carbon market has changed considerably. As the market has grown, demand has also grown for projects that can verify the delivery of emissions reductions. Rapid growth has seen increase demand for verifiable standards for projects that aim to reduce emissions of CO_2 or other GHGs. To address new developments in avoided deforestation project design, WCS continues to work with WinRock International to register the Makira Forest Protected Area Project under the Voluntary Carbon Standard (VCS). The VCS is a set of industry standards for projects that will "Reduce Emissions from Deforestation" and VCS certified projects signify to buyers that a project can deliver the credits they promise. The process of project registration involves first submitting a methodology outlining how to define the baseline of deforestation and how to monitor project benefits. When approved, this methodology then becomes the basis for the VCS Project Design Document (PDD). There are currently no approved VCS methodologies and, in fact, the work WCS is conducting with WinRock in Makira may be one of the first methodologies submitted for VCS approval. WCS is incorporating the World Bank BioCarbon methodology into its project design as the basis for its methodology in the VCS submission. An intention of the work of WCS and WinRock is that the VCS methodology developed for Makira will serve as an adaptable, sub-national demonstration site methodology for Madagascar as it develops a national REDD strategy.

A methodology that will meet VCS standards is likely to have the following requirements:

- It will include an analysis of both historic rates of deforestation and a conservative prediction of likely future rates;
- It will predict the likely location of future annual deforestation events;
- It will require full stratification of the project area by carbon stocks so that the carbon stocks of the specific areas projected to be deforested would be known;
- The analysis will include a large enough area outside the project boundary to capture leakage due to activity shifting that occurs as a result of project implementation .

In addition, WCS will also work with SmartWood to validate the Makira Forest Protected Area Project under the Climate, Community and Biodiversity (CCB) certification. The project validation would follow the requirements of the Climate, Community and Biodiversity Alliance (CCBA), as specified in the Climate, Community & Biodiversity Alliance (CCB) Standards, First Edition May 2005 – currently in update review. CCBA is a 'design' standard with which Makira will be able to certify that it provides multiple co-benefits including climate change mitigation, community benefits and biodiversity benefits.

Marketing Emissions Reductions from Avoided Deforestation in Makira

Marketing of the Makira carbon also posed a huge challenge. WCS had anticipated that a final agreement would be reached with the GOM and that marketing of credits could begin in 2007. However it took longer to finalize agreements with the GOM as buyers increasingly demanded VCS credits. Given rapidly evolving market conditions it was a significant step to develop and finalize the agreement between the GOM and the Makira Carbon Company to sell emissions reductions generated from the Makira Protected Area Project. The agreement now serves as a model for the GOM as it moves toward developing a national REDD strategy, as well as, a general model that the GOM wishes to adopt for future PES programs. This agreement also marks one of the first national level agreements to permit the selling of emissions reductions credits from an AD/REDD project. Securing government support at all stages of the project design, including the marketing, is a critical part of assuring an investor that emission reduction credits are secure.

Conclusions

Summary of Makira Project

Approximately eight years have passed from the initial idea of carbon financing in Makira to the current protected areas status of Makira, for which the bulk of carbon has yet to be sold but for which an agreement to do so has recently been signed (Figure 6). Although this may seem like quite a long time to managers with limited time and funding for conservation projects, it should be noted that very little conservation or development work had been done in Makira prior to the scoping exercises that began in 2001 and few if any organizations had a long-term presence there to facilitate relationships with local communities. Thus, conservation and livelihood studies, including biodiversity and socio-economic surveys, had to be initiated before the project could start. Additionally, in 2001, much work in the country was stalled for several months due to presidential election irregularities meaning project activities were hampered for many months.

How Key Components of REDD Have Been Implemented in Makira

The key components of a REDD project include verifying that credible emissions reductions have been achieved based on an established forest carbon baseline; that the emissions reduced from the project are additional to what would have been reduced without the project; that reducing emissions at one site does not result in leakage to another site; and that emissions reductions will be permanent. Each of these issues must be addressed using credible methodologies, which can be guaranteed by employing internationally recognized certification schemes and collaborating with well-known and respected organizations.

The Makira project has met all of these criteria. Baselines have been established using a business as usual approach that was conducted and verified through WinRock International and through the use of remote sensing imagery analyses conducted by Conservational International. Leakage has been addressed by the establishment of a series of Transfer de Gestion sites and the agreement between WCS and the newly formed COBAs to co-manage the TdG zones, where most of the deforestation has occurred, through the provision of technical support for sustainable land-use practices. Furthermore, the establishment of transfert de gestion sites, the formation of the COBAs and the contract signed by these groups with the MEFT has allowed these groups to legally exclude outsiders from using their resources, further decreasing the potential for deforestation from tavy. Initial observations from the field suggest that these activities have already helped decrease deforestation in the area surrounding Makira.

In many cases, leakage occurs when pressures, such as people, are displaced to another location. However, in the case of Makira, the drivers of deforestation are being managed at the sites of origin. Additionality has been demonstrated here because these forests were largely unprotected before this project was developed. So, emissions reductions resulting from conservation and development activities associated with the Makira project are additional to what would have been the case under the business as usual scenario in which no formal conservation or forest management plans were in place. Permanence is a harder criteria to prove within REDD, however, the avoided deforestation credits are being estimated over a thirty year time period. Throughout this time

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Devolving authority to communities

period, the sustainable land-use practices and alternative livelihood activities being supported in the TdGs are aimed at promoting a transition away from destructive land-use practices.

Within PES schemes in general, it is important that the seller has the right to sell the service to a buyer. In the Makira case, the owners and managers of the forest carbon are different since the government technically owns forested land, although, the COBAs now have an agreement with the government to manage it. Through the development of contracts through which sellers and managers are incentivized to participate in the scheme, these potentially blurry issues of ownership are being addressed.

Key Components of Success

Several key factors are important when considering the success of the Makira project establishment to date and the accomplishments it has made as a pioneer in a very new, constantly changing market. Firstly, the national government has been extremely supportive of this effort both directly, as a project collaborator, and indirectly, through conducive policies such as the NEAP, the Durban vision and decentralized management of forest resources by rural communnities. The national level policies supporting forest management by COBAs, has permitted the creation of community groups who can directly benefit from and contribute to the Makira project. Without official policies and structures in place for developing legal arrangements between the government and community groups to manage natural resources, it would have been more difficult and time-consuming to create viable and officially recognized structures for managing forest resources surrounding the Makira protected area, which is critical for achieving the emissions reductions from avoided deforestation.

Multiple written contracts have helped solidify these arrangements. The contracts have been developed between WCS and the Government of Madagascar for management of the protected area, the co-management of the TdGs, and the sale of carbon; and between the communities and the Government of Madagascar for devolved management of the TdGs. Importantly, the opportunity costs of the communities for establishing COBAs to manage their resources within the TdGs and surrounding controlled use zones were low and, due to the large size of Makira, were zoned in a way that did not cut off access to critical forest resources necessary for livelihoods or require individuals to contribute any up-front funding towards the project, which can be an obstacle to reforestation projects involving poor communities.

In fact, the arrangements facilitated by the Makira Protected Area project and stated within the GCF benefit affected communities in many ways by providing them with management responsibility over their traditional lands, permit greater decision making power over forest resources within a COBA and allow resource rights holders to exclude outsiders from exploiting their resources. Without a lead organization, such as WCS, to coordinate and implement these key arrangements with many different villages and across multiple levels of government, it is doubtful that a project of this size could have been realized in the time that it was. It is important to note that a large proportion of the work and effort in implementing the Makira Protected Area Project has focused on institutionalizing and supporting local governance structures for managing forest resources, which is a key aspect to devising PES schemes that deliver benefits for conservation and poverty reduction. Conservation risk (the risk of the protected area failing due to market failure) is low because the governance structures that are in place now, such as the TdGs, the COBAs, and the multi-zoned protected area model, have established a foundation for conservation and sustainable livelihoods that will be useful for the management of Makira regardless of the source of financing. Such an approach decreases risks associated with an uncertain market and provides structures that can be maintained for sustainable, democratic natural resource management in the long-term.

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TRANSLINKS

Case Study:

Forest Carbon Financing for Biodiversity Conservation, Climate Change Mitigation and Improved Livelihoods: the Makira Forest Protected Area, Madagascar

Appendices 1-3

Appendix 1: Equations for Biomass Estimation

Regression equation used to estimate aboveground biomass of trees:

Tropical moist y = EXP [-2.289 + 2.649LN(dbh) – 0.021(ln(dbh))2].

Revised from Brown 1997.

Regression equation used to estimate aboveground biomass of trees:

Root Biomass Density (t/ha)
= exp[-1.0587 + 0.8836 ln(aboveground biomass density)].

Revised from Cairns et al. 1997

Lying dead wood biomass volume per unit area was calculated using the equation:

Volume (m^3/m^2)
= 9.869 * ∑ (diameter(m)^2 / 8 * corrected transect length(m))

Appendix 2: Estimates of Deforestation and Emissions Reductions With and Without the Project

Year	Without project defor. rate	With project defor. rate	Without project ha lost	With project ha lost
2000	0.14%		502	502
2001	0.15%		506	506
2002	0.15%		511	511
2003	0.15%		515	515
2004	**0.15%**	**0.15%**	**519**	**519**
2005	0.15%	0.14%	524	481
2006	0.15%	0.13%	528	445
2007	0.15%	0.12%	533	412
2008	0.16%	0.11%	537	382
2009	0.16%	0.10%	542	354
2010	0.16%	0.10%	546	328
2011	0.16%	0.09%	551	303
2012	0.16%	0.08%	555	281
2013	0.16%	0.08%	560	260
2014	0.17%	0.07%	565	241
2015	0.17%	0.07%	569	241
2016	0.17%	0.07%	574	241
2017	0.17%	0.07%	579	241
2018	0.17%	0.07%	584	241
2019	0.17%	0.07%	589	240
2020	0.18%	0.07%	593	240
2021	0.18%	0.07%	598	240
2022	0.18%	0.07%	603	240
2023	0.18%	0.07%	608	240
2024	0.18%	0.07%	613	240
2025	0.18%	0.07%	618	239
2026	0.19%	0.07%	623	239
2027	0.19%	0.07%	628	239
2028	0.19%	0.07%	633	239
2029	0.19%	0.07%	639	239
2030	0.19%	0.07%	644	239
2031	0.20%	0.07%	649	238
2032	0.20%	0.07%	654	238
2033	0.20%	0.07%	659	238
2034	0.20%	0.07%	665	238

From Martins et al., 2004

Year	Weighted average forest C stocks	Residual C stocks	Per-ha emissions	Total C emissions avoidance per-ha
2000				
2001				
2002				
2003				
2004	**286.1**	**13.1**	**273**	**0**
2005	286.1	13.1	273	-11,740
2006	286.1	13.1	273	-22,670
2007	286.1	13.1	273	-32,877
2008	286.1	13.1	273	-42,418
2009	286.1	13.1	273	-51,345
2010	286.1	13.1	273	-59,705
2011	286.1	13.1	273	-67,543
2012	286.1	13.1	273	-74,899
2013	286.1	13.1	273	-81,810
2014	286.1	13.1	273	-88,310
2015	286.1	13.1	273	-89,642
2016	286.1	13.1	273	-90,982
2017	286.1	13.1	273	-92,329
2018	286.1	13.1	273	-93,685
2019	286.1	13.1	273	-95,049
2020	286.1	13.1	273	-96,421
2021	286.1	13.1	273	-97,802
2022	286.1	13.1	273	-99,190
2023	286.1	13.1	273	-100,586
2024	286.1	13.1	273	-101,990
2025	286.1	13.1	273	-103,403
2026	286.1	13.1	273	-104,823
2027	286.1	13.1	273	-106,252
2028	286.1	13.1	273	-107,688
2029	286.1	13.1	273	-109,132
2030	286.1	13.1	273	-110,585
2031	286.1	13.1	273	-112,045
2032	286.1	13.1	273	-113,513
2033	286.1	13.1	273	-114,989
2034	286.1	13.1	273	-116,473

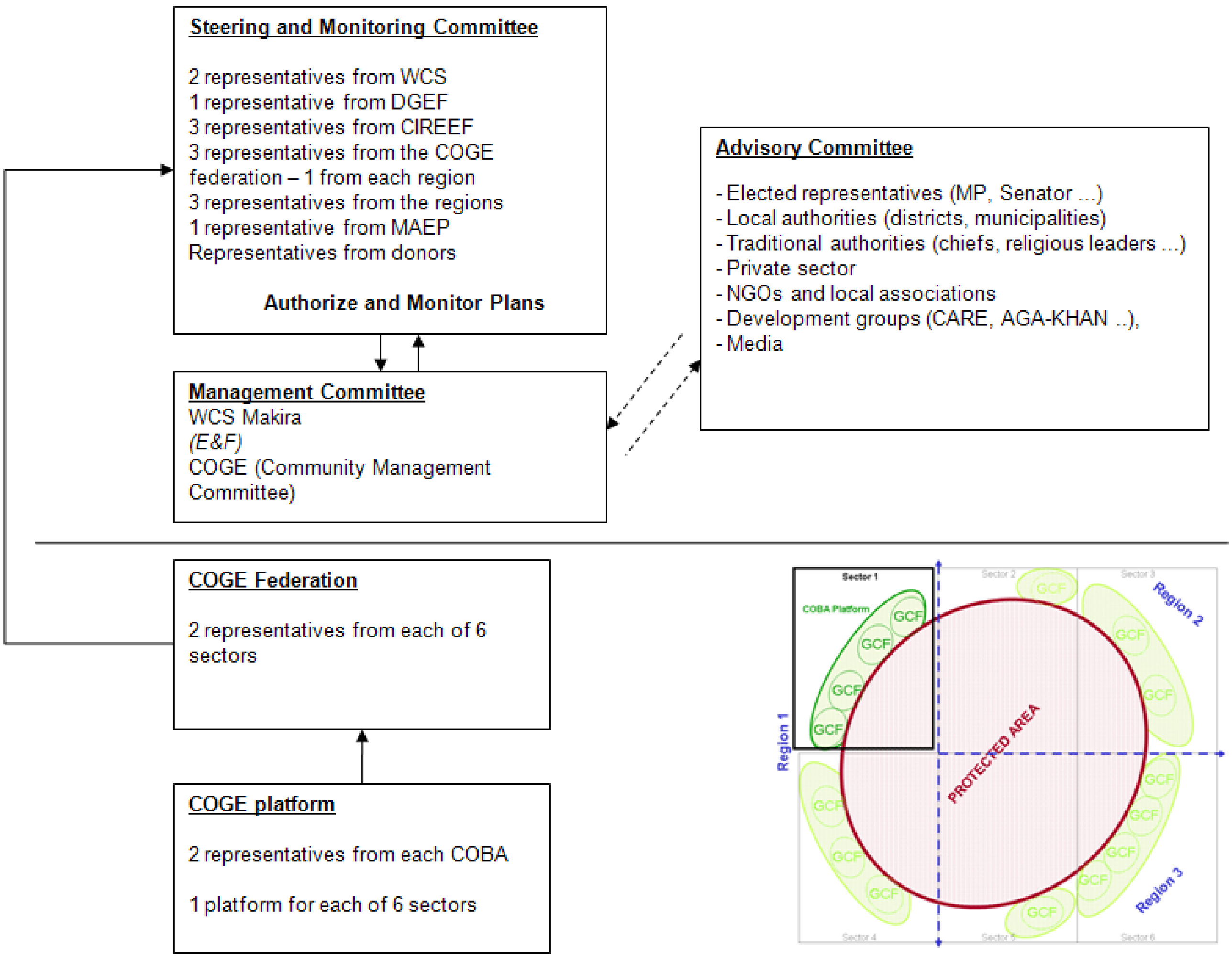
Summing these avoided emissions over the 30-year analysis period gives a total carbon emissions avoidance attributable to the Makira Forest Project of 2,589,898 t C, or 9,496,294 t CO_2 equivalent

Appendix 3: Management structure for Makira protected area

Collaborative co-management between WCS (the officially delegated manager) and the COGEs of the green belt around Makira.

Structure has 3 committees :

- The steering and monitoring committee (the decision making body)
- The management committee
- The advisory committee which includes external actors who influence or are influenced by the protected area



The organization of the local communities/GCFs (forest management contract areas) will be as follows :

- Each sector will have a platform of COGEs that discuss issues related to management of their GCF sites in relation to the Makira PA
- Each sector platform will identify two (2) representatives to be part of the Federation of COGEs (sector iv will be the sole sector that will have 3 representatives given the large number of GCF and ZOC sites)
- The Federation of COGEs will then select three (3) representatives, one (1) representative per region to be part of the Makira PA steering committee.

The role of the individual COGEs in the management committee will be to participate in all decisions made concerning activities in the Makira PA ZUCs, ZOCs, Grande Pistes, as well as within the Zone de Protection (the 2.5km zone that extends out from the limit of the Makira PA.

It will be the responsibility of WCS to work with the COGEs on these management/protection/conservation activities. However, the COGEs will be expected to respect management decisions in these zones as they will have had representation in the steering committee speaking on their behalf.

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This publication is made possible by the generous support of the American people through the United States Agency for International Development (USAID), under the terms of the TransLinks Cooperative Agreement No.EPP-A-00-06-00014-00 to The Wildlife Conservation Society. TransLinks is a partnership of WCS, The Earth Institute, Enterprise Works/VITA, Forest Trends and The Land Tenure Center, The contents are the responsibility of the partnership and do not necessarily reflect the views of USAID or the United States government.