

Creating New Values for Africa:

Emerging Ecosystem Service Markets



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Ecosystem Marketplace





Forest Trends' mission is to maintain, restore, and enhance forests and connected natural ecosystems, which provide life-sustaining processes, by promoting incentives stemming from a broad range of ecosystem services and products. Specifically, Forest Trends seeks to catalyze the development of integrated carbon, water, and biodiversity incentives that deliver real conservation outcomes and benefits to local communities and other stewards of our natural resources. Forest Trends analyzes strategic market and policy issues, catalyzes connections between producers, communities and investors, and develops new financial tools to help markets work for conservation and people.

www.forest-trends.org



The Katoomba Group seeks to address key challenges for developing markets for ecosystem services, from enabling legislation to establishment of new market institutions, to strategies of pricing and marketing, and performance monitoring. It seeks to achieve the goal through strategic partnerships for analysis, information-sharing, investment, market services and policy advocacy. The Katoomba Group includes over 180 experts and practitioners from around the world representing a unique range of experience in business finance, policy, research and advocacy.







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Ecosystem Marketplace, a project of the non-profit organization Forest Trends, is a leading source of information on environmental markets and payments for ecosystem services. Our publicly available information sources include annual reports, quantitative market tracking, weekly articles, daily news and news briefs designed for different payments for ecosystem services stakeholders. We believe that by providing solid and trustworthy information on prices, regulation, science and other market-relevant issues, we can help payments for ecosystem services and incentives for reducing pollution become a fundamental part of our economic and environmental systems, helping make the priceless valuable.

www.ecosystemmarketplace.com

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Foreword

Ecosystems provide services that sustain life. Forests and wetlands, for example, contribute to climate regulation, purify and deliver reliable flows of water, and support plants and animals upon which humans rely for sources of food and fuel. If nature did not provide these services, we would need to spend billions of dollars developing the infrastructure to accomplish what ecosystems do for free – if we were able to replace them at all. Yet, over 60% of ecosystem functions around the world are currently being degraded faster than they can recover. It is clear that for ecosystem services to be maintained, stewardship of these services and resources needs to become as, or more, profitable than alternative land uses.

Concern has led to innovation. Environmental markets, such as regulatory and voluntary carbon markets, and payments for ecosystem services (PES) are giving value to carbon storage, flood protection, clean, reliable flows of water, and other ecosystem services.

Africa has been underserved in this respect, mostly due to the specific conditions prevailing on the continent. The African economy is more rural than the economies of North America, South America, and Asia, and its rich natural resources are often managed by people who are scattered across the land. This dispersed rural economy creates a dynamic which demands increased application of both low-cost technologies to harness the conservation potential of small communities and replicable methodologies to incorporate livelihood considerations into carbon, biodiversity, and water PES programs.

As environmental markets and PES gain international attention, there is a need in Africa for capacity-building activities to introduce PES concepts and lay the foundation for a greater number of investments in restoring and maintaining ecosystem services. In order to address demands for knowledge and best practice, Forest Trends and the Katoomba Group are collaborating with ICRAF Pro Poor Rewards for Environmental Services in Africa (PRESA) with support from the United Nations Development Program South Africa to strengthen the community of African experts and institutions engaged in PES.

This booklet *Creating New Values for Africa: Emerging Ecosystem Service Markets* contains 12 featured projects and initiatives which demonstrate the current innovations and challenges to carbon, water, biodiversity PES implementation in Africa. Our hope is that this publication, (coupled with training sessions, policy advice, legal analysis, and network building) is a new contribution to building the African movement. Our goal is simple: enable community leaders, government actors, NGO technical staff, project developers and other interested persons to gain access to PES best practice, build a local community of PES learning, craft policies that are supportive of PES, and design PES projects which provide lasting ecosystem services and livelihood benefits.



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Markets and Transactions across Africa

Cash-strapped governments around the world are utilizing Payments for Ecosystem Services (PES) to preserve natural resources by incorporating the cost of environmental degradation into the cost of development. PES are implemented to give value to the benefits nature provides for humans such as carbon storage, flood protection, clean reliable flows of water, amongst others. PES programs vary in size and design depending on local circumstances, but they also follow general rules and principles. This booklet examines both the general and the specific tendencies across the African continent.

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These issues were widely discussed at several side events at the 17th Conference of the Parties (COP17) to the United Nations Framework Convention on Climate Change (UNFCCC), which took place in Durban, South Africa, in December 2011. While the UNFCCC works to develop a regulatory market for carbon emissions reductions, voluntary carbon markets are already operating across the globe. Although voluntary carbon PES implementation in Africa has been dominated by Reduced Emissions for Deforestation and Forest Degradation (REDD+), these side events highlighted a growing focus on the potential for agricultural and soil carbon activities to deliver food security, carbon sequestration, and livelihood benefits to individual farmers and communities.

Below is an overview of the issues we address in this booklet.

Carbon

Despite the global economic slowdown, investors and buyers have continued to funnel record amounts of capital into forestry projects that reduce greenhouse gas emissions by conserving forests and capturing carbon in trees. Ecosystem Marketplace's *State of the Forest Carbon Markets 2011: From Canopy to Currency*¹ documented a record \$175 million flowing to support forest carbon projects in 2010, representing commitments to sequester enough carbon to offset nearly 30 million tons of carbon dioxide (CO₂) emissions. While Africa remained a relatively small player in terms of global supply (representing about 8% share of the global OTC market), a growing pipeline of large projects and initiatives suggests that the continent will grow stronger in this respect in the future.

¹ http://www.forest-trends.org/publication_details.php?publicationID=2963.

Carbon: REDD+

This expectation was supported by a Joint Declaration of Intent on REDD+ in the Congo Basin from Central African and donor partner countries that was announced at COP17. The partnership intends to scale up REDD+ implementation in a region with more than 200 million hectares of intact rainforest and 120 million residents. The global implications of this 15-country collaboration, along with other results from COP17, are summarized in the chapter “Africa in Durban: A New Beginning” (page 8).

This growth is being driven in part by new technologies that make it easier and cheaper to measure the amount of carbon captured in trees. The article “Ghana Measures Forests from Sky to Land” (page 12) explores one such technology that combines remote sensing with extensive ground proofing to map Ghana’s national biomass and forest stocks at low cost and in a way that can be replicated across the continent.

Carbon: Soil

Methodologies have also been developed in Africa for carbon credit-generating activities outside of forest conservation. African carbon activities in 2010 included agro-forestry, soil conservation, and Improved Forest Management (IFM). As the majority of landholders in Africa are smallholders engaged in subsistence agriculture, carbon markets are being explored on the continent as a way to prevent deforestation and also to ensure livelihoods and food security for individual farmers.

The Kenya Agricultural Carbon Project is piloting low-cost, climate-friendly agriculture through a new methodology that can possibly be used by farmers across the region (“Kenyans Put Soil Carbon to Test,” page 22). Small-holders are trained in diverse crop management techniques to increase yields and generate additional income from carbon credits. This is the first project to sell soil carbon credits in Africa and it introduces a new approach to carbon-accounting methodologies for the agricultural sector. More importantly, it illustrates how carbon finance can deliver ecological and community benefits.

The potential for soil carbon finance to deliver food security, climate change, and livelihood benefits is also being explored in a carbon offset pilot project known as the “cocoa-carbon initiative” in Ghana in which cocoa producers return to shade-grown cocoa systems (“How Carbon Markets Can Help Avert a Chocolate Shortage: Cocoa Carbon in Ghana,” page 26). This project is part of a climate-smart agricultural finance scheme attempting to channel funds to farming techniques which promote healthy soil, maintain productivity, and sequester carbon while also supporting local farmers in Ghana’s cocoa sector.

Carbon: Safeguards

As REDD+ implementation grows on the continent, policy makers, and project developers are working to incorporate safeguards to prevent unintended negative impacts of national REDD+ strategies. “Forest Carbon Law in Ghana” (page 32) discusses the statutory requirements around land ownership that create perverse incentives which conflict with REDD. Also, cost-effective social and biodiversity impact assessments (SBIA) will help REDD+ project developers to ensure that their projects contribute to high-quality social and biodiversity outcomes (“Incorporating Social and Biodiversity Goals into Carbon and REDD Projects,” page 36).



Rural Livelihoods

Social and institutional development components have indeed become essential to carbon project and policy design in Africa. Projects on the continent often include approaches to improve local capacity to identify, formulate, and implement ecosystem management activities for goals such as poverty alleviation or local land rights. The potential opportunities of PES and community development are illustrated through a Ugandan schoolteacher's personal experience in a project that aggregates tree planting activities of small holders in Africa into certified carbon reductions for corporate buyers in Europe ("Beatrice Ahimbisbwe's Trees for Tots;" page 42). According to the neighboring Bunyoro Kingdom of Uganda, however, engaging in water, biodiversity, or carbon PES will remain a challenge for many tribal groups in Africa as they continue to struggle for legal rights to traditionally occupied forests ("Ugandan Tribe Struggles to Maintain Forests and Access Benefits;" page 46).

Biodiversity

The 2011 Update of the State of Biodiversity Markets report documented eight biodiversity offset programs in development in Africa: in Uganda, Madagascar, Namibia, and South Africa. The factors that hinder biodiversity market development in Africa are said to include financial barriers, political instability, and disagreements within the conservation community on how and if biodiversity markets should be structured.

However, making the connection between biodiversity and business may create new opportunities. Countries across Africa, including Madagascar, Ghana, Guinea, Mozambique, Egypt, and Uganda, are creating new regulations that consider economic instruments like biodiversity offsets. "Can Namibia find the Balance of Developing its Mineral Resources Sustainably and Protect Its Biodiversity for the Future?" (page 50) presents Namibia's innovative process involving landscape-level planning to support national biodiversity offset policies.

Biodiversity conservation efforts in Africa have historically been dominated by the continent's charismatic species—elephant, buffalo, lion, leopard, rhino, and chimpanzee. The resulting nature-based tourism sector has fueled a strong historical focus on protected areas. Yet, current rates of degradation outside of protected areas are contributing to significant stress on resources within the areas. "Uganda Tests Ability of PES to Deliver Benefits for Biodiversity" describes a biodiversity PES project that seeks to address this issue by restoring not only chimpanzee habitat, but also by improving local livelihoods and delivering hard data to answer a much debated question: Can PES deliver positive livelihood and biodiversity impacts outside of protected areas? (page 54).

Water

Ecosystem Marketplace's State of Watershed Payments report² documents more than \$8 billion in Payments for Watershed Services (PWS) and Water Quality Trading (WQT). In Africa, such programs are concentrated in the East and Southern regions. Altogether, the report identified 10 programs in South Africa, Kenya, Tanzania, Uganda, and Malawi, which together generated \$64.7 million in transactions on nearly 200,000 hectares in 2008, the last year for which reliable figures are available.

² http://www.forest-trends.org/publication_details.php?publicationID=2438.

In most cases, watershed management activities in Africa are part of a national ecosystem conservation programs that include investments in watershed service enhancement and rehabilitation, but beyond that, private sector PWS are likely to experience tremendous growth in the years to come. In Gabon, payments from hydroelectric plants to upstream farmers support preservation of the Mbé watershed (“Can Libreville’s Electricity Users Save Gabon’s Mbé Watershed?” page58). In Tanzania, WWF, and the Natural Capital Project are mapping ecosystem services of Tanzania’s Eastern Arc Mountains in an effort to entice payments from downstream users such as breweries and water utilities to subsistence farmers living and working in the mountains (“How Much for this Mountain Forest?” page62).

This collection of cases represents a wealth of PES experimentation in Africa on the part of government, NGOs, and private organizations. It provides real examples of current best practice while illustrating trends in water, biodiversity, and carbon market activities on the continent. Although not exhaustive, research conducted for this booklet indicates that transactions for ecosystem services in Africa incorporate social elements (food security, poverty alleviation) and value livelihood and ecological benefits with equal importance. While private sector investment in PES is expected to increase as replicable mapping techniques, scientific methodologies, and aggregation tools become more widely available, some questions remain around legal and institutional frameworks. Forest Trends will continue to track and share information about the maturing landscape of PES implementation in Africa through a number of initiatives on the continent.

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Africa in Durban: A New Beginning

The Durban climate talks yielded agreement on a wide range of issues that are good for Africa, but that's only a small part of the potential to be gained by incorporating Payments for Ecosystem Services into the African economy.

The Kyoto Protocol's Clean Development Mechanism (CDM) has funneled billions of dollars to the developing world, but less than 2% of that went to Africa – largely because the Kyoto Protocol was aimed at tackling industrial emissions, of which Africa had very few. The aptly-named "Durban Platform,"³ however, is aimed more squarely at the issues that impact sub-Saharan Africa, and it comes amid a cornucopia of initiatives designed to ensure that economic development comes sustainably to the continent.



Photo: Shutterstock

Forged in a series of late-night negotiating sessions at the 17th Conference of the Parties (COP 17) to the United Nations Framework Convention on Climate Change (UNFCCC) in Durban, the Platform has been criticized as little more than an “agreement to agree”. It's a legitimate critique, for the Durban Platform won't yield a binding global agreement until 2015, but such nay-saying overlooks the fact that the Durban Platform delivers near-universal agreement on several formerly contentious issues. Because of this, it has a good chance of becoming what it aspires to be: namely, a springboard to a new global climate-change agreement that has buy-in from both developed and developing nations.

This is especially critical for Africa, as many of the areas of agreement are those that are most relevant to the African continent – including the need to support market-based mechanisms that promote sustainable land-use and forestry. The Durban talks – and the scores of side events that surrounded them – also reflected concern over the growing conflicts between food, fiber, fuel, and water – especially relevant issues in the African economy.

Green Light for REDD

The Durban Platform explicitly calls for the development of programs designed to promote REDD's maturation and signals the end of opposition to REDD within the UNFCCC. Every nation previously opposed to the mechanism now either endorses or has halted the opposition to it. Though this is a dramatic turn-around from even a few short years ago, it still leaves any global regulatory impetus to REDD at least five years away.

REDD projects will, therefore, continue in the interim, but in a sort of limbo dominated by voluntary markets. Now, however, they will also enjoy more support from governments and the financial sector. This provides a tremendous opportunity for project developers as they will now

³ http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/cop17_durbanplatform.pdf.

be able to launch projects that can be “nested” within evolving national, sub-national, and international REDD regimes.

No Shortage of Ideas

Even before Durban, Africa was awash in ideas. Indeed, while researching projects for this booklet we found scores of projects that looked great on paper, but had achieved little on the ground. The challenge moving forward is to turn these ideas into action, and we are seeing plenty of evidence that this is underway. As we were going to press, the Tanzania Natural Resource Forum (TNRF) had just launched a series of papers detailing not only good ideas, but action plans for implementing them.

The TNRF is a collective of community-based efforts aimed at ensuring the development of green governance – and that’s exactly what’s needed if payments for ecosystem services are to deliver environmental benefits. All across Tanzania – and, indeed, across several African nations – we’re seeing communities acting proactively to establish baselines and develop systems that can monitor carbon stocks. But this will come to naught if governments don’t step up.

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Cross River State

Many of the most promising developments are taking place at the state level, which we see most clearly in Nigeria’s Cross River state – the first African state to join the Governors’ Climate and Forests Task Force (GCF), which was launched by then-California Governor Arnold Schwarzenegger in 2009 and includes 16 state governments in the United States, Mexico, Brazil, Indonesia, and Nigeria. In Durban, GCF participants outlined a concrete infrastructure for measuring, monitoring, and verifying REDD activities across several of the participating states, and Cross Rivers is at the forefront.

Congo Basin

In the closing days of Durban, seven Central African countries and seven donor partner countries unveiled a “Joint Declaration of Intent on REDD+” to create a viable REDD+ infrastructure in the Congo Basin. Three of the African countries involved in this initiative – the Democratic Republic of Congo, the Republic of Congo, and the Central African Republic – recently completed the arduous task of developing REDD Readiness Preparation Proposals (R-PP).

While this new initiative goes a long way towards bringing the Congo Basin in line with the Amazon Rainforest, it will only fly if the countries can demonstrate adequate governance – a universal challenge in both the developed and developing world. Indeed, research by Ecosystem Marketplace shows wide variance in the quality of local governance across the United States, with some regions employing good governance – and reaping both environmental and economic benefits – and other regions failing to govern properly and suffering environmental and economic consequences.



Governmental and Financial Support for Voluntary Markets

The private sector has demonstrated an appetite for voluntary REDD credits, and governments have ratcheted up their support of voluntary markets of all kinds to compensate for the lack of a global regulatory driver. These two powerful trends were documented in two Forest Trends/Ecosystem Marketplace studies published on the eve of the COP. The first study, *State of the Forest Carbon Markets 2011: From Canopy to Currency*,⁴ documents a record \$175 million flowing into forest carbon projects in 2010, despite the global economic slowdown and lack of regulatory clarity.

The second study, *New Approaches to Old World Carbon*,⁵ identifies a clear effort on the part of European regulators to support local voluntary projects to ensure their environmental integrity and economic viability. This support was underpinned in Durban, where the fifth annual Forest Day event drew more than 1200 participants.

Furthermore, throughout the COP, scores of side events focused on the latest developments in forest carbon, including the emergence of forest bonds to secure endangered forests until more clarity can be established. The Durban Platform itself officially launched the Green Climate Fund, which will provide finance for mitigation activities (including REDD+) and nationally appropriate mitigation actions (NAMAs).

Supply Chain Management: The Über-Regulatory Driver

The growing emphasis on supply-chain management is helping to fill the regulatory void as companies look to produce their products more efficiently and NGOs become adept at using the bright light of transparency to “out” bad players.

Underpinning all of these themes is a clear consensus on the need to manage land more efficiently and sustainably. This represents a multi-trillion-dollar shift in the structure of the agricultural economy – a shift that will involve REDD, soil carbon, and PES. As was made abundantly clear in Durban, markets are not a panacea, which we see in the sections of this booklet that focus on “climate-safe agriculture” (pages 22 and 26), which has been implemented on more than 30% of US cropland but only has 5% penetration in the developing world.

Mitigation Banking and Ecosystem Arbitrage

The drive towards greener supply-chain management will impact both extractive and agriculture sectors in the developing world. The rise of corporate social responsibility (CSR) and development-bank lending requirements have led to a surge of pilot projects designed to test the efficacy of mitigation banking-type offsets in the developing world.

These overlooked markets in biodiversity and water dwarf the market for forest carbon, as two Ecosystem Marketplace/Forest Trends reports made clear. The *State of Biodiversity Markets Update* report⁶ documented a \$1 billion-per-year offsetting market in the United States, while the

⁴ http://www.forest-trends.org/publication_details.php?publicationID=2963.

⁵ http://www.ecosystemmarketplace.com/pages/dynamic/resources.library.page.php?page_id=8743§ion=home.

⁶ http://www.forest-trends.org/publication_details.php?publicationID=28481.

State of Watershed Payments report⁷ documented more than \$10 billion in watershed payments to date.

The Business and Biodiversity Offsets Program⁸ (BBOP) is currently developing voluntary pilot programs across the continent, and all of these have the potential to ensure that development happens without damaging valuable ecosystem resources.

⁷ http://www.forest-trends.org/publication_details.php?publicationID=2438.

⁸ <http://bbop.forest-trends.org/index.php>.



Ghana Measures Forests from Sky and Land

Cash-strapped countries hope to earn carbon credits for saving their rainforests, but many fear their gains will be wiped out by the high cost of documenting the carbon they capture in trees. Ghana hopes to change that by blending satellite technology with ground-truthing in a way that they say is both cheap and effective.

Daniel Tutu and Winston Asante barely noticed the morning glow creeping into the night sky outside their hotel on that second straight sunrise they'd worked through with hardly a break and no sleep at all. "And no coffee," says Asante. "It makes me hyper."

The marathon session topped off more than two years' work by scores of researchers at universities and government offices across Ghana, all cooperating on a project that could revolutionize the way developing countries measure and value their rainforests. It employed technology as basic as digging in the dirt and as advanced as data-mining the newest satellite data that the United States and Japan have to offer. If it worked, it would slash the cost of measuring forest cover and provide a tool that developing countries around the



Photo: Rebecca Ashley Asare

world could use to establish baselines and map out their forestry strategies. And it was about to face its first big test.

Will It Work?

The two men packed up their computers and made their way down dusty streets to the Achimota Forest Reserve, a patch of woods that the city of Accra had saved for posterity in the 1930s. It has been shrinking ever since.

The modern campus of the Forestry Commission of Ghana now occupies a clearing at the edge of the reserve, and 30 men waited inside. These were the officials who, after months of debate, were charged with answering an apparently simple question: How should the country define a forest? The question isn't as peculiar as it seems, and the answer would determine the fate of the country's forests and the flow of millions of dollars in carbon finance.

Cocoa, Carbon, and the Right Strategy

The Forestry Commission is charged with preserving forests and ensuring it is done in a way that doesn't hurt the country's legions of cocoa farmers – most of whom operate just above the subsistence level. It is this dual mandate to serve both the environment and the farmer that led the Commission to embrace forest carbon – but they first had to decide which type of forest carbon they wanted to pursue.

Most members of the commission favored a REDD (Reduced Emissions from Deforestation and Forest Degradation) strategy, which would let farmers earn carbon credits by saving endangered forests. A growing minority, however, favored an A/R (Afforestation/Reforestation) strategy,

which would let them earn carbon credits by planting trees on land that hadn't been forest for a long time – if ever.

The choice was complicated by uncertainty over the future of both mechanisms. A/R is the only forest carbon vehicle recognized under the Kyoto Protocol's Clean Development Mechanism (CDM), but it's an unpopular vehicle and is not likely to see its prospects improve at talks in Durban, South Africa. REDD, on the other hand, is little more than an aspiration within the United Nations Framework Convention on Climate Change (UNFCCC), but it has been gaining wide acceptance in the voluntary markets and in newer regulatory regimes around the world, according to Ecosystem Marketplace's State of the Forest Carbon Markets 2011 report. What's more, REDD is evolving into something called "REDD+", which recognizes a broad range of activities aimed at reviving degraded forests, while pure REDD only recognizes programs that save endangered virgin forest.

With these factors in mind, most Commission members concluded that REDD+ provided the best vehicle for integrating conservation into the cocoa economy. Farmers, they reasoned, could accept lower yields, but only if "cocoa carbon" made up for the reduced income; and cocoa carbon is only feasible on a large scale under REDD+. The Commission even wrote up a REDD Readiness Preparation Proposal (R-PP) that was accepted by the Forest Carbon Partnership Facility (FCPF), a global non-profit partnership that helps developing countries ready themselves for REDD.

What Is a Forest?

But the Commission couldn't chart a course until it knew for sure how its actions would be recognized under global agreements aimed at differentiating a cluster of trees from a forest. Such agreements had been hammered out through years of debate, and were designed to account for the environmental value that a cluster of trees delivers while taking into account regional differences and the limitations of carbon accounting. If Ghana embarked on a REDD+ course and found out later that the trees it saved didn't fit the recognized legal definition of a forest or that its baseline measurements weren't up to international standards then it would all be for naught.

And both of these were very real possibilities. For one, the forest inventories that Ghana did have were based on old estimates that the Food and Agriculture Organization (FAO) had made for general guidance. They weren't rigorous enough for constructing a baseline or formulating a carbon strategy. For another, the definition that Ghana used in its R-PP was based on different criteria from those laid out in the Marrakesh Accords, an internationally-recognized set of agreements under the CDM that base their definition on a forest's size, potential height, and the degree to which land is covered from above by branches and leaves (called "crown cover").

Without a solid understanding of what type and number of forests it had, the Commission was paralyzed.

Finding an Answer

Yaw Kwakye, who runs the Forestry Commission's Climate Change Unit, knew that Tutu and Asante had spent the previous two years working on a groundbreaking effort to map the country's biomass, and he asked if they could use that biomass data to generate maps showing Ghana's forest cover under different definitions.



The map was the first major project undertaken by the West Africa Katoomba Incubator, which is a joint project of the Katoomba Incubator (KI) and the Nature Conservation Research Center (NCRC).

The idea for the biomass map came in November, 2008, when NCRC CEO John Mason invited Oxford Professor Yadvinder Malhi to a two-day workshop that NCRC was hosting in Ghana. “NCRC wanted to help Ghana get ready for REDD,” says Malhi, who’d spent more than a decade examining the impacts of climate change on forests around the world – in the process becoming an expert in measuring the amount of carbon in trees, grass, and everything in between.

“Measuring biomass is core to understanding the impacts of climate change,” he says. “And there are two primary tools for doing it: one involves going out in person and hugging trees with measurement tapes, and the other is remote sensing.” Measuring trees is effective but requires lots of people and sophisticated logistics to get enough data, while remote sensing is cheap but generally considered less precise at the local scale. Malhi wanted to test new methods of incorporating ground data into the tools that analyze forests from the sky.

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The Limits of Technology

One of those improvements was being developed by Sassan Saatchi, a physicist at the US National Aeronautics and Space Administration (NASA) who had worked with Malhi at Oxford while mapping biomass in the Amazon and Peruvian Andes. Malhi and Saatchi both knew that the technology for doing large-scale mapping would not be deployed for years, but they wanted to see what they could accomplish with the technology that exists today.

“New remote sensing approaches using light detection and ranging (Lidar) and radio detection and ranging (radar) from airborne sensors have been successful in providing high-resolution estimates of forest carbon density for small areas,” Saatchi wrote in a paper published in May by the Proceedings of the National Academy of Sciences of the United States. “The space-borne sensors needed to use these approaches for large-scale mapping and monitoring efforts will not be available before the end of this decade,” he continued. “Until then, cost-effective mapping of carbon stocks for project- and national-scale assessments will rely on a combination of satellite imagery and ground-based inventory samples of forest carbon density.”

His solution was conceptually simple: gather data from Lidar and radar, mix it with photographic images, and compare it to hard data from the ground, then come up with an algorithm that could take the best of all readily-available inputs from the sky and distill it into a reliable presentation of what was on the ground.

“On the flight back to London, I kept thinking of all this, and how useful a carbon map could be for Ghana,” he says. “I was also keen to try these ideas out on a larger scale.” So, after landing, he e-mailed Mason and arranged for one of his Cambridge students, David Aitken, to spend some time with NCRC. Mason in turn called Jacob Olander, head of the Katoomba Incubator and his partner in the West Africa Katoomba Incubator. Together they applied for a grant from the Moore Foundation to get the map off the ground.



When the funding came in, they hired Asante and Tutu – old schoolmates who had each pursued different careers in forestry. As the project began, Asante was working as a free-lance consultant, and Tutu was working for the Ghanaian Environmental Protection Agency (EPA). Tutu joined the project part-time and headed off to NASA’s Jet Propulsion Laboratory at the California Institute of Technology, while Asante became a full-time employee of NCRC and oversaw the gathering of ground data.

“They were critical to the success of this project,” says Malhi. “They not only had a good scientific skill set, but they had the talent and connections to build on networks and relationships of trust. If I’d hired two Oxford researchers to come over and do this, it would have been a much more difficult process.”

Looking for Help

Malhi knew that the Forestry Commission and universities had already taken many of the measurements they needed, but he also knew from past experience that researchers are protective of their data. “People have put in a lot of work into gathering this data,” he says. “They’re always afraid someone will run away with it and not involve the people who did the heavy lifting.” He wasn’t sure people would share, and he could understand why.

The Workshop

Malhi asked Asante to invite all the key players to a workshop in Accra to make sure they all understood the nature of the project and then to ask them to share information. The workshop took place in December, 2009, and to his surprise, every participant willingly shared their data with the Incubator mapping project. “People understood that this was part of a national effort to make REDD+ a reality,” says Malhi. “We weren’t writing a paper, but were creating a resource that would be freely available for Ghana to use.”

As the data came in, he and Asante realized it was extensive in some places – mostly in the forest reserves the wooded south – and scant in others – mostly in the northern savanna woodlands. “We weren’t expecting much data in the north, because it’s mostly sparse woody vegetation and other stuff that most Ghanaians don’t think of it as forest,” says Malhi. “Plus, the research capacity is mostly in the south – clustered around Kumasi and Accra.”

Filling the Holes

Asante assembled a team of one botanist and five assistants and spent the months of July, August, and September of 2010 canvassing the nation with them to document the dominant land use in each region – first by asking locals to simply tell them what was there and then by visiting some plots themselves. “Once we got there, we would take as many types of measurements as we could – water, soil, etc.,” says Asante. “We didn’t really know if we’d have a chance to come back and wanted to use each trip as best we could.”

Off to NASA

While Asante was scouring the Ghanaian countryside, Tutu was at NASA working with Saatchi. They began working with three sets of data – two provided by NASA and one by the Japan Aerospace Exploration Agency (JAXA). From NASA came visual data generated by the agency’s workhorse Landsat and MODIS (Moderate Resolution Imaging Spectroradiometer) projects and



Lidar (Light Detection and Ranging) data from its GLAS (Geoscience Laser Altimeter System) project. From JAXA came radar data from its ALOS-Palsar satellite. Lidar uses lasers the way radar uses radio-waves, and would essentially estimate a forest's height, with the laser's first bounce hitting the top of the forest and the second one hitting the bottom. By combining that data with the images, Saatchi and Tutu were able to get a fairly good idea of what was on the ground.

The process was long and tedious, and involved first filtering and then crunching data that had come from three different sources in three different forms. The filtering involved removing obvious errors, such as outlier data caused by light or sound bouncing at bad angles. The crunching was more of a challenge.

Crunching the Data

The satellite technology had proven adequate for determining the amount of biomass when the land in question had one clearly dominant type of land-use, such as farms, forests, and savannah, but it was less effective on land where the uses were more mixed, so Tutu and Saatchi created three maps.

The first was a “probability map” that depicted the likelihood of a given patch of land having a given biomass. The next was an “error map” that aimed to depict the biomass from secondary land-use types. The third was a map based on regression analysis that aimed to distill a single, reliable figure for each pixel.

In the end, the probability map proved best on larger scales, even though it was weak on a pixel-by-pixel basis. As Saatchi wrote in his paper, “Benchmark map of forest carbon stocks in tropical regions across three continents,”⁹ the probability map was often just 50/50 at the level of individual pixels – each of which represented one hectare – but it was 95% accurate on plots the size of a typical forest carbon project (10,000 hectares or more) and to 99% when scaled up to the size of a country (1 million hectares or more). “The regression-based map worked well when we were looking at flat land, but it didn’t really work when we got into something like the shade of a mountain,” says Saatchi. “In the end, the probability map was the most accurate representation of what was on the ground.”

Fixing the Algorithms

Tutu returned from California in September, 2010, just as Asante was wrapping up his field work. Then they began fine-tuning the maps by comparing data from the sky with data from the ground and adjusting the algorithms when necessary. Then they would test the new algorithms by seeing how well they predicted what they knew was already there. As the process continued, the maps became more and more accurate.

Revealed Truths

By the time of the meeting at the Forestry Commission, the maps were almost ready to be made public, and Kwakye called Tutu and Asante with a request: Could they, he asked, use the maps to project the shape of Ghana’s forests under the different forest definitions allowed under the Marrakesh Accords? That’s because the Accords don’t just give countries an absolute definition of what constitutes a forest, but rather proscribe a range within which countries can set their own

⁹ <http://www.pnas.org/content/108/24/9899>.

minimum thresholds. This means that one country can define a forest as being any cluster of trees larger than a half-hectare with crown cover above 10% and populated by trees that can grow at least two meters high. Another country could set its minimum thresholds at one hectare in size with 30% crown cover and a minimum height of five meters.

So, for 48 hours, the two combed through the digital maps pixel-by-pixel, punching in four different recognized definitions of a forest and generating maps showing how much forest the country had under each definition. The results were astonishing.

When they set the canopy threshold at 10%, forests covered large swathes of the country; but when they the threshold at 30%, forest cover plunged, and the forests that disappeared were among the most degraded – and thus endangered. These were exactly the forests that could benefit the most from REDD+ financing.

Setting the threshold higher wouldn't give them extra land on which to plant trees, but rather would swap land that was eligible for the up-and-coming REDD+ mechanism for land that might be eligible for the outgoing and cumbersome A/R mechanism. In the end, they settled on a threshold of 15%, setting the stage for REDD+. "Without that map, we wouldn't have known what we had," says Kwakye. "It made it possible for us to formulate a strategy based on a realistic understanding of our resources."

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The Implications

The mapping process isn't yet powerful enough to support projects – even under current voluntary standards, which require higher accuracy on a hectare-by-hectare basis. It is, however, proving to be a powerful decision-making tool.

Malhi believes it can also help guide the development of new sensor techniques, such as the European Space Agency's upcoming BIOMASS sensor which will allow for direct forest biomass assessments. "We're not trying to replace ground inventories, because if you actually undertake a project, you will still need that," says Malhi. "But we are trying to see if, by identifying a few local stars, engaging the wider community, and having a few international experts involved you can provide enough information to help inform decision-making."



Kenyans Put Soil Carbon to the Test

Modern farming methods churn up soil and release carbon into the air, where it contributes to climate change. Ultra-modern methods conserve topsoil and increase production, trapping small amounts of carbon in the earth and plants. The Kenya Agricultural Carbon Project aims to leverage that little bit of carbon to spark an agriculture revolution.

David Ongoro has been working his three-hectare farm in Kenya's fertile Nyanza Province for over a decade, and for the past two years he's been enjoying bumper crops. He attributes that to a local forester named Danish Juma, who told him he could earn carbon credits for shifting to something called "climate-safe" agriculture.

Ongoro jumped at the chance – but not for the carbon credits. "I'm a farmer," he says, "and the most important thing for me is what I get from my farm – the outputs." It turns out those outputs respond to the same activities that reduce carbon emissions – a happy correlation that sparked a 20-year experiment called the Kenya Agricultural Carbon Project (KACP), which aims to test the role carbon finance can play in persuading small-scale farmers to adopt more sustainable practices.



Photo: Shutterstock

The KACP was developed by the VI Agroforestry Programme, a Swedish NGO that has been planting trees in Eastern Africa since 1983 and is being funded by the World Bank. Juma signed on as a field officer two years ago, and his mission ever since has been to recruit and train farmers like Ongoro. His pitch is simple: sustainable agriculture can raise your yields and it also locks carbon in the ground – which means you might earn carbon credits down the road.

The Happy Convergence

Ongoro and 15,000 other farmers joined the project and have ratcheted up their outputs – perhaps as much as 30%, although an exact figure is still a few years off. "The yields are definitely up, but we don't know the exact amount yet," says Bo Lager, who runs the project for VI Agroforestry. "We also can't say with certainty how much of that increase can be attributed to the new practices and how much is just normal fluctuation."

The "new" practices are really a combination of old and new technologies called sustainable agricultural land management (SALM); these technologies were developed not to capture carbon, but to conserve topsoil. Healthy topsoil teems with life, and that means carbon. As we churn through topsoil, we not only extract the nutrients that support agriculture, but we release carbon into the air – lots of it: roughly 80 billion tons since the advent of mechanized tilling 200 years ago.

SALM reverses this in two ways: first, by increasing yields, which captures carbon in plants; and second, by avoiding soil disruption, which keeps carbon locked in the soil.

Efforts are underway to bring 50,000 more farmers into KACP, which aims to generate carbon credits for another 20 years. Money will be used to train farmers in SALM while helping them adapt to climate change and commercialize their crops.

Manure, Mulch, and No-Till Farming

Ongoro says the practices are fairly simple, but also labor-intensive. “I’ve learned to do crop rotation now, which I wasn’t doing before, and I use manure along with industrial fertilizers,” he says. “I also don’t remove residues – that’s the left over stuff after a harvest – but rather compost it.” And, instead of digging up long rows of dirt to plant his seeds, he employs “no-till farming”, which is practiced on 40% of US farms. It’s credited with halting the depletion of topsoil there and locking an estimated 60 million metric tons of carbon in the ground annually.

Practices [such as “no-till farming”] could go a long way in Africa, where agricultural greenhouse gas emissions are projected to skyrocket as the population grows and the diet shifts. Already, 66% of the continent’s cropland has been severely degraded, which leads to more deforestation as farmers move on to more fertile land.

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The Role of Carbon

The KACP has yielded intriguing insights into the supporting role that carbon finance can play in helping to alleviate those emissions. “A farmer who joins this program will benefit through improved production, improved nutrition, and increased income from agricultural activities,” says Juma. “That’s the benefit; carbon should be viewed as a bonus.”

And there’s the rub: carbon is likely to deliver a small bonus at best, because SALM locks up just one or two tons of carbon per hectare per year. Ongoro’s three hectares might earn just \$15 per year in carbon credits at today’s prices, with much of that going to cover the KACP’s administrative costs. What’s left will be distributed to the farmer’s cooperative that Juma belongs to, and no one really knows how much that will be.

Lager says that KACP’s costs are fixed, which means that the higher the price of carbon goes, the more he can disperse to farmers’ cooperatives. If prices stay at today’s levels, farmers won’t earn much directly from the credits, but will receive decades of training and adaptation support.

Carbon income, therefore, may best be used to support education, outreach, and organization – activities that promote the transition to a more sustainable economy – with farmers reaping the benefit of higher yields. “You could make that argument,” says Lager. “But we still plan to give most of the money to farmers’ groups.”

The Risks

The program won’t work everywhere, in part because it’s not clear how much of Africa’s soils are well-suited for soil carbon projects. Research done by the Terrestrial Carbon Group, for example, found that only two African countries – South Africa and Congo – offer a high potential of soil



carbon sequestration. Soil specialist and retired Duke University professor William Schlesinger says that peatlands, wetlands, and cold regions are, in general, better places for locking up significant amounts of carbon in soils.

“Since soil carbon contents are driven more by decomposition rates than input rates, hot areas and deserts simply do not store as much carbon,” he says, adding that the best road to sequester carbon in soils in Africa would be to focus on incorporating crop residues or their ash into soils where this has not been done traditionally.

Modeling vs. Measuring

Which brings us to the question of how to measure changes in carbon stocks. Releasing carbon from soils takes much longer than from trees and sequestering is a much longer process as well. “Measuring and validating an estimate of soil carbon over any considerable area is a non-trivial amount of work due to the high degree of spatial variation in soil characteristics and the relatively small changes in the carbon content that will be seen on an annual basis,” says Schlesinger, adding that modeling cannot replace field surveys because the models are too dependent on the parameter estimates that drive them. The KACP is dealing with that by monitoring behavior instead of trying to measure carbon, and then knocking 60% off its estimated total.

Soil Carbon and Coffee

KACP is the first project to earn soil carbon credits, but other projects are underway across Africa. Ecosystem Marketplace publisher Forest Trends, for example, is working with Ecoagriculture Partners and Climate Focus on the African Agricultural Carbon Facility, which aims to test the viability of such mechanisms in coffee-based systems.

There, the plan is to increase tree cover, and composting of coffee husks with manure prior to spreading on field sites showed significant carbon sequestration potential—with assumed annual additional sequestration potential of 1.8 tCO₂/ha/year.

In other words, converting sun-grown into shade-grown coffee, represents a promising commodity-based option for agricultural mitigation in Kenya as substantial amounts of additional terrestrial carbon can be stored. Extension services for coffee farmers are readily available and can be leveraged to deliver carbon-focused assistance. In addition, organic certified coffee systems commonly have a quality control entity that interfaces with farmers and could also play a role in carbon MRV (measurement, reporting, and verification).





How Carbon Markets Can Help Avert a Chocolate Shortage: Cocoa Carbon in Ghana

If the price of cocoa rises to the point that it rivals that of caviar twenty years from now as some experts predict, it will be because we stuck with farming techniques that wreak havoc on both soil and surrounding forests. Such techniques also contribute to global warming, and carbon finance can help make them a thing of the past.

Can carbon save cocoa? That, some say, is the million-dollar question – or, more accurately, the US\$2.2 billion question, since industry insiders estimate that this is the value of carbon stored in Ghana's cocoa landscapes. That value could play an important role in ensuring the long-term survival of the nation's cocoa industry, which faces existential threats in the wake of depleted soil fertility, reduced water supplies, and various diseases worldwide.



Photo: Caroline Campbell, NCRC

Already Brazil, once the second-leading cocoa producer in the world, has seen its cash cow fall victim to a massive fungal disease. Now, instead of making money from cocoa, Brazil pays to import it.

Meanwhile Ghana – which is second only to Côte d'Ivoire in world cocoa production – has seen yields per acre farmed dwindle and until very recently stagnant national production, spurring some farmers to abandon the livelihood that supported their families for generations. That decline and the accompanying flight from farming have been in remission for three years – thanks largely to the current high price of cocoa – but current agricultural techniques are unsustainable over the long haul.

Two-thirds of Ghana's stored carbon lies in its high-forest region – and the country has already lost most of this, seeing it shrink from 8.2 million hectares prior to 1900 to less than 2 million hectares today, including protected and unprotected forests.

The Cocoa Conundrum and the Sun Curse

Cocoa has always been rough on land. Under the best of circumstances, the cacao trees from which cocoa is harvested suck nutrients out of the soil at rates that require massive infusions of chemical fertilizer – which only 30% of cocoa farmers use – and also require heavy doses of insecticides – which about half of farmers use, but in insufficient quantities.

Under traditional cocoa-farming systems, forest trees were left intact, because older strains of cacao trees grow well in filtered sunlight and because at the time it was very hard to remove large forest trees from the farm. Over time, hybrid varieties have improved yields – beginning with strains that can be harvested twice per year instead of once--but the hybrid trees also tolerate more direct sunlight. This makes it possible for farmers to chop down larger shade trees, with the aid of chainsaws, and plant more cacao trees – an apparent improvement over traditional farms because the hybrids offer higher yields. Unfortunately, full sun or low-shade systems suck even

more nutrients out of the soil because the hybrid tree's metabolism operates at a higher rate in sunny environment. Sun-dominated systems also encourage some insect pests and – more importantly for the world at large – rob the planet of both carbon-sequestering trees and of valuable habitat for various species of rare animals and plants by encouraging the destruction of natural shade trees that store carbon and provide shelter.

Due to the rate at which full sun hybrid systems absorb nutrients from the soil and exhaust the productive capacity of the cacao trees, such plantations are often abandoned within a few decades, and new farms are planted on newly deforested land, says Michael Richards, a natural resources economist with Forest Trends, publisher of the Ecosystem Marketplace. Cocoa farmers often then extend their farms or move into other forested areas, bringing deforestation with them and releasing more carbon into the atmosphere.

Most Ghanaian farmers still use the shaded variety of cacao tree, but the hybrids are taking hold – especially in the Western part of the country – and the global atmosphere is paying the price. Long-term, farmers are paying a price as well. Soil fertility has shrunk noticeably; the hybrid-cacao trees' lifespan is growing shorter; and farmers are struggling to survive. Climate change and unsustainable farming techniques have decreased the amount of land supporting cocoa crops by 40% in the past four decades alone, reports the Ghanaian Nature Conservation Research Centre, a leading conservation NGO in West Africa – although the area under cocoa has been increasing in recent years as cocoa prices rise.

Some experts believe that if nothing is done, Ghana's cocoa sector could go the way of Brazil's. “The world is focusing on how to increase consumer demand for chocolate, especially in Africa, but it may not be a great long-term investment, if we run out of cocoa in 30 years,” says John Mason, executive director of the Nature Conservation Research Centre (NCRC). Preliminary research by the University of Reading in the UK suggests that traditional shaded-cocoa farms store over twice as much carbon as shade-free farms. Farmers could be persuaded to increase their tree canopy and decrease their cocoa yield if carbon trading makes it worth their while.

Re-Thinking the Process

Scores of environmental non-governmental organizations (NGOs) have called for a moratorium on new sun cocoa plantations and a return to shade-cocoa. Many believe that carbon offsets for projects that reduce greenhouse gas emissions from deforestation and forest degradation (REDD) can make it worthwhile for farmers to return to shade-growing, but Michael Packer, managing director of ArborCarb Ltd, says simply reviving the shaded growth method will not be enough. “Traditional cocoa is problematic, too, in the way it has been produced,” he says. “After all, it led to the deforestation that exhausted soil, which lead to the requirement for hybrids.”

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The solution, he adds, is to manage cocoa plantations differently. “We need to work with the ecosystem to manage soil nutrient content, biodiversity, and associated ecosystem services – including carbon sequestration and disease control,” he says.

Pioneering Cocoa Carbon

This sparked a push to create the world's first-ever cocoa carbon initiative – and, not surprisingly, its Petri dish is Ghana. Forest Trends, NCRC, and the Katoomba Group (an international network promoting ecosystem service markets and co-publisher of the Ecosystem Marketplace) are spearheading a carbon-offset pilot project under the Katoomba Incubator program, which has already initiated community-based projects across Latin America. At a larger scale, the cocoa carbon initiative is couched within an effort, also led by these organizations, to facilitate a climate-smart agricultural finance mechanism for Ghana's cocoa sector. If both endeavors are successful it could dramatically change the way that cocoa is grown in Ghana, providing both climate change mitigation and adaptation benefits to farmers.

Who Are the Farmers?

The majority of cocoa farmers still attain low yields (less than 400 kg of cocoa beans per hectare). A large number of these cocoa farmers are share croppers, but many also farm on family land or land they have purchased. Regardless of the ownership structure, the cocoa carbon initiative plans to measure whether farm owners who preserve or enhance the carbon-stored in the shade trees on their farms and in adjacent forest lands can receive benefits. These benefits may be in the form of payments from the sale of carbon-offset credits, or through access to agricultural loans, insurance, and extension services that provide information on best farming practices. The overall aim is to see whether increasing the amount of shade (and therefore carbon) on farms can go hand in hand with increasing productivity to improve farmer livelihoods.

According to Rebecca Ashley Asare, Coordinator of the West Africa Incubator and an expert on cocoa-farming practices in Ghana, people's initial response is always, “no-way” because shade does reduce productivity, but this assumes that the system is operating at its productive potential. “Most farmers in Ghana could significantly increase their yields through the adoption of a few simple practices, like pruning the canopy of the cocoa trees and planting fewer cocoa trees to reduce competition.”

Asare believes that there is real opportunity to increase yields on farm through the adoption of best-farming practices, regardless of the shade level. Carbon only creates an additional incentive to improve farming practices, and potentially new revenue streams by which to do so. This could answer the US\$2.2 billion question – if policymakers can navigate several complex hurdles. Chief among them is land tenure.

The Tenure Quandary

In 2009, the Katoomba Group invited key participants from a range of stakeholder groups – including various government departments – to an REDD Opportunities Scoping Exercise that identified tree tenure as a major constraint for REDD. Tree tenure laws in Ghana, for example, discourage farmers from keeping timber trees because the state owns all naturally occurring trees, while planted trees belong to the person who plants them. Farmers, therefore, are only permitted to fell timber trees for household use, but not for income. Only timber groups with government



concessions can fell naturally occurring trees for money – leaving cocoa farmers no economic or financial interest in preserving trees growing on the land they either own or work.

Adding to the complexity: many cocoa farms are located within the “off-reserve” areas of timber concession zones (i.e., land located outside of protected areas and forest production reserves). This means that a logger with a concession can harvest the farm’s trees – although the logger does have to let the farmer know he’s harvesting them, and technically he has to compensate the farmer for the felled timber trees and any damage to cacao trees from machinery. Unfortunately, there are no standards of compensation, and disputes are quite common. To avoid the hassle – and the risk of damage – cocoa farmers often select smaller shade trees in preference to timber shade trees. They have also been known to destroy timber saplings and even ring-bark mature timber trees. Those who keep the trees often sell them clandestinely to chainsaw operators who cause minimum damage to cocoa.

The REDD Opportunities Scoping Exercise concluded that the best chance for sustainable shade-tree cocoa farming, as well as other tree-based systems, would be the extension of what are known as Community Resource Management Areas (CREMAs) in which communities can hold greater rights manage and benefit economically from the natural resources on their land, including trees. NCRC is working with a few pilot CREMAs, but there are currently only a handful in the country, and the government has not adopted a policy of promoting them. Local NGOs argue this must change as part of a national REDD program.

The Importance of Education

A public-private partnership named the Sustainable Tree Crops Program (STCP) kicked off in 2000 to introduce sustainable innovations such as integrated pest management and reduced chemical use to enhance cocoa productivity. Farmers graduating from the program’s “farmer field school” have seen their incomes improve by 15-50 percent, says Bill Guyton, president of the World Cocoa Foundation that supports the partnership and represents nearly 70 chocolate companies worldwide.

So far, however, only a small percentage of cocoa farmers participate in the field school, and Guyton says he’s anxious to explore the use of carbon credits to augment farmer income and industry sustainability. Credits could be generated through four types of transactions activities under the REDD banner or as afforestation/reforestation projects under the Kyoto Protocol’s Clean Development Mechanism – or in the voluntary carbon market.

Compensation for Limitation

REDD-wise, cocoa growers could be compensated for not encroaching on forest reserves or deforesting to extend their plantations. On farms, they could get credits for maintaining shade cover and not promoting full-sun exposure. As for reforestation, farmers would be rewarded for reverting from a full-sun system to shaded cocoa to planting trees and encouraging regeneration. They could also get credits for rehabilitating abandoned plantations and not letting them turn into low-productivity agricultural land or bush, which have low carbon-storage capacity.m

“It is a potential win-win situation for everyone,” says Richards. “It promotes biodiversity and environmental sustainability, would ensure supply sustainability for the big cocoa buyers, and it could improve the livelihoods of thousands of small farmers.”



Potential vs. Practice

Potential is one thing. Practice is another. "We're all convinced that this area has real potential," says Ken Norris, a researcher from the University of Reading and a scientist who has studied the relationship between carbon and cocoa-farming systems in Ghana. "The problem is there are a whole lot of practical issues to overcome to make it work." For instance, because verification of carbon offsets is expensive, CO₂ contracts typically apply to project areas that cover a minimum of 30,000-50,000 hectares. But the average cocoa farmer in Ghana is only 3-4 hectares of cocoa. Each contract, then, would require approximately 7,000-13,000 farmers to federate.

And carbon rights are not established in law yet – although many are going on the assumption that they will follow the timber rights outlined above, namely, that standing trees will fall under the jurisdiction of the Forestry Commission, while planted trees – and their largesse – will be owned by whoever plants them. "This is a major organizational democracy initiative about benefit-sharing," says Mason. "We're trying to work out the best way of doing it, perhaps through existing community groups or organizations."

Money

And, of course, there is the issue of funding. Norris estimated the project cost at US\$5.5 million. Cocoa carbon credits are not expected to flow for at least another two or three years – yet Mason says he is optimistic; he already has potential buyers. "The cocoa industry is prepared to buy our credits as soon as we're able to bring them to market," he says, adding that he's been working with the cocoa industry over the last three years – and his message is sinking in. "It's gone from ignorance and skepticism to the realization that a major shortage of cocoa beans is looming."

Winning Industry Support

Mason also asked the cocoa industry to chip in. He recently presented the initiative at the launch of a new not-for-profit organization called Source Trust. Set up by Armajaro, a leading cocoa supplier whose clients include Cadbury, Nestlé, and Kraft, amongst others, Source Trust certifies and promotes sustainable cocoa-farming practices in local communities.

It already raised US\$1 million to pay for education and water projects that promote sustainable farming, as well as bed nets that reduce malaria. Chocolate manufacturers pay Armajaro a premium of US\$30 per ton in exchange for a traceable and sustainable cocoa supply. "As an industry, our interest is to ensure that farmers have good yields over the long term, not just in the next couple of years," says Nicko Debenham, head of traceability and sustainability at Armajaro and a spokesperson for Source Trust.

Encouraging farmers to leave 40% shade cover on their farm would serve that purpose. Debenham says Source Trust will assess its stakeholders' interest in providing the US\$4 million Mason requested for the cocoa carbon initiative. The carbon pilot project could also piggyback on Source Trust's certification program as the administrative platform for carbon payments.



Outside the Box

It will take years before cocoa-industry stakeholders can answer the US\$2.2 billion question. But the final answer could transform not only the cocoa industry and carbon trading, but farming as we know it. "Instead of thinking about producing food to the detriment of the environment," Norris says, "we could produce food to preserve the environment." But, he says, he is concerned about what's been done to mitigate the crisis so far. "All the big manufacturers are competing against each other when this is a time for a major concerted effort."

The Ghana Cocoa Carbon Initiative and associated effort to establish a climate-smart agricultural finance mechanism for Ghana's cocoa sector could answer these concerns. The two initiatives have already received funding support from the Gordon and Betty Moore Foundation, the Rockefeller Foundation, and Norwegian Agency for Development Cooperation, Norad.

"Instead of thinking about producing food to the detriment of the environment," Norris says, "we could produce food to preserve the environment."



Forest Carbon Law in Ghana

Forest carbon projects are only as good as the legal system in which they reside. Even voluntary carbon projects can only be implemented in a system where tenure is clear and laws are enforced. Typically, however, tenure and uncertain legal context present significant stumbling blocks. A new report examines the state of REDD in Ghana's legal apparatus.

Africa is home to one of the world's largest forest basins and should, by all rights, be a hotbed of forest carbon activity, yet Ecosystem Marketplace's State of the Forest Carbon Markets report documented only a sliver of last year's record volume coming from Africa.¹⁰



Photo: Shutterstock

Several countries are working to fix that, and one of the most advanced is Ghana, which has been admitted to participate in the REDD+ Readiness Preparation processes of the World Bank's Forest Carbon Partnership Facility (FCPF) and has several affiliations with other forest governance initiatives that give it a head start as far as forest governance and REDD are concerned. It also just wrapped up a three-year effort to document and map all of its biomass (see "Ghana Measures Forests from Sky to Land") – an accomplishment that could support REDD readiness across the continent.

To truly take advantage of REDD, however, Ghana must shore up aspects of its legal and policy framework, and that means answering questions such as how forest carbon rights and benefits are allocated under the current regulatory framework. These issues are as essential to address as what future legal and policy changes are needed for REDD and REDD+ projects to be implemented and thrive.

A new report commissioned by the Katoomba Group and Forest Trends (publisher of Ecosystem Marketplace) and authored by Nigerian law firm The Rock and Partners, in collaboration with legal consultants in Ghana and the Nature Conservation Research Centre (NCRC),¹¹ attempts to untangle this complicated web of uncertainties about carbon rights and benefits as well as their implications in Ghana. It does so by closely examining not only the statutes on the books, but also by reading past judicial decisions on forest and natural resources issues – a necessity since Ghana is a common law country.

Who Owns the Carbon in the Trees?

Forest carbon rights in Ghana, as elsewhere, are complicated by the fact that no laws specifically apply to carbon captured in trees. So, to figure out what the laws are that regulate forest carbon, one has to draw inferences from related laws and norms related to land, forests, and natural resources, among others.

¹⁰ http://www.forest-trends.org/publication_details.php?publicationID=2963.

¹¹ http://www.forest-trends.org/publication_details.php?publicationID=2957.

But even this inquiry is far from straightforward in the case of Ghana. As far as land rights are concerned, the country has a dual system of land ownership and control, where some land is held collectively under customary law (which can take a number of forms), and other areas are publicly owned and regulated by statute. The overlap of statutory and customary law creates confusion and conflict in some areas, while at the same time leaving geographic and regulatory gaps.

Perverse Incentives

Legal requirements around ownership also create perverse incentives for deforestation. For example, in areas subject to customary law, unoccupied land is considered to belong to the nearest community. Unfortunately, to claim unoccupied forest, the community has to clear trees or cultivate the land. In addition, according to law, all naturally occurring trees belong to the state, which in turn can grant timber concessions to companies and private individuals. As a consequence, a landowner may be subject to having concession-holders come in to remove naturally occurring trees. And even though timber concessionaires are legally liable to landowners if they damage the land, crops, or other property, farmers have an incentive to illicitly remove naturally-occurring saplings to avoid this possibility.

To truly take advantage of REDD, however, Ghana must shore up aspects of its legal and policy framework, and that means answering questions such as how forest carbon rights and benefits are allocated under the current regulatory framework.

Getting rid of perverse incentives in the law is one priority area for legal and policy reform around REDD. Another key part of the puzzle is specifically addressing how forest carbon will be treated under the law. In theory, tradable credits for emissions reductions or removals can be created via activities that either (1) prevent carbon emissions that would have occurred via deforestation or forest degradation or (2) cause more carbon to be stored in soil or plant biomass, e.g., via improved forest management or tree-planting. Given the existing legal framework in Ghana, such credits might be treated in a number of ways.

Vegetable or Mineral?

Carbon might be seen as a natural resource, like minerals, ownership of which is vested in Ghana's government, in trust for the people. Under this interpretation, the people actually responsible for day-to-day land uses and land-use changes would have very limited access to REDD+ incentives, which would be controlled entirely by the state. It would be important for the state in such circumstances to provide for robust benefit-sharing with individual and community land managers to make sure their incentives align with REDD+ and benefits are shared equitably.

Alternatively, since in Ghana rights in trees are separate from rights in land, forest carbon benefits might be part of the rights that exist in trees. In this case, ownership would depend on where the trees are and whether they are planted or naturally-occurring. Generally speaking, carbon credits from all naturally occurring trees and planted trees in forest reserves would belong to the state. Carbon credits from planted trees outside of forest reserves would belong to the planter or owner of the land, as applicable. In general, this arrangement would limit direct participation in REDD+ to projects that involve reforestation, agroforestry, sustainable plantation management, and other REDD+ modalities that include tree-planting; it would largely exclude people from doing projects that are based on avoiding the loss or degradation of existing forests (generally, naturally occurring trees that belong to the state), which is at the heart of REDD+.



There is also the possibility that forest carbon credits might be considered to belong to the landowner on the reasoning that they are inherently tied to the land itself. This last scenario would be the most favorable one for REDD+ projects as it could provide key stakeholders – land users and managers – with direct economic incentives for preserving forests. However, it also is likely to face political difficulties as it does not necessarily include a major role for the government.

Forest carbon rights in Ghana, as elsewhere, are complicated by the fact that no laws specifically apply to carbon captured in trees.

And of course, there is the possibility that a wholly unique regulatory framework will be created, with consequences that are difficult to anticipate.

New Laws for a New Concept

In order for the government to maintain ultimate regulatory responsibility and at the same time for individuals and communities to be able to receive a major share of the incentives for forest conservation and restoration, collaborative approaches are needed. The 1994 Forest and Wildlife Policy Act is a good first step but provides only the framework without specific structures or processes for implementation.

One potential land-use arrangement that has been discussed as a possible model for expanded collaborative resource management and use on the ground is the model of Community Resource Management Areas, or CREMAs. A CREMA is a geographically defined area with “one or more communities that have agreed to manage resources in a sustainable manner” and where the government actually transfers management authority to communities or community-based organizations. On the plus side, CREMAs’ objectives are very much in sync with those of REDD+.

At this point, however, CREMAs are not legally recognized entities and therefore do not by themselves provide the legal certainty needed to support REDD+ projects. In order for this to happen, a CREMA must be organized into a different entity, such as a company or fiduciary trust, so that its members can sue and be sued, providing legal certainty and recourse for participants – and potential buyers – in a REDD+ project. However, there is a chance that new legislation, which is currently under consideration, will recognize CREMAs as legally independent entities, which would eliminate this problem.

All in all, this new report raises more questions than it provides answers – but in doing so, it paves the way, or rather points to ways that must be paved, for REDD+ projects to thrive in Ghana.



Incorporating Social and Biodiversity Goals into Carbon and REDD Projects

REDD talks have bogged down in Durban on the question of how to ensure that the people and species living in the forests don't get short shrift. It's an issue that voluntary markets have been dealing with for years, and this new tool can make the job easier.

Negotiators from around the world are working to develop a global mechanism for slowing climate change by saving endangered rainforests and capturing carbon in trees, but an old issue has once again brought talks to a halt. That issue is “safeguards”, or how to ensure that forests aren’t saved at the expense of the people living in them.

It's a sticky issue, and one that the Community, Carbon, and Biodiversity (CCB) Standards have been wrestling with in the voluntary carbon markets for years. More than 40 projects have already been validated under the standard, and CCB projects accounted for roughly 60% of all forest carbon projects tracked in Ecosystem Marketplace's report *State of the Forest Carbon Markets 2011: From Canopy to Currency*¹² – making them by far the leading standard for “non-carbon” values.



Photo: Michael Richards

From Theory to Practice

As with most standards, the CCB Standards look great on paper. The challenge is to implement them effectively. If projects don't use appropriate methods, such as credible social impact assessments, the Standards will not achieve their objectives. Therefore, four leading NGOs in this space – Forest Trends (publisher of Ecosystem Marketplace), the CCB Alliance (CCBA), Flora and Fauna International (FFI), and the Rainforest Alliance – came together to develop user-friendly guidance for project developers on how to conduct cost-effective social and biodiversity impact assessments (SBIA). The result of these efforts is the recently released *Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects* authored by Michael Richards (Forest Trends) and Steve Panfil (Conservation International, formerly with the CCBA).

“Previously, projects had to rely on an annex within the CCB standards which suggested various appropriate approaches,” said Jeff Hayward, the Climate Initiative Manager for the Rainforest Alliance, speaking at a global webinar that launched the manual and drew participants from 44 different countries. “Now, with the SBIA manual and tool kits, auditors and projects have more guidance as to what constitutes the necessary elements to a high-quality social or biodiversity method.”

¹² http://www.forest-trends.org/publication_details.php?publicationID=2963.

Key Challenges for Social Impact Assessment

The CCB Standards clearly mandate that social and biodiversity benefits, like carbon impacts, must be “additional” – meaning that the social benefits are due to the project rather than due to other factors. This means it’s critical to determine which results can be attributed to which activities – and this is also the hardest part of any impact assessment.

The traditional approach to attribution is to use the experimental or quasi-experimental method (also known as “matching methods”) involving comparisons between control and treatment (or project) communities or individuals. But this is too expensive for most forest carbon projects, as well as being problematic as regards finding good controls and on ethical grounds.

Another key challenge for SIA is the nature of social impacts. The social impacts of terrestrial carbon projects (or of any other projects) are, by their very nature, intangible and difficult to predict and measure because they are mainly felt over the longer term, and many of them are indirect. We also have a weak empirical basis for understanding the social impacts of carbon projects, partly due to the lack of credible monitoring in the past, but also due to the short history of terrestrial carbon projects. It is no wonder that there are so many contested viewpoints on the social impacts of forest carbon projects!

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The “Theory of Change” Approach

Following a research process which started in 2008, the conclusion was reached that the “theory of change” approach (or theory-based evaluation) is more cost-effective for terrestrial carbon projects. Such a process works by examining a project’s theory of how it will achieve its objectives based on a cause-and-effect analysis. It is incorporated into the project development process from the start and works by first establishing a sequence of events or project results that will lead to the desired objectives (or social impacts) and then looks for carefully-chosen indicators that will measure short- and mid-term outputs along that causal chain. If the projected outputs and outcomes are materializing, then developers can be confident that long-term objectives or impacts will be met. If they’re not, then it’s time for some re-evaluation.

In the SBIA process, this is achieved by holding multiple stakeholder workshops in which the participants are divided into groups to examine the priority social and biodiversity issues. Each group performs a problem-tree analysis of its “priority issue” – such as alleviating poverty, empowering women, promoting better local governance, developing sustainable agricultural livelihoods or protecting an endangered species – and then draws up a roadmap of how to achieve it.

This approach is also used by the micro-finance sector as a cost-effective approach to social impact assessment in light of the high cost of “matching methods”. The methodology developed for terrestrial carbon projects draws heavily on the “Open Standards for the Practice of Conservation” developed by the Conservation Measures Partnership (2007) and supported by the on-line Miradi software.



The NGO partners published a provisional manual in 2010, and this was subsequently peer-reviewed and field- tested on three REDD projects. Based on the case studies and peer reviews, a thoroughly revised and more user-friendly “Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects” was released in October 2011.

The Seven-Step Process

The manual divides the impact assessment process into seven steps, known as the SBIA stages, which meet the CCB requirements for a participatory design process. This serves not only to measure outputs, but to keep participants focused on outputs in ways that they might not otherwise be. “Through this process, projects are creating, at the onset, a systematic and defensible logic that’s going to articulate how net-positive impacts will be achieved over the life of the project,” says Hayward. “It allows the validator to question and probe the model, and the developer supports and substantiates the logic behind the model.”

The first SBIA stage brings in all participants and creates a focus on those outputs that the project can achieve without getting bogged down in areas that it can’t have much impact in. “There is no point in doing a detailed assessment of education levels in local communities if there is no expectation that the project is going to be able to change these,” said Steve Panfil of Conservation International, also at the launch webinar. “But if the project has targeted health, for example, through improvement of access to clean water, then obviously health conditions are going to need to be described in some detail in stage one.”

After establishing that focus and bringing in the key stakeholders, the process moves on to analyzing the negative and positive (for some stakeholders) outcomes of the business-as-usual approach, then laying out the causal chains of how the project can achieve its objectives, then evaluating what can go wrong with the project and aiming to minimize that, then identifying the most cost-effective indicators for the monitoring and evaluation process. “In practice, this is an iterative approach rather than a step-by-step approach,” says Panfil. “We find that we often go back and revise work done from earlier stage and apply adaptive management as we move along.”

Not Just for CCB

Although the SBIA Manual is mainly oriented to the CCB Standards, it can be used for other multiple-benefit standards and other types of PES projects. The benefits of the “theory of change” approach to SBIA go well beyond credible monitoring and include: strategic project design necessary for achieving social and biodiversity objectives; effective participation of project stakeholders; promotion of adaptive project management; and ease of understanding to a range of stakeholders. Forest Trends also believes the Manual has a high potential to be applied at national-level REDD+ as a tool for ex-ante impact assessment and adaptive program management, as well as for M&E (monitoring and evaluation).

Social Impact Assessment Training Courses in Africa

Much of the early action in promoting the SBIA approach has been in Africa. Of the four country or regional training courses to date, three have been in Africa: 1) in Tanzania in October 2010 organized jointly between the Tanzania Forest Conservation Group (TFCG), Care International, Forest Trends and CCBA; 2) in Kenya in August 2011 organized by the World Agroforestry Centre and Forest Trends, and; 3) in DRC in September 2011 organized by UNREDD and Forest Trends.

In each training course, roughly 20 participants – mainly project proponents, support NGOs and government staff – worked through six case study REDD+ projects: two projects in Tanzania, which were projects involving TFCG and Care International; two projects in Kenya/Uganda, which were projects of the Green Belt Movement (Kenya) and Jane Goodall Institute (Uganda); and two projects in DRC, which were projects supported by the National REDD Coordination office in coordination with WCS and WWF.

The TFCG REDD Project, Lindi District, Tanzania

The first full-scale application of this approach in the world has been with the project “Making REDD work for communities and forests in Tanzania” implemented by TFCG in conjunction with Tanzanian Community Forest Conservation Network (MJUMITA). This project emphasizes direct and equitable incentives to rural communities to conserve and manage their forests, including through strengthened local governance, land-use plans, sustainable agriculture, developing a carbon-trading cooperative to aggregate and market the carbon, and community development plans.

The work was undertaken over a four month period in early 2011 by TFCG staff who had attended the SBIA training course, with support facilitation by Dr. Tuyeni Mwampamba, an SIA specialist from Tanzania who also co-facilitated the Tanzania and Kenya training courses.

Social impact assessment (SIA) workshops were undertaken at the village- and landscape-scales. At the village scale, TFCG staff held three-day workshops in 13 villages with representatives from all sub-villages with a focus on the early stages; at the landscape scale, a four-day “landscape stakeholder workshop” was held. In all, there were 375 participants in the village workshops and 65 in the landscape workshop. The aim of the landscape-level workshop was to validate and consolidate the information generated by the village workshops and to arrive at a set of road maps or “results chains” for each of the priority social impacts. These workshops were complemented by in-depth stakeholder analysis in five representative villages in conjunction with an analysis of deforestation drivers and by focus group discussions with women and other stakeholder groups, which were conducted by an independent consultant.

This process resulted in the identification of eight priority social issues for the REDD project; a “problem flow diagram” of each social issue; a theory of change for each issue of how the project stakeholders think that key social outcomes can be achieved; an analysis of risks and potential negative impacts, and how to mitigate them; and a community development plan outlining the social changes that the communities expect the project to bring about directly or indirectly.

Due to these workshops and follow-up work this REDD project now has a clear strategy for achieving its social objectives and reducing the social risks; a credible monitoring plan which meets the CCB Standards (this was put together by Dr Mwampamba based on data from the workshops); good community buy-in to this plan as a result of the highly participatory process; and a strong basis for adaptive management. TFCG deserves great credit for investing in a “state-of-the-art” SIA exercise which will prove to be a vital learning experience for other REDD+ projects in Africa.

Application in the Kasigau Corridor

For Mike Korchinsky, REDD is as much about people as it is about trees – perhaps even more so. His company, Wildlife Works, is behind the Kasigau Corridor REDD Project – Kenya’s first REDD



project covering 500,000 acres of territory and involving more than 3000 individual stakeholders. “The people who live in and around the forest will make or break your REDD project,” he says. “They need work, and wildlife provides that work.”

With that in mind, he's following in the footsteps of TFCG. In October, 2011, the Kasigau Corridor REDD project in Kenya held a multiple stakeholder SIA workshop, shortly after their social and biodiversity monitoring officer, Mwangi Githiru, attended a Forest Trends SIA training workshop. The Kasigau SIA workshop, attended by 35 (mainly local) stakeholders developed “problem flow diagrams” and theory of change “results chains” for five priority issues (governance, poverty, human-wildlife conflicts, environmental degradation, and education) outlining how the project hopes to overcome these problems – and thereby achieve its objectives. A future workshop will assess the key risks and negative impacts and develop the indicators and monitoring plan.

These two African field experiences with the SBIA methodology have not been without their challenges, but they have allowed these two REDD projects to move forward in terms of both their monitoring plans (and meeting the CCB Standards) and in terms of strengthening the social sustainability of their projects in realization that carbon and social sustainability are inextricably linked. As pointed out by Jane Dunlop, who works as a community development advisor to FFI on its REDD projects in Indonesia: “REDD+ will not work unless community and social aspects are properly addressed. In other words, community aspects of project design are not optional, but are crucial to project success.”

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Beatrice Ahimbisibwe's Trees for Tots

When geography teacher Beatrice Ahimbisibwe and a handful of Ugandan farmers started planting trees to earn carbon credits in 2003, their neighbors thought they were crazy. Many of those neighbors have since joined her as the handful grew to more than 300 participating in a sophisticated income-sharing arrangement that can serve as a model for similar communities around the world.

Beatrice Ahimbisibwe spent much of April 2011 registering students at a new primary school in Bitereko, Uganda. This may not seem like much—but it wouldn't have been possible if she and four other Ugandan farmers hadn't started planting trees nearly a decade ago to earn carbon credits under an arrangement spearheaded by local NGO Ecotrust.

When they cut the deal back in 2003, she and her small group were outliers. Most people in the sub-county of Bitereko doubted that this new arrangement would work, and many feared they would lose their land to the carbon credit buyers. But Ahimbisibwe – a geography teacher – saw an opportunity to earn extra money by providing a needed ecosystem service, and she jumped in with both feet.



Photo: Rebecca Anzueto

In a poor rural area with unpaved roads and no electricity, it is easy to understand how one would be doubtful of these new initiatives. But Ahimbisibwe says that through her education and profession she both learned and taught about issues like pollution and climate change, and she believed that planting trees could bring a real benefit – even if she had to wait for many years to sell the timber.

Investing in the Community

When Ecosystem Marketplace first visited her in 2005, Ahimbisibwe had just begun reforesting a one-hectare plot using native species which she hoped would sequester 62 tons of carbon over 10 years. She sold these original credits for \$8/ton, to be paid out in installments over the ten-year period, at the end of which she will have earned \$452. (Some of the credits are deducted for a buffer to protect against any unforeseen damages.) Since then, she has planted an additional 2.5 hectare plot, which will generate 145 tons of carbon sequestration benefits.

Ahimbisibwe used the first payments to construct the new primary school in her neighborhood, purchase furniture for her current home, and begin construction on a new home. In addition to these direct benefits, she has travelled locally and internationally, learned about different tree species and has served as a host to researchers interested in learning more about the project, become skilled at using a computer and has taken a strong leadership role in her community. She is also able to share the substantial technical knowledge she has gained over time with other group members and farmers.

Kato Eriasaf, another founding member, created an agroforestry system on his property which incorporates shade-grown coffee under his carbon-sequestering trees and, on a separate plot, he introduced a few cows once the trees grew big enough that they would not be damaged by the livestock. Kato has used the majority of the money earned thus far for the upkeep of his plots as well as for school fees for his children. Seeing the success of the pioneers has encouraged many more people to join the Bitereko Carbon Community (BCC) to begin planting trees for carbon benefits. In fact, now 316 individuals, 3 secondary schools, 1 primary school, and 1 church are all involved in reforestation activities.

Leading the Next Generation

Ahimbisibwe still teaches geography—but now she also teaches about trees. At the Nkinga Vocational Secondary School, each of her teenage students is given charge of three trees, which they plant and then care for throughout the school year. The hope is to plant over 1,000 trees in the schoolyard that will provide shade for students and teach them to be responsible and care for the environment. The school has already received its first payment, which helps to defray the tuition costs and purchase materials for students.

“Climate change is already affecting Mitooma District,” says headmaster Marsiale Tumwebaze. “Rains are falling at different times and we need to take actions to help combat these changes.” This awareness has helped spread the program beyond the school and into the surrounding community. Tumwebaze has begun planting trees on his personal property and hopes to receive his first payment this year and at least three students have convinced their parents to join the carbon sequestration program with Ecotrust.

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At Kigarama Mixed Secondary School, Headteacher Alfred Matovu hopes to encourage environmental responsibility amongst his students. The patriotic club has volunteered to care for the trees planted behind the school and spends afternoons watering the saplings and clearing weeds from the area. The students themselves are excited to teach visitors about their trees and how they care for them; and they are also learning about the different species they have planted—some which will bear fruit for a sweet snack.

Community Carbon Fund

The carbon farmers in the Bitereko Carbon Community and other communities involved in Ecotrust projects do something very unique with their carbon profits: they share them. In all carbon projects, for example, a certain percentage of credits – depending on the risk associated with delivering carbon credits – are set aside as a buffer to protect against the loss of these credits due to fire or strong winds. These credits cannot be sold in the market at the beginning of a project; however, if they are not used and the risk decreases, they could potentially be sold throughout the project’s lifetime. In the case of Ahimbisibwe and other farmers in the Bitereko Carbon Community, 10% of the carbon credits generated are set aside for this purpose.

In addition, Ecotrust collects a supplementary 10% from the credits that are sold by each individual and pools the money into a Community Carbon Fund. (Ten percent of Ahimbisibwe’s carbon money is added to 10% from Kato and 10% from the Vocational School to create a larger



pool of resources.) Once this fund reaches a certain level, the monies are transferred back to the community carbon group.

This money can be used in several ways. First, it can be used to assist in the management of natural hazards that lead to carbon loss. This includes protecting trees from fire, buying new saplings to replace those eaten by a wayward goat, or capacity building in the case of an epidemic, for example. In Bitereko, the community has chosen to use the funds as a small rotating loan. If a member needs cash to pay school fees, for instance, they can borrow money from the Bitereko Community Carbon Fund at a low interest rate and repay the loan as soon as they are able—making the money available for another family. Additionally, members can choose to use the money to support projects that will benefit the greater community such as watershed management, sanitation, soil conservation or establishing an apiary.

All of these actions help the project's standings within the Plan Vivo standard. The Plan Vivo standard (www.planvivo.org) focuses on community empowerment and poverty reduction within payment for ecosystem service projects. By ensuring community rewards and ecological integrity, the project provides additional guarantees of carbon sequestration benefits to be delivered.

Providing an Example

Ahimbisibwe and other early adopters are leading the way for other carbon farmers in Bitereko. When we spoke with Kato, his young grandson was by his side, proud of the work his grandfather was doing. The students at the schools participating in the project already understand the benefits that trees can provide for them and therefore have a greater respect for nature and our planet.

Ahimbisibwe presented the work that she has been doing at the Training for Community Stakeholders on Payment for Ecosystem Services event in Hoima, Uganda, delivered by Forest Trend's Communities and Markets Program and the Katoomba Group, with such dignity and delight that all of the other participants began to see how these complex payment schemes can bring tangible benefits to their lives.

Forest Trends' Communities and Markets Program has run several similar trainings for community leaders globally. In each case, when a community leader stands up to speak about his or her experience with a PES project – whether Ahimbisibwe, or Almir Surui – participants seem to become more excited and interested when one of their peers is able to present a real case and bring these concepts “down to earth.” With this in mind, the Communities and Markets Program is beginning to form a network of community leaders interested in PES (focusing on Latin America initially) to share experiences and lessons learned from projects and policy initiatives.

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Moving Forward

Experiences such as that of Ahimbisibwe can provide insight for how small landholders and local communities can be included in climate change mitigation strategies. The landscape of Bitereko



has already changed significantly in the past 8 years, along with the attitude of the new generation. The students are excited about protecting the natural resources in their community. Many times rural and indigenous communities are the first to feel the impacts of climate change, but at the same time, they are largely excluded from any decision-making processes. As the international community works towards designing new agreements and mechanisms, lessons learned from existing experiences should be incorporated to maximize benefits for all of those involved.



Ugandan Tribe Struggles to Maintain Forests and Access Benefits

Indigenous people like Uganda's Bunyoro-Kitara tend to take good care of their land—and to lose big when someone else finds natural resources on it. Payments for ecosystem services (PES) offer a way to profit from good stewardship, but only if governments keep things clean. Unfortunately, that's not always the case.

Yolamu Nsamba knows firsthand the pitfalls of working with local governments and government-sanctioned groups to preserve the forested jungles his tribe has treasured and lived in for centuries. “The areas which were previously very well-conserved by the traditional authorities are now totally cut down under the very noses of the (non-indigenous) development council leaders,” he says. “And nobody is doing anything about it.”



Photo: Shutterstock

Nsamba is Secretary to the King of the Bunyoro-Kitara Kingdom, an ancient tribal group in Western Uganda whose presence and influence dates back to the Bronze Age. He was speaking after attending a training course on payments for ecosystem services for local leaders in Hoima, Uganda in early April sponsored by environmental non-profit Forest Trends (publisher of Ecosystem Marketplace).

Nsamba and his fellow tribesmen aren't the only ones worried about poor governance. It is also a concern for international investors and proponents of Payments for Ecosystem Services, which rely on good governance to make sure the right people are being rewarded. In some cases, however, the local and national government leaders with whom PES investors negotiate are more willing to take investor dollars than demonstrate real commitment to conservation. Many local council leaders have been accused of receiving conservation cash while simultaneously allowing loggers to deplete forest reserves. “People are elected into office in local government; they see it as a power source,” Nsamba says. “And they are out in the forest—logging.”

The Global Battle for Indigenous Rights

The concern over how to preserve forests and who to pay comes up often in nations where forest credits are generated. From Uganda to Peru and Brazil, land-tenure rights for indigenous groups are a central issue in the establishment of environmental markets and schemes. Indigenous groups mindful of both the potential and risks of PES are beginning to take a stand.

In Peru, for example, a group of indigenous tribes published a collective statement saying they would reject REDD and carbon markets without defined territory, property rights, and autonomy on indigenous lands. Other indigenous groups in neighboring Brazil, however, embraced PES projects after a landmark study by international law firm Baker and Mackenzie found that indigenous tribes do own carbon rights in Brazil. Recent regional legislation in Acre, Brazil, even provides incentives for “traditional knowledge” as an ecosystem service. These are three positive

indicators that international policy makers, legal experts, and communities alike agree on the importance of local land tenure to the success of PES.

The Legacy of Idi Amin

In Uganda, indigenous groups have limited land-tenure rights. Idi Amin, exacerbating a century-long scraping away of tribal powers, seized these rights from the Bunyoro-Kitara Kingdom and other indigenous tribes during his dictatorship in the 1970s. He left tribes with only symbolic and cultural ownership. “We had governments, civil society institutions, decision-making structures,” Nsamba said, shaking his head. The Bunyoro were previously charged with managing the forest reserves they occupied. “Now the law says we are cultural leaders,” while governments have been given the power to oversee native forests.

Although this particular experience is unique to the Bunyoro, Nsamba’s testimony offers a lucid illustration of an increasingly recognized global truth about forest governance. Traditional inhabitants, not governments, are often the most effective stewards to ensure conservation of future forest resources. But recognizing this is only half the battle. Without legal property rights, historical conservationists such as the Bunyoro-Kitara Kingdom are limited in their ability to engage in or benefit from conservation activities—including PES.

The Bunyoro-Kitara: A History of Conservation

The Bunyoro-Kitara Kingdom has a rich yet painful history. Considered one of the most powerful indigenous Kingdoms in Africa from the sixteenth to the 19th centuries, it has a land mass of 3,241 square miles, roughly one and a half times the size of the U.S. state of Delaware.

For hundreds of years, the Bunyoro-Kitara Kingdom conserved forest reserves in the Budongo and Bugoma areas of Western Uganda. But when legislative changes put the reserves in full possession of local governments, the Bunyoro watched an unfortunate pattern of neglect and exploitation degrade the very forests they once protected. Instead of standing idle, representatives of the tribe have begun exploring opportunities such as PES to restore their ancestral home.

When colonists occupied Bunyoro land in the late 1800s and early 1900s, the Bunyoro-Kitara Kingdom’s capacity to protect its forests began to erode. Historical records document that foreign influence was resisted with steadfast resolve. But unfamiliar European disease such as syphilis and sleeping sickness left the Bunyoro unable to thwart military and political takeover. Infant mortality rates soared so high that children were even given names to express it. The Father of King Solomon Iguru the 1st himself was called Gafabusa, or “we are waiting for death.” The tribe was displaced, moving from their longtime home in the Budongo forest reserves to the Northern Nile Valley. When the epidemic ended, the colonial governor denied the Bunyoro re-admission to their lands.

In 1914, a new law converted the Budongo forest reserves in the Bunyoro-Kitara Kingdom into “conservation areas.” The tribe worked to cooperate with the colonial administration and local government to develop the nature reserves on Bunyoro land. Legislative changes, however, put the reserves in full possession of local governments in the 1960s, where they remained throughout the duration of the Idi Amin dictatorship. The Kingdom was removed from the Budongo and Bugoma forests in 1967, signaling a simultaneous abandonment and deterioration of the reserves.



Forests, once teeming with life, have been hacked away by loggers. Elephants and chimpanzees that once had plenty of room to roam now pillage crops and compete with humans for land and food. Local governments “were not effective in doing conservation work,” Nsamba said, adding that they do not see the value of the forests for their ecosystem services.

And despite over 15 years of consensus on the crucial conservation role played by indigenous people, the issue of tribal property rights remains a source of confusion and conflict. As a result, in rural forested areas like those occupied by the Bunyoro-Kitara Kingdom, communities often have little to no access to payments for ecosystem services (PES) schemes such as reduced emissions from deforestation and forest degradation (REDD).

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2011: Year of Opportunity?

Today, indigenous peoples and local communities hold defined land tenure rights in only about 2% of forests throughout Africa. Nsamba’s historical account has resonance with indigenous communities there and across the globe. It brings home recent worldwide discussions about forest governance and the effectiveness of communities rather than governments in conserving forest resources.

In Uganda, for example, the conservation community noted for decades the influence of land tenure on forest health. As early as 1992, Abwoli Y. Banana and William Gombya-Ssembajjwe pointed out in *People and Forests, Communities, Institutions and Governance* that “the recognition of indigenous rights to forest-resources management leads to successful management practices.”

Andy White, Coordinator of the Rights and Resources Initiative (RRI), a global coalition to advance forest tenure, policy, and market reforms and in which Forest Trends is a leading partner, reiterated this observation. In his recent article, “Cash Alone Will Not Slow Forest Carbon Emissions,” published in *Nature*, he highlights a range of new studies by RRI and other partners. These studies show “that governments, not local people, are the primary drivers of global deforestation.” He added that “where indigenous peoples and forest communities have their rights recognized, they are far better forest stewards than are governments.”

The RRI analysis also identifies major opportunities for advancing local land rights and livelihoods in 2011. “We need to be doing a better job of taking advantage of these growing opportunities to benefit local people,” said White. “The year 2011 will undoubtedly present threats and potential rollback of rights, but there is tremendous opportunity for progress if we can seize it.”

Communities and Markets – A Long Way to Go

The Communities and Markets Program of Forest Trends is working to meet this challenge head on, says program director Beto Borges. Through partnerships, the program facilitates, identifies, and leverages opportunities for local and indigenous groups to gain from PES mechanisms and markets, where appropriate.

The work concentrates on ensuring that communities and rural residents have sufficient information on PES to become aware of their rights and make informed decisions. This is accomplished through training workshops, policy advice, legal analysis of land tenure regimes, and project development support.

Nsamba, for example, met with Forest Trends officials during the Training Community Stakeholders on Payment for Ecosystem Services event in Uganda. Through the Katoomba Group and its Communities and Markets Program, Forest Trends collaborated with the Chimpanzee Sanctuary and Wildlife Conservation Trust to engage with a group of 40 community leaders in Western Uganda. The event provided these leaders with the background and techniques needed to help educate and prepare their communities about opportunities and risks in engaging in PES. The Ugandan National Environment Management Authority, United Nations Environment Program, Global Environment Facility and the United States Agency for International Development helped sponsor this event.

The training course, Nsamba said was “a big eye opener, it shows the possibilities.” “Clearly”, he added, “payments for ecosystem services provide financial and conservation opportunities for my tribal Kingdom.” But he understands his country’s land tenure system and access to benefits remains a major challenge. To address this, Borges says his program and the Katoomba Group designed activities to support community involvement, create new policy contexts, and enable and prioritize local participation in forest conservation through access to land tenure and PES information.

Specifically, Forest Trends is working on strengthening information- and capacity-sharing between local communities, project developers, and governments. It is offering a “South-to-South” collaboration to connect policy developers across Latin America and Africa so that they can share experiences in designing and implementing PES frameworks that involve and benefit communities. Forest Trends also added a “Peer-to-Peer” network that brings community leaders in Africa and Latin America together online and in person. They share lessons learned from engaging in PES’s projects and discuss policies aimed at conservation of their natural resources and improved livelihoods. Forest Trends provides capacity-building training courses on PES to local communities and other audiences. It offers technical assistance to regional governments in Latin America and Africa to help increase benefit sharing in PES projects and policies.

“The effective engagement and participation of local communities in PES schemes, such as REDD+ actions to mitigate climate change, is recognized by the UNFCCC Convention and has gained significant momentum during the COP16 in Cancun,” Borges said. “However, based on Nsamba’s on-the-ground account and recent discourse, we have a long way to go before land tenure is no longer a prohibitive factor in PES and REDD+.”

Traditional inhabitants, not governments, are often the most effective stewards of conservation. But without land tenure they are unable to capitalize on this ability. Unless governments find a way to grant titles to historical conservationists such as the Bunyoro, these governments could soon find themselves without forests to protect. As Nsamba puts it: “Our livelihood depends on it.”



Can Namibia Find the Balance of Developing Its Mineral Resources Sustainably and Protect Its Biodiversity for the Future?

Humans have been leaving their mark on the Namib Desert for millennia, but only in recent times has the potential for major disruption of these arid ecosystems through unchecked economic development become significant. Now, the Ministry for Environment and Tourism's Strengthening the Protected Areas Network Project has commissioned a Landscape-Level Assessment for the Central Namib to help make sound decisions on economic development while retaining the desert's special character and people's livelihoods.

Namibia's ancient Namib Desert has been shaped by fierce sun and wind, and is characterized by an extensive "sand sea" with exceptionally high dunes, glaring gravel plains, and moon landscapes. The desert's demanding ecological conditions have led to some peculiar and highly specialized fauna and flora—such as the large and diverse lichen fields flourishing near the coast due to regular fog events, the isolated communities of iconic *Welwitschia mirabilis* (strange cone-bearing plants that can live for hundreds of years and whose ancestors are believed to have been abundant during the Jurassic), and an intriguing diversity of tenebrionid beetles (more than 170 species), some with special physical and behavioral fog-harvesting adaptations that have even inspired the research and development of novel moisture-collecting materials in distant laboratories.¹³

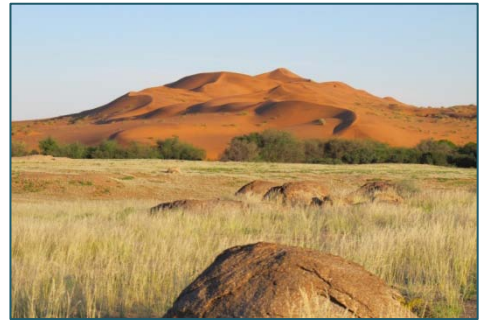


Photo: Amrei von Haase

Rock paintings and archaeological evidence from different periods in history indicate that humans have been present in this region for several hundred thousands of years, but never have they impacted the environment as they are now as first diamonds and then uranium were discovered across the country.¹⁴

The Uranium Rush and the Diamond Drive

Diamond mining began in the Southern Namib in the early 1900s and soon spread off-shore. The country is also rich in mineral resources, including deposits of copper, zinc, gold, and uranium. The "Uranium Rush", which peaked around five years ago and is centered on the fragile Central Namib, saw a surge in demand for large numbers of exploration and mining licences near and even inside the Namib Naukluft National Park, one of the country's flagship protected areas.

¹³ <http://www.physorg.com/news68824436.html>.

¹⁴ <http://www.nerc.ac.uk/publications/planetearth/2010/autumn/aut10-ancestors.pdf>; <http://cup.columbia.edu/book/978-0-231-70194-5/a-history-of-namibia>.

The Government faced a dilemma: one of its main concerns is building a stronger economy to tackle persistently high levels of unemployment and poverty, so it wants to see these various resources developed as a priority, albeit within the framework of sustainable development.¹⁵

The Moratorium

These areas where mining is concentrated provide one of the cornerstones of the tourism industry, which is rapidly growing to become a significant contributor to the national Gross Domestic Product. Indeed, to conserve its rich natural and historical heritage and to contribute to meeting its commitments under the Convention for Biological Diversity, Namibia has established an excellent system of statutory Protected Areas. When counting community-managed conservancies, which may well offer the potential for future Payments for Ecosystem Services schemes and for the delivery of biodiversity offsets or compensation, this means that around 40% of the total land surface is under some form of protection.

But mining is the mainstay of the economy, and the government's position was not an easy one. In the end, in response to the "Uranium Rush" the government commissioned a Strategic Environmental Assessment (the Uranium-SEA) for the Central Namib and placed a temporary moratorium on the issuing of new licenses until the SEA was complete. The principal aim was to assess the likely direct, indirect, and especially the cumulative impacts of a range of uranium mining scenarios on the receiving environment and then to provide recommendations and actions in a Strategic Environmental Management Plan to inform decision-making and to help avoid and/or limit negative impacts on people and the natural environment. Initiated by the Chamber of Mines and then officially commissioned by the Ministry for Mines and Energy (MME), the U-SEA was – by all accounts – the first SEA in the world to be conducted for a mineral province.

Rock paintings and archaeological evidence from different periods in history indicate that humans have been present in this region for several hundred thousands of years, but never have they impacted the environment as they are now as first diamonds and then uranium were discovered across the country.

Are Offsets Part of the Answer?

The situation in the Central Namib has raised important questions: How can the goals of biodiversity conservation, social well-being and economic development (e.g., mining development, associated infrastructure) be aligned, and is it possible to strike a balance? These were some of the central themes explored in a national workshop in July 2010 on responsible development that took place in the context of the mitigation hierarchy and biodiversity offsets¹⁶ and was supported by sound landscape-level planning. The Business and Biodiversity Offsets Programme (BBOP of Forest Trends) together with Fauna and Flora International (FFI) organized and shared their collective experience with participants of the workshop, which was hosted by the Ministry for Environment and Tourism (MET).

¹⁵ <http://www.npc.gov.na/vision/vision2030.html>.

¹⁶ Responsible development in the context of the mitigation hierarchy means first to avoid, then minimize likely negative impacts on biodiversity and then to restore any remaining damage so as to render land available for future generations. Where residual impacts are likely to remain after avoidance, minimization, and restoration, a biodiversity offset can be designed and implemented to achieve a no-net biodiversity loss outcome (provided impacts can be offset). This will involve conservation activities (e.g., restoration and/or protecting threatened biodiversity) that achieve gains commensurate with the losses incurred.



In her opening speech, Minister of Environment and Tourism Netumbo Nandi Ndaithwah emphasized the timely nature of the debate, referring specifically to the potential for integrating promising developments in the uranium mining sector with mechanisms such as biodiversity offsets, in the context of the mitigation hierarchy, to ensure ecologically sustainable outcomes that take care of the natural ecosystems.

Putting It Together

When interpreted together with a strategic assessment previously undertaken for the Namibian coastline,¹⁷ the Uranium-SEA helps to put the proposed developments in the Central Namib into perspective. The outputs highlight some of the social, economic, and environmental costs and benefits associated with the mining developments—and with different scenarios that might be expected. The products also lay out risks and offer recommendations for mitigating these risks, including the need for further studies. This kind of information is critical for further sound planning and decision-making, although it is important to recognize that it is most effective at an early stage in any development so as to enable strategic decisions.

A key issue raised in the Uranium-SEA as being in need of further investigation was the use of water in the arid region and particularly the risk of unmonitored groundwater abstraction for uranium mining. A detailed study by the German Federal Institute for Geosciences and Natural Resources (BGR) and the Geological Survey of Namibia has now produced the first groundwater model for the Central Namib. This confirms experts' concern around potential groundwater depletion due to increased use for mining in the region and the recommendation that alternative water sources (e.g., desalination plants) be used.¹⁸

How can the goals of biodiversity conservation, social well-being and economic development (e.g., mining development, associated infrastructure) be aligned, and is it possible to strike a balance?

The Landscape-Level Assessment (LLA)

Biodiversity considerations were included in the Uranium-SEA primarily through an expert mapping process that identified preliminary areas of high biodiversity value. However, to validate and refine these areas and to provide a spatial decision-support tool, a Landscape-level Assessment (LLA) was commissioned by the Ministry of Environment and Tourism in the latter half of 2011. BBOP is collaborating in this FFI-led project along with several partners, including the Gobabeb Research and Training Centre, EnviroMEND, Anchor Environmental, and Hamburg University. The project's approach follows systematic conservation planning principles, and the team is currently using field data and consultations with specialists to classify and map biodiversity patterns (species, ecosystems) and key ecological and evolutionary processes across the Central Namib landscape.

This is a challenge given the many different facets of biodiversity characterizing parts of the region. Large mammals (Hartmann's Zebra, springbok and other antelope, desert elephants, even lions) visit the area—some stick to the dry river corridors while others opportunistically use patchy grass resources on the plains; flamingos and other migratory birds form massive, globally

¹⁷ For more information, see the Ministry of Environment and Tourism's Namibian Coast Conservation and Management Project (NACOMA, <http://www.nacoma.org.na/>) and the MIME's SEA of the Central Namib (<http://www.saiea.com/uranium/>).

¹⁸ <http://www.wise-uranium.org/upna.html#WATER>.



significant seasonal congregations in coastal salt pans and lagoons; Cape fur seals get together in large breeding colonies that are linked with the inland desert through corridors of nutrient transfer. The Namib is also a scorpion and reptile enthusiast's paradise. Endemism is high, especially amongst the invertebrates, and new species keep being identified. Just recently, another new species of gecko was discovered.¹⁹

What Will the LLA Accomplish?

The aim of the LLA is to establish the conservation status and significance of the different biodiversity features that characterize the Central Namib and which are important for the integrity of the natural landscape. As it is impossible to identify and map every facet of biodiversity though, surrogate features are used to represent biodiversity more broadly. For example, vegetation types, as based on the state-of-the-art vegetation map that the LLA team is currently producing, can serve as good surrogates. The LLA will assess the vulnerability of these biodiversity features to a range of different mining-related development scenarios, and it will examine spatial options for different conservation outcomes, highlighting critical biodiversity areas, ecological support areas, and the potential for appropriate biodiversity offsets. In this, the LLA team is not working in isolation but together with many stakeholders, individuals, and organizations in Namibia and elsewhere, who are contributing valuable data and expert advice.

In turn, the project endeavors to contribute meaningfully towards developing institutional, technical and resource capacities for utilizing the final outputs expected in April 2012. Training and capacity building has already been started as part of the ongoing LLA project. This is envisaged to continue once the products are available for use by the various Namibian Ministries (e.g., MET, MME, Lands and Resettlement), the Erongo Regional Government, municipalities, the mining and tourism industries, and the communal sector through NACSO (the Namibian Association of Community Based Natural Resource Management Support Organizations).

The intention of the LLA is to develop a sound information base in order to support integrated land-use planning and decision-making and sustainable development in the Central Namib. Yet, decision-support tools are only part of what is needed to achieve this. And judging by the active national debate and the high level of collaboration amongst different players in the country (e.g., at the recent "Mining in Protected Areas" Conference) most stakeholders and decision-makers seem to recognize this. While information and outputs from planning processes such as the LLA can certainly help align important project development with the unique natural desert systems and people's livelihood needs, the ultimate choices and decisions that need to underlie such a balance remain in the hands of Namibian society.

¹⁹ www.nacoma.org.na/Downloading/Toktok_Talkie_No16.pdf.



Uganda Tests Ability of PES to Deliver Benefits for Biodiversity

Most Ugandans still live directly off the land, but not always in a sustainable way. Many believe that Payments for Ecosystem Services can help promote good land stewardship, and now a major experiment is testing that hypothesis by using a randomized evaluation methodology piloting 140 villages with about 1,400 households. The study divides the farmers into two groups. Each group is being trained in sustainable land use, but only one is getting payments.

Kwamya Julius Nyakoojo has been farming cocoa in Uganda's Hoima District his entire life, but his farm's yields aren't what they used to be and neither are the prices he receives for the newly-harvested beans. So, a few years back, he began clearing native forest to plant more cocoa trees. That didn't sit well with the chimpanzees of the surrounding forest. They ended up devouring the fruits of his labor.

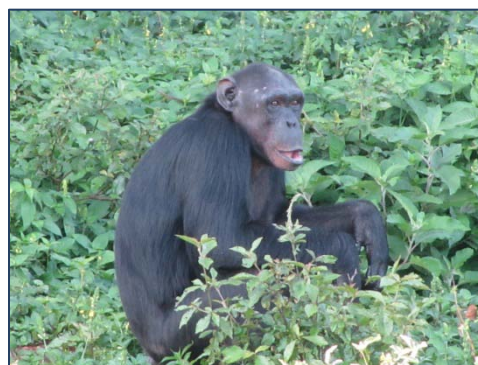


Photo: Rebecca Anzueto

It's a common theme in Uganda, where lush valleys, blue lakes, and stunning mountain vistas deliver ecosystem services that directly support more than 90% of the country's people and provide a home to more species of primates than any other country on earth. But as cash-strapped farmers like Kwamya ratchet up production, they are coming into conflict with the living ecosystems that support them and the animals living there.

In Uganda, Kwamya's actions matter, because a whopping 70% of forests are in the hands of private landowners and rural communities, and half of these have been degraded, with 86,000 hectares per year being lost to deforestation. Rural communities are among the key drivers of this degradation, because they harvest forests for building materials, medicine, charcoal, firewood and farming. If this continues, many of the species which Uganda is famous for – including the chimpanzees – may become extinct in the near future.

That's why farmers like Kwamya and other farmers have joined in a massive experiment that goes by an equally massive title: "Developing an Experimental Methodology for Testing the Effectiveness of Payment for Ecosystem Services to Enhance Conservation in Productive Landscapes in Uganda."²⁰ Focusing on the Kibaale and Hoima districts of Western Uganda, this experiment aims to test the ability of Payments for Ecosystem Services (PES) to enhance the conservation of Ugandan biodiversity, specifically targeting productive landscapes. Coupled with intensive training in sustainable land-use and PES, residents of these communities are divided into two groups: one that receives payments for avoided deforestation, reforestation, adjusted agricultural activities, forest monitoring, and watershed protection (the "test" group), and one that does not (the "control" group).

²⁰ More information about this event can be found here: <http://www.forest-trends.org/event.php?id=543>.

Project developers have already used standard modeling procedures to establish baselines in Kibaale and Hoima and formulated two projections: one to predict what will happen with PES, and one to predict what will happen without it. When the pilot ends in April, 2014, the Chimpanzee Sanctuary and Wildlife Conservation Trust (CSWCT) will compare the predictions to the reality. If the results are positive, this hard data will be used to convince private sector investors that PES works.

The Coordinated Response

The four-year pilot project was developed jointly by a rare confluence of actors from government, civil society, the private and nonprofit sectors, and global multilateral organizations – including the Ugandan National Environment Management Authority (NEMA), the CSWCT, the United Nations Environment Program's Global Environment Facility (UNEP-GEF), and others – each of which had its own goals and objectives.

Specifically, NEMA was looking to increase conservation efforts on private land, while CSWCT was looking to address deforestation threats in areas of declining chimpanzees' habitat, while UNEP-GEF was looking to test whether PES mechanisms truly deliver measurable biodiversity and livelihood benefits. NEMA is the project proponent, CSWCT the local contractor, and communities the providers of ecosystem services. UNEP-GEF is funding most of the project activities with additional co-financing from Darwin Initiative through IIED (International Institute for Environment and Development) which is also supporting the scheme's design process.

The Grand Vision

The project will run from April, 2010, to April, 2014 and has goals on three levels. At the local level, it aims to implement a successful PES project. At the regional level, it aims to build lasting capacity for PES design and implementation in Uganda. Finally, at the global level, it aims to deliver scientific data to inform policy and future project development.

The Test

Working with international scientists from Stanford University in the US, the World Bank and Innovations for Poverty Action (IPA), the project will measure impacts of PES in a sample size of eight sub-counties of Hoima and Kibaale including 1,400 villages. In half of the villages, residents are eligible for payments (treatment group), the others not (control group). Every village will receive capacity building on PES, exposure to forest cover change and climate issues, forest management interventions, and sustainable forest use options. With all of the villages receiving basic capacity building and sensitization, the project can more accurately isolate and measure the impacts of PES on biodiversity and livelihoods.

After capacity building and sensitization, residents of villages eligible for payments can choose to participate or not participate in the PES program. This "test" group is then offered a payment in return for contractually agreed activities. Those that are interested must submit an application and negotiate an individual contract.

These voluntary contracts are unique to each farmer. The farmers discuss the contract elements with project partners and CSWCT, and then it is finalized in a participatory process with landowners through focus groups and community organizations. Before beginning



implementation, a contract and evaluation plan will also be created and agreed for each participating farmer. The farmer receives a payment based on forest area conserved and number of hectares reforested. The current upper limit is 35 USD per hectare per year and provides seedlings for reforestation of the degraded forests or deforested areas. Cash will be distributed on a yearly basis, starting from the contract sign date.

The project, however, does not attempt to fully address opportunity costs of other activities with payments alone, according to Christine Akello, Senior Legal Officer at NEMA. “We are trying to broaden the entry point for communities by offering many resources, not just one existing resource everybody is targeting,” she says. “We seek to provide options and opportunities for involvement and participation.” The project at its foundation promotes sustainable use, not protection.

Current Progress, Challenges, and Next Steps

In February 2010, UNEP-GEF approved the project and by June, the project steering committee had met and the census of private forest owners in Hoima was complete. Sensitization and workshops for leaders in Hoima began in December of 2010 and have resulted in 286 finalized farmer contracts spanning six villages and one sub-county. The project plans to finalize all contracts by February 2012 and will then begin to implement all contractual obligations. The impact evaluation scientists will simultaneously monitor the PES scheme impact by closely following both social and ecological outcomes.

Kwamya Julius Nyakoojo is ahead of the curve. His previously unproductive cocoa plantation is now a demonstration landscape in environmental protection.

The biggest challenges facing the project include the high expectations from farmers on payment levels, the lack of land tenure on target properties in forest corridors, the ongoing negotiation delays, and engaging additional finance sources. “They have not been clear about how it will perform,” says Kwamya. “There is a hope it will be a solution to our problems, but there are also fears—what trickles down to the farmers is not substantial. It is not enough to persuade somebody to be a conservator of the environment.”

Despite this difficulty, he is diversifying his cocoa farm to raise tree seedlings with technical support and financial compensation. Kwamya says, “Using my example, CSWCT has injected slightly above 5,000 USD into my farm’s operations over the years. “CSWCT also put in knowledge to dissuade me from certain practices, to completely revolutionize my landscape and my way of viewing my environment,” he says. “However the ordinary farmer must have more money to mitigate his needs... If the value that goes down to the farmer is not substantial, PES will still be a zero. It will remain on paper.”

Engaging the Private Sector

Generating payments which support farmer land-use changes requires more than just public and donor funds. The project’s biggest challenge lies ahead: even if it generates results, it still has to use those results to win over the private sector. NEMA and CSWCT plan to use data generated at the close of the pilot phase to approach private sector buyers in Uganda and internationally with concrete evidence and fact-based projections of social and environmental benefits.

While it will be 2014 at the earliest that this data is generated, private sector interest has already been piqued. In April of 2011, NEMA, CSWCT, Forest Trends, and The Katoomba Group jointly

organized a training event for private sector and government decision makers on PES in Uganda.²¹ It attracted representatives from local cocoa distributors, national eco-tourism operators, and companies like Tullow Oil Uganda, Hydromax, ESCO Ltd, and BAT Uganda.

New Threats Enter the Mix

What project developers are finding, however, is that it's very difficult to maintain experimental control when the real world is your Petri dish. Recently, oil has been discovered in the Hoima district of Uganda. This has led to controversial approval of an oil exploration and development project between Tullow Oil Uganda and The Ugandan Ministry of Energy.²² The areas affected by Tullow Oil project are predominately protected forest reserves in the high-biodiversity value Albertine Rift, Lake Albert Basin—the precise region of the planned PES project.

This adds extra weight to NEMA and CSWCT conservation efforts on private lands. As protected areas in this region become increasingly accessible to international industry, mitigating impacts through voluntary afforestation and reforestation is important to maintain the rich biodiversity in this area. Tullow Oil recognizes this need and has become an active participant in the PES project by joining the Technical Steering Committee and attending PES training workshops.

Global Implications

This is the first project of its kind in the UNEP-GEF portfolio. Never before has there been an effort to implement an experimental methodology to test the effectiveness of a PES scheme. The data on real versus expected results on biodiversity and livelihoods will generate vital information regarding the actual benefits of PES schemes involving rural communities in Uganda. On the national level, NEMA plans to use the experiment's results to identify the type of conservation scheme best suited to the Ugandan context. The evidence about PES effectiveness will help the government to develop a replication strategy in other areas at risk of deforestation.

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Kwamya Julius Nyakoojo is ahead of the curve. His previously unproductive cocoa plantation is now a demonstration landscape in environmental protection. He continues to produce cereals, bananas, and keeps goat and cattle, using manure management to minimize environmental impacts. He gives tours to community members involved in the PES project so they can view the potential of PES. Project developers hope that by 2014, smallholders and the private sector alike will be able to view not just the potential of PES in western Uganda, but the impacts as evidenced by this initiative

²¹ See <http://www.forest-trends.org/event.php?id=543> for event materials.

²² Read more here: <http://www.independent.co.ug/business/business-news/4036-tullow-oil-deal-empty-victory-for-uganda>.



Can Libreville's Electricity Users Save Gabon's Mbé Watershed?

As mining and logging spread across Gabon's Mbé watershed, they threaten the river that nourishes the capital city, Libreville, and also drives the city's turbines. USAID and the Global Environment Facility are helping the government of Gabon and the Wildlife Conservation Society entice electricity users into paying to maintain the watershed – for their good and the good of others.

When Gabon's late president Omar Bongo created 13 national parks covering 10% of the country's territory in 2002, he turned Gabon into a conservation champion overnight. Gabon has since surprised critics who dismissed the move as a publicity stunt by following through with a comprehensive legal framework and an ongoing search for long-term, sustainable environmental protection. The country is already using carbon finance to preserve its forests by earning credits for reducing emissions from deforestation and forest degradation (REDD) and has recently become a pioneer in the use of other Payments for Ecosystem Services (PES).



Photo: Shutterstock

The idea of taking into account the non-market value of ecosystem and to charge for the services they provide (anything from carbon sequestration to flood control to crop pollination) could provide new incentives for conservation—and the most recent frontier is water. The Ministry of Environment recently teamed up with the Wildlife Conservation Society (WCS) on a Payment for Watershed Services (PWS) scheme designed to preserve and revive the Mbé watershed in the Northeast of the country.

Now Is the Time

"The awareness and capacity for PES in Gabon is low," says WCS Gabon technical advisor Christina Connolly, "but there is a keen interest in the project because it fits into the sustainable development concept." The timing is right. Gabon has enjoyed substantial – and sustained – oil revenues since the 1960s, but with production forecast to decrease in the medium term, the pressure is on to diversify the economy. Mining and logging have huge economic potential, but their impact on the environment could be disastrous.

Forests cover 85% of the country and are home to some of the highest levels of biodiversity in the world. The Mbé watershed is one of many gems in Gabon. A 2004 study by the Central African Regional Program for the Environment (a USAID initiative) concluded that "in terms of numbers of species per hectare, it is the richest site in Africa assessed to date." Endemicity is high, and the local ape population hasn't been affected by the Ebola virus.

The Mbé also plays a vital economic role: The watershed is the main source of electricity for Gabon's capital, Libreville, which makes up 60% of the country's population. Electricity is generated from a hydroelectric dam owned by the Société d'Energie et d'Eau du Gabon (SEEG), a

subsidiary of the French multinational Veolia. Forests in the watershed reduce siltation in the reservoirs and help regulate water flow.

Threats to the Mbé

Despite its environmental and economic importance, the Mbé is facing serious threats. In addition to illegal mining, logging, and hunting, there is no capacity to regulate activities of the numerous legitimate actors: logging and mining concessions, the Monts de Cristal National Park (which occupies a third of the watershed), and local communities.

The approach has been piecemeal, and existing laws are often not enforced. The Forestry Code, for instance, requires concessionaires to adopt sound environmental practices, but none of the logging companies in the watershed abide by it. They are not FSC-certified and do not use reduced-impact logging techniques either.

WCS, with support from the GEF and USAID Translinks, is in the process of developing a PWS mechanism in the Mbé for services rendered to the city of Libreville. It aims to be operational by 2013, and the basic principle is that electricity users downstream would pay land users upstream to adopt land-use practices conducive to the protection of the ecosystem and the good functioning of the hydroelectric dam. It's trailblazing work, but Connolly hopes it will serve a greater purpose.

Early Days and Institutional Challenges

Gabon's complex institutional makeup is likely to be one of the biggest challenges in getting the scheme running. To begin with, there are a dozen stakeholders involved – from several ministries to the Monts de Cristal National Park (which covers a third of the watershed area) to local authorities, mining and logging concessionaires, and local communities – and as many conflicting priorities to reconcile.

The scheme also lacks a strong business case for the time being. Because of a chronic lack of data, it is difficult to show the link between deforestation and sedimentation; since it is the premise the Mbé scheme is based on, Connolly says studies to establish a connection will be put in place. "At the moment, it is hard for SEEG to know the extent of the change they would have a stake in addressing."

Defining the Services

The exact nature of the services rendered is equally difficult to define. Local populations currently have a relatively low impact on land degradation, making it difficult to determine what harmful activities they could be paid to stop doing. Equally tricky is the notion that logging companies would somehow be paid to adopt environmentally friendly practices when that is already required by laws they have simply failed to comply with.

Connolly acknowledges these are difficult questions, but she believes the program is an opportunity to rethink the current situation. Since the stick didn't work, perhaps the carrot will? The PWS could provide an incentive for logging companies to go above and beyond the current legal framework such as not cutting trees near rivers or on steep slopes which create acute sedimentation problems. As for local communities, there is a move towards more community involvement, so there is scope.



Then there is the issue of payment. SEEG would be the main buyer, but it is likely it could pass on some or all of the cost to its customers. "People are very supportive of the project in principle," says Connolly, "but when we start talking about passing the cost on to consumers, it may change." Ensuring that the funds are then collected and distributed appropriately is another consideration: Who would be in charge?

Etienne Massard Makaga, General Director for the Environment and Nature Protection at the Ministry of Environment, is more dogmatic. "The PES is a new way of seeing things: we have to shift from thinking about the environment in an economic context to thinking about the economy in an environmental context. We're changing the paradigm. And this pilot project is about bringing the entire Gabonese society to change paradigm," he says. He thinks that once people understand the mutual benefits of the system, they'll adhere to it. "If SEEG realizes that the new approach is generating savings in operational costs, it will definitely take part. And if consumers get a better, more reliable electricity supply, a 2-3% increase on the bill will be money well spent."

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The Road Ahead

If the Mbé PWS materializes, WCS has planned interesting follow-up measures to evaluate the impact of the scheme: two sample areas will be compared, one taking part (treatment group) and one not involved (control group). "It's not a new idea," says Connolly, "but it hasn't been implemented systematically in the past. With the benefit of hindsight from other projects, we thought it would be good to include at the design stage."

Funding or not, Connolly says WCS will pursue its work on PES in Gabon. The government also has high hopes for PWS schemes. The country plans to continue developing hydroelectric energy; large-scale PWS schemes could be part of the development, such as in the Grand Poubara dam in northeast Gabon, part of a €3-billion deal to exploit the Belinga iron mine.



How Much for this Mountain Forest?

The downward flow of water from the Eastern Arc Mountains of Africa generates up to half of Tanzania's power and provides much of Dar es Salaam's drinking water. As agriculture moves up the slopes, however, it destroys the natural ecosystems that support the ancient catchments – resulting in muddy torrents in the wet season and trickles in the dry. Can valuing those ecosystem services lead to their salvation?

If anyone knows the value of the Eastern Arc Mountain ecosystem, it is George Jambiya and Neil Burgess. Together, they've spent more than three decades helping WWF and the Tanzanian government document thousands of rare plant and animal species that populate the Arc, not to mention the ecosystems they support and the animals and economies that depend on them. Until now, however, neither can tell you with scientific certainty the value of the ecosystem services that flow from those plants and animals. "On the one hand, you can say, 'Look, we all depend on these services, so the value is inherent,'" says Burgess. "But we can't go to Coca Cola and say, 'This catchment delivers this amount of clean water, and has this value to you.'"



Photo: Forest Trends Archive

The ability to make that statement with confidence, however, would help save life-supporting ecosystem services that support – and, in our economic system, compete with – tangible hard commodities like timber and food. "Right now, a lot of the values that are being applied to forestry management are only taking into account things like timber prices and logging permit values," says Jambiya. "Things such as carbon sequestration and, especially, hydrological services don't come into play, and the value of water is not determined by the market or even by supply and demand – but by an arbitrarily-set figure, which is probably very much on the low side. Often the official water fees are not paid, making the resource effectively free. The situation of biodiversity is even worse in terms of valuing their market value."

The two are among a handful of experts spearheading a five-year research and policy project called "Valuing the Arc", which began in January 2007 and runs until March 2012. Its mission is to quantify the economic value of specific ecosystem services in the Eastern Arc Mountains, and it harvests expertise from five UK-based universities (Cambridge, East Anglia, York, Leeds, and Cranfield), two Tanzanian universities (University of Dar es Salaam and Sokoine University of Agriculture), the WWF Tanzania Programme Office, and the Natural Capital Project. Along the way, they've helped with efforts to identify and educate potential buyers and sellers of ecosystem services and provide fodder for a CARE-WWF partnership called "Equitable Payments for Watershed Services (EPWS)".

Katoomba in Uganda

Burgess got the idea for Valuing the Arc after attending a 2005 Katoomba Meeting in Kampala, Uganda (Katoomba VIII) on behalf of Tanzania's Department of Natural Resources, for whom he was working at the time. "We knew the forest was storing a lot of carbon, and the whole payments for ecosystem services thing was beginning to emerge," he says. "The Katoomba Meeting catalyzed a lot of things and brought a lot of people together." Among those people were PES project developers from Mexico, South America, and South Africa. "I saw what they were doing and thought, 'Well, that all looks similar to the beginnings of what has happened in Tanzania,'" Burgess recalls. "I figured maybe we could start to go more in the ecosystem service direction here."

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First the Price, then the Payment

"Neil basically realized that he needed to get beyond general statements about the value of nature and show decision-makers where the value lies within their actual landscapes," says Taylor Ricketts, co-founder of the Natural Capital Project, which is itself a joint project of Stanford University's Woods Institute for the Environment, The Nature Conservancy, and WWF.

Over the years, Burgess and scores of other researchers had taken a shot at mapping the ecosystems of the Eastern Arc Mountains, and several facts were clear: First, they knew that the area of fog-enshrouded, moss-laden "cloud forests" that capture and store moisture high in the mountains was declining. Second, they knew that farmers were both tapping the mountain streams for agriculture and for their domestic use, including washing in the river. They also knew that downstream rivers were running faster in the wet season and slower in the dry season – and muddier all year long. But they didn't know the extent to which each problem could be attributed to specific practices, and they couldn't determine how much maintaining the upper catchments was worth to end-users such as breweries and water filtration plants.

Building the Team

Once back home in the UK, Burgess mentioned his dilemma to Cambridge Professor Andrew Balmford, who told him about a grant available from the Leverhulme Trust. Balmford applied for and won that grant, while Burgess lined up the University of Dar es Salaam and the Sokoine University of Agriculture, each of which unleashed scores of staff and PhD students to ramp up the mapping process.

"That's where we come in," says Ricketts, whose Natural Capital Project (NatCap) supplied a tool called InVEST (Integrated Valuation of Ecosystem Services and Trade-offs) – a software package that maps ecosystem services and their economic values. As NatCap was joining the project, Ricketts applied for and won a grant from the Packard Foundation that complemented the Leverhulme grant—and set to work delivering their piece of the puzzle. "We've basically built a program that plugs into the industry-standard GIS tool," he explains. "You can map how much



carbon is being stored in forests and woodlands, for example, or where people harvest products like medicinal plants directly from ecosystems."

InVEST also offers modules that map important areas for water supply, flood control, timber harvest, crop pollination, and other ecosystem services. It is freely available on the Internet and has been downloaded more than 2,500 times. NatCap alone is using it to support more than a dozen other projects around the world. "You can use only the modules you care about, and customize those to your situation," he says. "Every few weeks, we get an e-mail from someone telling us about a project that used the tool with no NatCap involvement, and it's great to see the range of uses out there."

Laying the Groundwork and Priming the Pump

The tedious task of lining up the partners and identifying their responsibilities consumed much of the first phase of Valuing the Arc. After that came identifying the gaps. "We spent quite a lot of the end of the first year putting together all available data on water flows, timber, carbon etc," says Burgess. "A lot of the data was from previous work, including the previous project that I'd worked on. We basically compiled all available data that we knew of from the past 20 years."

The project is broken into six teams: one for carbon, one for water, one for biodiversity, one for timber, one for non-timber forest products, and one for agriculture.

Early Rewards

In 2010, Cambridge University used the carbon team's map to provide the government with two hypothetical maps showing the state of Eastern Arc carbon decades from now. One map showed the state of carbon sequestration if the government adopted a sustainable development approach to the mountains, and the other showed what would happen under business as usual. (Ricketts and Burgess contributed to a paper on the two scenarios, which was published in the *Journal of Environmental Management*).

As the measurements become more concrete and targeted, Burgess believes the beneficiaries of ecosystem services will become buyers—for economic reasons, and not just for philanthropy.

That same year, the Tanzanian government used the carbon maps to demonstrate its growing REDD readiness at the 15th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 15) in Copenhagen. That led to a grant from the Norwegian government to expand the carbon mapping across all of Tanzania, beginning in January 2011.

Mapping Other Ecosystem Services

Ricketts says even more tangible fruit will come due when results are published in 2012. "For the last nine months we've been synthesizing the six services into multi-service assessments," he says. "Basically, trying to say where the value for each one is coming from and where the overlap is."

In mid- 2012, they hope to publish the results, showing the impact of different land-use practices on agriculture growth, urban health, urban growth, and other ecosystem-dependent activities "The science is to take the alternative scenarios and tell people what the consequences of each pathway are for a big bundle of ecosystem services," says Ricketts. "The big bundle is what we're

doing now.” After the papers are out, they will hold a workshop for stakeholders who have been working with the project for the past five years.

Will Beneficiaries Become Buyers?

As the measurements become more concrete and targeted, Burgess believes the beneficiaries of ecosystem services will become buyers—for economic reasons, and not just for philanthropy.

"We've got a lot of information coming together on habitat quality and on the amount of timber and non-timber resources coming out of the forest, as well as how much forest there is," he says.

"This will all be pretty fundamental stuff for the carbon baseline work in the near term, and should be valuable to the whole payments for ecosystem services arena that's going to be there in five or 10 years time."

Jambiya agrees, but says the near-term damage control can best be handled by government. "The whole intention of Valuing the Arc is to try to establish the true values of these resources and the services that they offer and through that make arguments for greater investment on the government side for conservation efforts," he says, adding that private sector investors will still be needed to make the system viable over the long haul.





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