

Beyond Carbon:

Biodiversity and Water Markets



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Introduction

It is widely acknowledged that well-functioning ecosystems provide reliable and clean flows of water, productive soils, healthy and balanced biota and many other services for human well-being. It is also widely documented that today many ecosystems and the services they provide are under threat.

The Millennium Ecosystem Assessment, the most comprehensive study of ecosystem services to date, concluded that more than 60% of the world's ecosystems are being used in ways that are not sustainable. Many conservation experts argue that for ecosystem services to be maintained at a healthy level, stewardship needs to become more profitable than alternative land uses.

The use of markets and market-based mechanisms to conserve and pay for ecosystem services is a growing global trend that is gaining a solid foothold not just in the carbon markets, but also biodiversity and water markets. Furthermore, these payments for ecosystem services (PES) are a practice that is no longer solely important to environmentalists but has become of essential interest to small local communities, government regulators, businesses, and financiers all over the world.

PES encompass innovative private deals, financing schemes, and government programs that have been structured around the premise that natural ecosystems provide valuable services, and that if marketed correctly, these services might help watershed and biodiversity conservation pay for itself and generate income for those willing to participate.

Brazil has a long history of innovative conservation finance. In this next decade, carbon finance and REDD (reduced emissions from deforestation and degradation) will certainly be a key focal point for Brazil, a country with the lion's share of the world's largest rain forest. But it is also important to remember that Brazil will have to look beyond carbon markets, to water and biodiversity, to ensure the comprehensive maintenance of all its ecosystem services.

To get a stronger sense of how these water and biodiversity financing mechanisms work in practice, the Ecosystem Marketplace has compiled selected articles that introduce the markets, delve into experiences outside of Brazil, and examine developments within the country.

We have broken this volume into four parts: the first summarizes key government initiatives in Brazil, and offers a guide to "the Matrix" of PES schemes around the world (Part 1: The Big Picture). The second offers a close examination of regulated biodiversity and water markets in the United States. (Part 2: The State of Play). The third offers a case study of an innovative biodiversity offset project in Malaysia, PES schemes in the Andes, and an examination of the growing acceptance of ecosystem markets at the federal level in the United States (Part 3: Global Developments). The final part examines established water and biodiversity payment programs in Brazil (Part 4: Local Developments).

This booklet is meant to serve as context and provide background for the Katoomba conference: "Avoiding Deforestation in the Amazon through PES Markets" held in Mato Grosso, Brazil in April 2009. The conference is the fourteenth in a series of Katoomba conferences designed to stimulate and strengthen environmental markets around the world.

Launched in Katoomba, Australia in 1999, the Katoomba Group is an international working group composed of leading thinkers and practitioners from academia, industry and government, all committed to enhancing the integrity of ecosystems through market solutions that are efficient, effective, and equitable. The group is a sister project of the Ecosystem marketplace and is also sponsored by Forest Trends.

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The Big Picture

A Brief Tour of Brazilian Payments for Ecosystem Services

By Daniela Lerda and Steve Zwick

Brazil is home to more than four million plant and animal species – and, it seems, nearly as many laws and mechanisms for preserving the environment. Here is an examination of twelve government-sponsored laws and mechanisms designed increase the flow of private capital towards conservation.

20 February 2009 | Brazil is home to the Amazon Rainforest, the Atlantic Forest, the Cerrado Savanna and other unique biomes that help purify the world's air by extracting greenhouse gasses and other impurities from the atmosphere while supporting countless species of plant and animal.

And many of these natural treasures are in danger – a direct result of our economy's inability to recognize the value of the ecosystems on which its own existence depends.

Twelve Steps to a Better Biosphere

The **Ecosystem Marketplace** web site (www.ecosystemmarketplace.com) has documented scores of non-governmental organizations (NGOs) and corporate donors who have launched voluntary Payments for Ecosystem Services (PES) schemes designed to incorporate the economic value of ecosystems into our market economy and to Reduce Emissions from Deforestation and Degradation (REDD), but such schemes will only bear enough fruit to make a difference if governments provide the regulatory drivers they need.

Brazilian state and federal governments have also launched a dizzying array of instruments and efforts to funnel private money towards environmental projects, and anyone looking to understand the evolution of PES in Brazil needs to be familiar with twelve of these efforts – even though many of them are not PES schemes in the strict sense of the word.

Most, for example, don't create a direct payment from the beneficiary of an ecosystem service (such as a city that gets clean water from mountain streams) to a provider of that service (such as indigenous farmers who maintain the catchments that provide the water). The principle of "protector receives" isn't always adhered to, but the principle of "polluter pays" is.

Furthermore, not all are created equally: some are little more than proposals, while others are backed by legislation long in force.

This brief overview of these mechanisms is by no means a comprehensive analysis, but rather a summary of the goals, strengths, and weaknesses of each effort.

ICMS Ecológico: the Ecological Sales Tax

The first mechanism is “ICMS Ecológico” (Imposto sobre Circulação de Mercadorias e Serviços Ecológico), which raises funds through a sales tax on all goods and services and then pays the money out to municipalities based on how many “conservation units” (protected areas) they maintain or the level of sanitation infrastructure present in the municipality.

This is not a federal initiative, but rather a common name for initiatives launched by several Brazilian states. The primary aim is to compensate municipal governments for the tax revenue they lose when land is designated a protected area, but it also has an incentive effect, encouraging the designation of new conservation areas.

The main motivation for the ICMS is the creation of new protected areas, and criteria for improving management of existing reserves only exist in some states. However, we should add here that the money that gets distributed to the municipality is not earmarked for conservation – it is up to the local government to define how to utilize the resources, and in some cases, depending on the state there are quality criteria related to the use of the resources which ends up acting as an incentive to reinvest in protected areas.

The state of Paraná launched the first ICMS Ecológico in 1992, followed by São Paulo one year later. The idea quickly spread to the states of Minas Gerais (1995), Rondônia (1996), Amapá (1996), Rio Grande do Sul (1998), Mato Grosso (2001), Mato Grosso do Sul (2001), Pernambuco (2001), and Tocantins (2002).

São Paulo alone has amassed a conservation coffer of 40 million Brazilian Real (\$R) since 1993, but critics say the mechanism isn't really delivering new conservation – in part because it simply rewards municipalities that are already fortunate enough to have large swathes of conservation, but also because debate over the best mechanism for distributing the funds is far from resolved.

Compensação Ambiental: Environmental Compensation

Brazil – like the United States and the European Union – has a program to offset the environmental impact of new development by requiring a compensatory payment for the non-avoidable impacts of new development. The program was initiated in 2000, but until recently required the payment of a licensing fee that had nothing to do with a project's environmental impact and everything to do with its budget.

Specifically, developers were required to pay a licensing fee, usually amounting to between 0.5% and 2.0% of the cost of their development. The payment is supposed to bypass public budgets and go straight to a protected area that is impacted by the project, but the law failed to define a method for determining the size of the payment.

As we all know, the debate over how to best value the economic impact of environmental degradation is central to all PES schemes, and simply ignoring that debate in favor of a mechanism based on the cost of the project led to a flurry of lawsuits, culminating in a 2008 Supreme Court decision mandating license fees more closely related to actual impacts.

Now the licensing fee is truly meant to be a “Compensação Ambiental” (Environmental Compensation), which means that licensing agreements should be tied to environmental impacts, and payments are directed towards protected areas (in Brazil, these are protected areas are equivalent to the International Union for Conservation of Nature (IUCN)’s Category One (nature reserve, free of development) or Category Two (limited protection) Protected Areas.

It all looks great on paper, right down to prescribing five specific uses for the money (studies for the creation of new reserves, management plan, sorting out land-tenure, purchase of goods and services necessary for managing an area, and management related research). The law creates a direct connection between private money and public action, and the amount of money raised since the initial licensing began is estimated at anywhere from \$R237 million to double that amount.

In practice, however, there’s still no way to assess environmental impact as mandated by the court ruling – and, as with ICMS Ecológico, no agreement on the best mechanism for executing the funds – or getting them into the protected areas. Now with the Supreme Court ruling everything has come to a halt while we await a new methodology for defining how to calculate costs associated with impacts, and with determining whether past payments needs to be revisited in order to meet the new valuation criteria.

Payment for Watershed Services

In 1997, Brazil passed the Lei da Política Nacional de Recursos, a law that essentially recognizes water as a public “good”, whose use must be duly compensated through a financial payment. Furthermore it stipulates that resources generated through this means should be used to protect the resource at its origin. This opens up the possibility for water payments to be directed towards conservation projects, but does not mean that all resources from water usage is directed towards conservation. Part of the payments can go towards maintaining the infrastructure that delivers the water, and the water that we pay for through our utility bill has nothing to do with the charges that are established under this law.

Water payments that relate to the use of resources from a particular watershed are collected by the local water management agency, which charges a usage fee and redistributes a portion of the payment to local watershed management committees.

In an effort to promote local participation, payments are to be assessed and distributed by local committees made up of volunteers, whose job is to assess the charges and then distribute payments to reforestation or environmental conservation projects within their watershed.

Unfortunately, this very effort to involve local communities is also the program’s weakness, subject to the same challenges that efforts involving community input face around the world. (Anyone who has ever been involved in a local civic group can attest to the heated battles that rage over what color to paint a fence – let alone the best way to revive a degraded watershed.)

As this is a new initiative, many committees either don’t exist or have yet to figure out how to work together, how to develop a plan, or how to conceive a vision that sets priorities and guides what needs to be funded and where and how to control costs. Few of the participants are trained conservationists or engineers.

The challenge is to promote an understanding of organizational structures and technical issues – not to mention good governance. A fundamental problem is water theft: water is often diverted from existing pipelines, which means that funding never really makes its way into the budget. This is a promising law, but one that needs better enforcement and practical guidance for committees to function in order to achieve the program's goals.

Gas and Oil Royalty Payments

As in other parts of Latin America, oil and gas companies in Brazil are forced to pay royalties, either to the federal government or the local government, depending on the jurisdiction.

These payments are earmarked for protection of biodiversity and reduction of air and water pollution – but the priorities aren't clearly defined, and the money is often pooled into larger budgets. This leaves the money in public coffers with no financial mechanisms for channeling it to the economic projects for which it is intended.

Many of these local governance issues flow from the newness of Brazil's democracy, which is just over 20 years old. If these local governance issues are not resolved, authority may be consolidated at a higher level. Other examples where this happens are the compensation payments for hydroelectric dams and for mineral extraction, which include the concept of compensating for environmental impact but are not necessarily directed towards environmental conservation.

Private Nature Reserves

Brazil offers private land-owners an opportunity to avoid paying property taxes by turning their land into a Reserva Particular do Patrimônio Natural (RPPN).

Again, this can be done either at the state or federal level, and the treatment is different for each.

If registered at the federal level, the land is considered a "sustainable use" reserve, which means that some productive activity is allowed, provided the land becomes part of the national protected area system – following the SNUC law (Sistema Nacional de Unidades de Conservação), which obligates the owner to develop a management and monitoring plan and to earn money from limited extractive activities.

If registered at the state level, the land is considered a "strict protection" area, which means it can only be used for research and eco-tourism.

If incorporated into the national system, RPPNs fall into a category between strict protection and "sustainable use" – largely because the article describing sustainable use was vetted in congress. The result is a category that is often described as sustainable use, but in reality is more restricted.

Either way, the land is incorporated into Brazil's protected area system – and the designation is permanent. Because there is no turning back, most landowners have been reluctant to take advantage of this program.

Furthermore, exemption from the Imposto Territorial Rural (ITR, the Rural Land Tax) has proven to be a weak incentive, because the tax itself is low and often not enforced, and the bureaucracy created to administer the SNUC makes it difficult to create RPPNs.

While for-profit landowners have generally paid little heed to getting RPPN designation, we are seeing interest on the part of environmental NGOs and research organizations.

Mitigation Banking, Brazilian Style

Under the 1965 Código Florestal, Brazil requires anyone owning more than 50 hectares of rural land to make sure that a certain number of hectares are set aside in a Reserva Legal. As in mitigation banking, the Código Florestal makes it possible for landowners to reach their quota either by setting aside their own land or by purchasing tradable certificates from other landowners within the same micro-region or watershed.

The percentage required to be set aside varies from as little as 20% to as much 80%, depending on the biome – and is the focus of a heated battle between the Ministry of Environment and the Ministry of Agriculture.

Not surprisingly, the highest figure for protection is in the Amazon, where the required set-aside was raised from 50% to 80% under the administration of President Fernando Cardoso, who preceded Luiz Inacio “Lula” da Silva.

The deadline for compliance is 2010, and the Ministry of Agriculture and Fisheries – backed by large agriculture interests – wants to not only roll back the ceiling to 50% in the Amazon, but also to allow the trading of certificates across watersheds and allow reforestation with non-native species. The Ministry of Environment wants to keep the ceiling at 80%, focus trading within watersheds, and limit most reforestation to native species.

The Kyoto Protocol’s Clean Development Mechanism

China and India have been erecting wind parks and other clean energy projects with funding from the Kyoto Protocol’s Mecanismo de Desenvolvimento Limpo (MDL) (in English: Clean Development Mechanism, or CDM), which allows greenhouse gas emitters in the developed world to offset some of their emissions by funding such projects in the developing world.

Brazil, however, already gets the bulk of its electricity from hydro plants and wind farms, while 75% of its cars run on ethanol. This leaves few options for reducing greenhouse gas emissions from industrial sources under the current Kyoto Protocol.

The bulk of Brazil’s MDL income goes to support methane capture projects in landfills, and is not a significant generator of income.

Since the majority of Brazil’s emissions come from deforestation, its main contribution for reducing emissions would come from avoiding forest loss. However, avoided deforestation is not eligible to receive carbon credits under the current regulated market. This opens the door for a voluntary market and for new negotiations that will unfold from a post-Kyoto agreement (post 2012).

Amazon Protected Areas Program

The Amazon Protected Areas Program (ARPA) is a federal program designed to protect 37.5 million hectares of Protected Area by 2012 – a size equivalent to all of Spain. It also aims to consolidate another 12.5 million hectares of existing reserves. It is estimated that R\$900 million (US\$395 million) is needed to meet this objective.

This program is now entering its third and final phase and now funds 60 protected areas covering 23 million hectares. It is overseen by a multi-stakeholder governing council, funded primarily by Germany's KfW Bank Group (formerly the Kreditanstalt für Wiederaufbau, or Reconstruction Credit Institute), the Global Environment Facility (GEF), and WWF (formerly the Worldwide Fund for Nature), and administered by the Brazilian Biodiversity Fund (FUNBIO).

Ultimately, the hope is to create a R\$544 Million (US\$240 million) endowment fund to cover recurring costs and support the protected areas. The fund currently has R\$50 million (US\$22 million).

The program is currently focused only on the Amazon, and does not include other protected biomes such as the Caatinga and Atlantic Forest.

Forest Concessions

Brazil also earns money from public lands by leasing them to timber companies, which are obligated to re-plant the forests and pay a tax. The program, however, is unevenly administered, and obligations to replant are often ignored by leasers, who find it easy to simply get away with non-compliance.

As with many of Brazil's environmental laws, this effort will hinge on enforcement, and the development of an effective enforcement mechanism is central to the debate.

Commercial Forestry Certificates

The environmental community is lobbying for a certification program that will go along with forest concessions to improve monitoring and enforcement of these instruments.

Such programs already exist, and the Forest Stewardship Council (FSC) has been active in Brazil, but instead of one nationally-agreed upon standard for certifying that timber has been harvested in a sustainable way, the market has generated a gaggle of varying certificates that mean different things to different people.

Larger users of wood products, including Aracruz Celulose, Brazil's leading paper and pulp company, have expressed an interest in supporting a national standard. Indeed, companies like Aracruz have much to gain on the public relations front, but smaller producers say they can't afford the administrative costs.

Green Tax Deduction

In Brazil, as in most countries, people and companies can write charitable donations off on their income tax – but in Brazil, the only recognized categories of charity are Culture, Education, and Athletics.

A new bill, Imposto de Renda Ecológico (IR Ecológico), aims to extend that status to donations in support of environmental projects. It has the backing of major NGOs like WWF, Conservation International, and the Nature Conservancy, as well as support from the Moore Foundation, but has run into stiff resistance from government entities concerned about reduced tax revenues and NGOs active in education, culture, and athletics.

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The Matrix: Mapping Ecosystem Service Markets

By Nathaniel Carroll and Michael Jenkins

The once-radical concept of saving the environment by documenting the economic value of environmental services and then getting industry to pay is finally catching on – but how is one to keep track of all the new methodologies and concepts? The Ecosystem Marketplace offers one solution: The Matrix, a new tool for surveying the ecosystem services landscape.

To download the Matrix, visit <http://www.ecosystemmarketplace.com>

17 June 2008 | Over the past decade, more and more businesses have come to recognize that man's economy depends on the earth's ecology, and that ecosystem services – from waste treatment and pollination to genetic resources – generate tangible benefits to industry.

Furthermore, because these benefits have gone unquantified, they have also gone unpaid for – and the ecosystems that provide them are in decline.

This has sparked a diverse array of efforts around the globe to value and pay for ecosystem services.

Many of these Payments for Ecosystem Services (PES) efforts – like the booming carbon markets – already channel billions of dollars into projects designed to keep the planet's ecosystem infrastructure alive.

Others, however, are less developed.

Even in carbon – by far the most successful ecosystem market to date - the concepts are emerging, changing rapidly, and dispersed across geography and institutions.

All of which makes it difficult to get a clear sense of the big picture of these markets: What are the major markets for ecosystem services? How big are they? Who's involved? Where are they heading?

Mapping the Markets

To map this PES landscape, the Ecosystem Marketplace researched the main PES schemes and each of their sub-categories (mandatory or “compliance” offsets for carbon forestry, voluntary offsets for carbon forestry, government-mediated watershed protection, and mandatory or “compliance” offsets for biodiversity, among others) and their key characteristics (size, environmental impact, community impact, market participants and shapers, and emerging trends).

To collect the information on such a broad spectrum of topics, we pulled together a team of authorities on PES, each of whom performed interviews, literature searches, and web searches to collect information for a specific category of market.

The result of this effort is a large spreadsheet showing all of the markets and their defining characteristics side by side. This poster-sized chart is a powerful tool for viewing and thinking about PES markets. We've dubbed it "the Matrix".

To create a more reader-friendly format for accessing this information online, we've split the Matrix into 'market profiles' that are essentially executive summaries or narratives for each market.

Commodity Types

There are different ways of categorizing markets for ecosystem services. If you're viewing them as ecological commodities, they follow the popular grouping of: *carbon, water, biodiversity, and bundled services*.

Carbon markets generally reward the stewardship of an ecosystem's atmospheric regulation services – specifically, the absorption of carbon dioxide from the atmosphere.

Water markets provide payments for nature's hydrological services – primarily the filtering of water through wetlands.

Biodiversity markets create an incentive to pay for the management and preservation biological processes as well as habitat and species.

Bundled payments secure all or a combination of carbon, water, and biodiversity services. Bundled payments also include those in which the ecosystem service payment is built into the price of the product, such as certified timber or certified produce.

Payment Types

If, on the other hand, you are viewing them as payment types, they fall into three categories: *voluntary, compliance, or government-mediated*.

Compliance markets are driven by regulation and enforcement, similar to other pollutant trading markets.

Voluntary markets are driven by ethical and/or business-case motives. In many cases, the threat of future regulation also drives these markets.

And **government-mediated markets** are publicly-administered programs that use public funds to pay private landowners for the stewardship of ecosystem services on their property.

Lay of the Land

The Matrix shows that while most PES markets are growing at approximately 10 to 20 percent a year, the carbon markets are skyrocketing at 200 to 700 percent a year.

While this is no surprise to most followers of environmental markets, carbon's surge is a dramatic entrance for an environmental commodity onto the world markets, and perhaps indicative of the power of markets for ecosystem services.

Promises and Pitfalls

The participants and experts we surveyed said they believe existing markets have the potential to serve the environment – but may not be living up to their potential. This underscores that these payment systems are instruments that by themselves aren't a solution.

PES, in other words, is not a single tool, but an entire tool box with different instruments for different circumstances.

To achieve the sustainable management of ecosystem services, PES schemes must be designed and implemented carefully, intelligently, and adaptively.

Spreading (and Tailoring) the Wealth

A recurring theme is the potential benefit for PES schemes in developing countries, as well as the necessity to tailor them to the specific circumstances of the region.

Many of the national compliance markets in developed countries require sophisticated regulation and enforcement to drive effective markets, such as species mitigation credits and water quality trading.

Developing countries, however, host a good number of PES schemes that are structured differently. The largest of these are the government-mediated programs in South Africa, Brazil, and China. China's watershed protection program alone is estimated to generate \$4 billion a year in payments.

Social Equity

Perhaps the most important example of how these markets must be crafted and managed carefully is the issue of social equity.

The majority of ecosystem services are produced in rural and natural areas where local communities depend closely on ecosystem goods and services and are the environmental stewards. It is clear from our research that an important aspect across all of these markets will be to ensure that the communities and small scale producers are able to actively participate and benefit from ecosystem service markets.

This will mean developing instruments to provide support, such as aggregation services to communities, shaping regulation to engage local small-scale providers, and clarifying tenure and user rights associated with these new opportunities.

There may be a large wave of investment opportunity in rural areas that are providers of these services. To make sure it is distributed fairly, organizations and overseas development aid groups that care about the equity dimension will have to provide a focused effort.

This is an important section of the Matrix and is reflected in the work of Forest Trends and the Ecosystem Marketplace.

Staying Oriented

A quick glance over the Matrix and through the pages of the market profiles will show that, indeed, there are a good number of initiatives attempting to value and pay for the services our green infrastructure provides. And with a closer look, informative patterns emerge in how PES are being applied in different circumstances.

We developed the Matrix to help members of the Katoomba Group and others working in this field to visualize and track the shifting global trends and nuances in PES - basically, to get oriented in the PES landscape.

Building a Database

To further this aim, we are developing an online database of the Matrix. This will provide convenient and current access to basic PES information provided in the Matrix. It will also allow for collaboration and data contribution, enabling the PES Matrix to be a living document under broad and continual update.

The Matrix products - chart, narrative, and online database – will aid in the evaluation and comparison of the different shapes and sizes of PES systems around the globe, creating a better understanding of what is being done, as well as where, by whom, and with what effect. We hope this will help refine existing PES systems and spur new and creative solutions.

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The State of Play

Biodiversity Banking: A Primer

By Ricardo Bayon

Mitigation Banking makes it possible for real estate developers to turn biodiversity into an asset instead of a liability – which ultimately makes it possible to preserve that biodiversity across the United States. But how do such mechanisms work? And what challenges do they face? The Worldwatch Institute tackled these issues in Chapter 9 of the 2008 State of the World: Innovations for a Sustainable Economy. For the sake of brevity, footnotes and sidebars have been eliminated. The entire chapter in its entirety can be viewed at www.worldwatch.org. Reprinted by permission.

19 February 2008 | Assuming agreement of the need to protect Earth's biological wealth, how much would you be prepared to pay to protect an endangered fly? Would you spend \$1.50, \$15, \$150,000, or more?

How about society as a whole: How much should society spend on the protection of this fly? Does the answer depend on the nature of the fly itself? On its role in the ecosystem?

Or is the calculus based on something else – perhaps on what you must give up to save the fly, or your standard of living, or your priorities?

The questions may seem crass and materialistic – and in some ways they are – but they are essential if the world is to conserve the species and ecosystems that sustain humankind.

The reason is simple: like many other important matters, the staggering loss of biodiversity is really a matter of values – and not just the principles that allow people to distinguish right from wrong, but also the more mundane concept of economic values.

Externalities: the Economic Blind Spot

In a way, the issue boils down to the fact that the world is losing species and ecosystems because the economic system has a blind spot. It sends the signal that cutting down a rainforest to grow soybeans or palm oil plantations makes more economic sense than leaving that forest intact. It says that building a shopping mall to sell iPods is more valuable than having a wetland that buffers coasts against storms, filters water, and provides nesting ground for birds.

It is what economists call a problem of externalities. Some values – like that of a species of woodpecker or of a particular ecosystem such as a rainforest or a wetland – do not enter into the economic system. They are external to it, and so they are not taken into account when economic decisions are made. Indeed, for eons

the price of nature has been woefully close to zero. Supply outstripped demand, and priceless came to mean worthless.

But that equation is changing. Priceless nature is becoming increasingly scarce, and therefore needs to be made valuable once again. Giving some economic value to biodiversity would make it easier to protect. At the very least, standing rainforests would not compare so unfavorably when considered against soybean fields and palm oil plantations. Their value would no longer be zero.

Nature on the Block

It may sound strange, even counterintuitive, but the solution to the loss of biodiversity may actually lie in the very same markets that appear to be causing the problem. It may lie in creating payment schemes for biodiversity; mechanisms that give nature a value and that force the economy to look into its blind spots.

Luckily, a good number of countries – from Australia and Brazil to the United States – have been experimenting with such schemes, sometimes for more than 20 years, and there is much to be learned.

Countries use a variety of mechanisms for giving value to ecosystems and the services they provide. In essence, these can be summarized as follows:

- **Government sets the price:** This is done either by fining those who damage the ecosystems (through endangered species laws, for instance) or by paying those who conserve it (providing tax breaks or subsidies for conservation, for example). While these systems are useful and play an important role in protecting biodiversity, they suffer from a fundamental flaw: they do not send the right signals to the economy; they do not permit society, via markets, to determine and understand the actual value (the price) of biodiversity.
- **Voluntary transactions set the price:** Users of ecosystem services voluntarily agree on the value with those who provide the services. These “self-organized private deals” are sometimes mislabeled as “markets,” but true markets depend on multiple buyers and multiple sellers meeting regularly to exchange goods and services. In contrast, in most cases these are one-time-only deals. They may also take the form of “voluntary biodiversity offsets,” in which an individual or company that damages biodiversity pays to “protect, enhance, or restore” an equivalent amount of biodiversity somewhere else.
- **A hybrid system sets the price:** In this case, scarcity of a traditionally “public” good is established through government regulation, which then forces buyers and sellers to negotiate in order to set a price for the good or service in question. Examples of this include various “cap-and-trade” schemes in the United States for sulfur dioxide and in Europe for greenhouse gases. These schemes create true markets because they generate demand for services from multiple buyers and therefore lead to the provision of services from multiple sellers.

While government payment schemes and voluntary biodiversity offsets are extremely useful and are likely to account for the majority of global payment schemes for biodiversity in the near future, they tell more about where we are now than where we might be in the future. The new and emerging regulated markets for biodiversity offsets hold the key to that future.

Therefore, we are focused here mainly on the third of these mechanisms: regulatory cap-and-trade systems.

Before delving too deeply into these issues, however, a story:

There is a small town nestled in the sand dunes east of Los Angeles – Colton, California – that provides some idea of the new world that may be emerging as a result of regulated markets for biodiversity off-sets.

Colton is smack in the economic center of San Bernadino County, one of the fastest-growing counties in the United States. But there is a fly in Colton's ointment of future economic growth.

A Fly in the Ointment

The city is currently involved in a series of legal battles over how much it should be prepared to pay to save an endangered fly: the Delhi Sands Flower-loving Fly, a rather pretty insect that, like a butterfly, hovers and sips nectar from local flowers. This tiny creature has the distinction of being the first fly—and only the seventeenth insect—to be declared an endangered species in the United States.

According to the U.S. Endangered Species Act (ESA), no individual or entity, public or private, can harm an endangered species – not even a fly – without a permit from the government. Thus, shortly after this fly was listed as an endangered species, construction of a hospital in San Bernadino county ground to a halt.

The hospital had planned to pave over seven acres of occupied fly habitat, but that all of sudden became illegal. The hospital then had to spend \$4 million redrawing its plans, moving its parking lot 250 feet, and making a few other minor changes. All so it wouldn't harm a fly.

The \$150,000 Fly

How much is a fly worth? Do you judge by what the fly does? With this fly, scientists do not know the answer to that question.

They know that pollinators, such as this fly, tend to have important and symbiotic relationships with the plants they feed on. In some cases, without the pollinator the plant cannot reproduce. Perhaps the flower-loving fly plays that role. Or it could be a cornerstone species, without which an entire ecosystem could collapse. Or maybe protecting this fly will protect dozens of other species, some of which may not even have been discovered yet.

Or maybe not.

E. O. Wilson has written: "I will argue that every scrap of biological diversity is priceless, to be learned and cherished, and never to be surrendered without a struggle."

The state of California, in contrast, has a more moderated view. Having determined that the fly should be protected, it decided to let the market decide what it costs to conserve it. And the market determined that the going rate in California for Delhi-sands fly habitat is currently somewhere between \$100,000 and \$150,000 an acre.

This story is interesting not so much because it is hard to believe that people are buying fly habitat – let alone paying \$150,000 for it – but rather because it forces society to answer that crass and materialistic question: How much is nature really worth?

Some would argue that the question should not even be asked. And yet society answers this question “by default” every day. Every time people buy soybeans, for example, they are putting a value on the Amazonian rainforests that were cleared to grow them.

At least in the case of the fly, the price tag is clear, evident, and visible. If a developer wants to pave over fly habitat, it will cost the company (in today’s market) as much as \$150,000 an acre. If that were all there was to this story, the concept of putting a price on endangered species would be quite troubling. It implies that someone could pay the price set by the marketplace and then go ahead and destroy the last surviving population of a species.

Bug Offsets

But that is not what is happening. The \$150,000 paid to pave over the fly’s habitat is actually being used to protect or create habitat for that same fly somewhere else. It is, in other words, an “offset” – not unlike the carbon offsets people are buying to counteract their greenhouse gas emissions.

As the money goes into legally and financially protecting the flies forever (at least in theory), in a way it is a market, or at least a market-like mechanism. It puts a value on endangered species and habitat, turning them into marketable assets. It puts a cost on the fly for those who would harm it, and at the same time it creates a value for those who would conserve it.

It is this marvelous alchemy – turning cost into value, liability into asset – that may ultimately allow society to preserve biodiversity. But does it work? And, if so, how does it work?

Wetland Mitigation Banking

Since the mid-1980s, the United States has had a series of functioning biodiversity markets worth more than \$3 billion a year. This system is currently the largest and most well-established experiment on Earth on creating biodiversity markets. Although these are markets involving the private sector, it is government that makes these markets possible.

The system that makes the flower-loving fly worth real cold, hard cash begins with government regulation. Indeed, it has its roots in two very important U.S. laws: the Clean Water Act (CWA) and the Endangered Species Act, both passed in the 1970s.

Although the CWA is basically designed to prevent the dumping of chemicals into the nation’s rivers, it is also in some respects a rather innovative biodiversity law – thanks to section 404, which attempts to prevent the placement of dredged and filling materials into the “waters of the US.”

Anyone wishing to dredge or fill a wetland considered of national importance in the United States must first obtain a permit through a program administered by the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (EPA).

In considering whether to award this permit, EPA and the Corps are supposed to follow a process known as “sequencing,” in which the first step is to determine if the damage to the wetlands can be avoided. If it cannot, the next step is to minimize the damage.

Finally, the developer is supposed to offset, mitigate, or compensate for any damage that cannot be minimized.

This hierarchy should be considered in all forms of offsets, but it is not usually codified into law. Section 404 of the CWA is an exception. The law is also quite clear on what is considered appropriate compensation for the damage to wetlands: developers must “create, enhance, or restore” an amount equal to or greater than the amount being damaged in a wetland of “similar function and values” in the same watershed. In some special cases, protecting a similar wetland is considered suitable compensation, though this is rare. The law recognizes that not all wetlands are equal: Someone cannot damage a wetland in California and protect one in New Jersey.

The compensation for any development projects that harm wetlands – whether done by private developers or the government – can be undertaken by the developers themselves or by third parties. And the Army Corps of Engineers and EPA are charged with overseeing this process and making sure the compensation happens.

One of the most interesting repercussions of this law is that there are now private, for-profit, wetland mitigation bankers who make money by creating, enhancing, and restoring wetlands and then selling the resulting “wetland credits” to needy developers.

They buy wetland areas in parts of the United States that are likely to experience economic growth; they work with the Corps and EPA to get “credits” for their “creation, enhancement, and restoration” of wetlands (hence creating a “wetland bank”); and then they sell these wetland credits to developers who find themselves in need of compensation.

Government Guides the Invisible Hand

In other words, wetland mitigation banking is possible because the government is restricting supply and allowing the market to set a price – a value – on this particular aspect of biodiversity.

In a way, it amounts to governments tinkering with the economic infrastructure in order to protect those aspects of biodiversity that should be valued, the externalities. And it is no small matter: Although there are no reliable figures on the size and value of wetland banking, the best guess is that there are more than 400 wetland banks throughout the United States, that the market for wetland mitigation is worth more than \$3 billion a year, and that entrepreneurial wetland mitigation bankers account for about one third of that business.

The rest is composed of people doing their own wetland mitigation in order to obtain permits or paying the government or nonprofit groups a fee instead of compensation.

Although wetland mitigation banking has proved to be a rather innovative concept – fueling the growth of a new “nature management industry” – it is important to point out that it is by no means perfect. Like all innovations, it has come in for some serious criticism. Some of these critiques are really about a reticence to assign a dollar value to biodiversity, reflecting an inherent dislike for the use of markets and capitalist tools to protect nature.

The critics often argue that the only way to protect nature is for government to restrict its use and strongly enforce this restriction. Although there is clearly a place for this type of protection, there are other powerful tools that should be used as well.

Besides, without wetland banking, U.S. wetlands would be worth little or nothing, and they would continue to disappear under strip malls, airports, and highways. With banking, their loss has at least a very real monetary cost and can generate funds that may actually lead to the creation of new, very similar wetlands.

More important, this cost sends a signal: developers who want to develop a site that has wetlands will spend considerably more per acre, so they had better be absolutely sure they must have that particular site.

The Shortcomings

Two other criticisms do merit concern, however. The first has to do with the fact that it is notoriously difficult to “create, enhance, or restore” wetlands, so the wetland acre used as compensation may be inherently “less valuable” in terms of biodiversity than the acre being damaged. Partly for this reason, many of the U.S. wetland banking systems require that each acre damaged be compensated with two, three, or more acres of wetland “created, enhanced, or restored.” It is a form of overcompensation or insurance and, while it alone does not resolve the matter, it does help.

So far, the studies on the quality of the wetlands created as compensation are mixed. In one study conducted in Ohio, scientists looked at the 12 oldest of the state’s 25 wetland mitigation banks. Although these had been studied and monitored by the Army Corps and EPA, the study found that many were not up to standard when checked against stringent scientific criteria. Indeed, against these measurements only three banks scored in the “successful category,” while five passed in some areas and failed in others. The remaining four failed nearly every assessment, functioning more like shallow dead pools than wetlands. More disturbing, none of the government agencies charged with oversight were taking the bank managers to task for this fact.

Overall, however, the study found that the banks were most successful when they maximized the areas defined as wetland, minimized areas of open water, and had similar plant and animal life to natural wetlands.

Ensuring Quality

Despite its implicit criticism of banking, the study’s author, wetland ecologist John Mack, remains one of the more steadfast supporters of mitigation banking. He says that the conclusion from his study should not be that banking as a concept is flawed, but rather that – when done properly – it can succeed. He argues that by using better designs, performance standards, enforcement, financing, and an appropriate watershed approach, wetland mitigation banking can produce high-quality wetlands.

The second important criticism centers on how wetland mitigation banks are monitored and implemented. How is it possible to ensure that an acre of wetland protected today will still be there tomorrow, the day after, and the day after that?

There is also a related question: Will funding be ensured to maintain the newly-created wetland?

Ensuring Longevity

To address these issues, the Corps and EPA require that wetland bankers provide both legal and financial assurances that the “created, enhanced, or restored” wetland will last (presumably) in perpetuity. The legal assurances usually take the form of conservation easements (legal restrictions on the use of land) held by third parties (usually a nonprofit or the government). The financial assurances can take a variety of forms. They are either trust funds set up to produce the interest necessary to run the bank or bonds or letters of credit that hold the bank financially liable for the protection of the wetlands.

In addition to these assurances, wetland mitigation banking requires a considerable amount of enforcement and verification. It needs the government agencies overseeing the system to continuously monitor and ensure that the promised wetland protection is delivered. Such “perpetual oversight,” however, is costly and is usually very difficult for understaffed and underfunded government agencies.

Nevertheless, as the mitigation industry grows it may generate the funds needed to monitor itself.

Despite these warranted criticisms, wetland mitigation is still probably a better system than the alternative—which, realistically, amounted to little or no real protection. Even if there were no wetland banking, roads would still be built, airports would still be constructed, and shopping malls would still go up. Wetlands, in other words, would still be damaged. History shows that society has not been very good at blanket prohibitions on the use of land.

And even if all further damage to biodiversity could realistically be prohibited, the problems of government enforcement and monitoring would still exist. It just would be spread out across tens of thousands of projects, and tens of thousands of acres of damaged wetlands, rather than across hundreds of wetland banks. In fact, numerous government officials report that the existence of wetland mitigation banking makes it easier for them to carry out their monitoring, enforcement, and protection work.

Endangered Species: From Liabilities to Assets

If endangered species are so important, so valuable, why does the economic system see them as liabilities? The perverse unintended consequence of the Endangered Species Act – forcing people to see endangered species as a liability – is nothing new. Ever since the act was passed some 30 years ago, people have been complaining that listing an endangered species places an unfair burden on the private landowners whose land harbors these species.

In such cases, they argue, the incentive is not to protect an endangered species but rather to get rid of it fast, before anyone knows it is there. This is what some have called the “Three Ss Approach to Endangered Species Management”: shoot, shovel, and shut up.

Critics of the ESA have often used this attitude to argue that the act needs to be revised or even dismantled. But rather than throw the legislative baby out with the bathwater, there are other, less drastic approaches. One of these involves a process known as conservation banking.

In the 1990s, people began looking for a better way to accomplish the ESA’s objectives – one that, instead of penalizing private landowners for harboring endangered species, would perhaps reward them. To do this, they created a system reminiscent of wetland banking. Under this system, landowners with an endangered species on their land can get a permit to harm that species (known as an “incidental take” permit in the euphemistic language

of the government) if they can show they have compensated for it by creating habitat for that same species somewhere else.

Again, as with wetland banking, this has paved the way for private, for-profit, species bankers to create habitat for endangered species, get credit from the government for any new members of that species found on their land (“new” meaning above an initial baseline), and sell those credits to other developers who intend to damage that species’ habitat or harm the species somewhere else.

Not much is known about the size and breadth of species banking across the United States, though it appears that there are more than 70 species banks and that these might trade anywhere from \$100 million to \$370 million in species credits each year.

Whatever the size, the use of conservation banking means that species banking, also known as “conservation banking,” can turn a species liability into a species asset. This is just what one company in Colton, California, discovered.

While the municipal government there sued the federal government over the Delhi Sands Flower-loving Fly, saying the government had no place regulating where people can build their houses, a sand and gravel company called Vulcan Materials Corporation acquired 130 acres of prime fly habitat—the largest remaining contiguous area of it in the Colton dunes.

But instead of hiring lawyers and attacking the fly’s endangered species status, Vulcan decided to see if it could make the fly pay.

Working with the U.S. Fish and Wildlife Service and the Riverside Land Conservancy, Vulcan set up a conservation easement on the land, created a management plan for the fly habitat, established a baseline for flies on its land, and obtained the right to sell “fly habitat credits” above that baseline to needy developers.

The bank opened in June 2005 and by December had already sold three of its credits.

Although Vulcan will not officially release the sale prices, reliable sources estimate that at least one credit sold for \$100,000, although they also say the price has now risen to \$150,000 per acre, as mentioned earlier.

According to Kevin Klemm, the owner of the development company that was Vulcan’s first customer, the credits were worth it. “The Vulcan Materials people were tremendous,” he says. “They were business-like and accommodating. They didn’t waste any time. The bank is a tremendous value... I spent six years of my life trying to build 18 buildings.”

And presumably he got nowhere because the government made it illegal for him to harm the flower-loving flies. Now, with a bank from which to buy offsets, he has an option.

To people like Klemm, the rapid response mitigation solution now offered by the Vulcan bank is no doubt a blessing. And Vulcan is not alone.

There are now conservation banks in the United States that sell credits on everything from vernal pool fairy shrimp and valley elderberry longhorn beetle to tiger salamanders, Gopher Tortoises, and prairie dogs. As noted, these

markets may be worth as much as \$370 million a year. The conservation of endangered species has thus become a very real, and very profitable, business opportunity.

Government Programs: Benefits and Drawbacks

Outside the United States, several other countries are also experimenting with regulated biodiversity offsets. For instance, the Australian states of Victoria and New South Wales either already have or are setting up schemes similar to the U.S. system, although with a few important differences.

The BioBanking system in New South Wales has proposed a scheme whereby some areas would be deemed too sensitive for development. These would be “red-flagged” and would ideally be the sites where species banking would occur. In other words, the Australians are looking at addressing one of the main pitfalls of the U.S. system: a lack of broad-based, landscape-level planning to determine which areas are most needed for conservation. For now, it looks like the BioBanking scheme will be voluntary, but the hope is that, since compensation for damage is obligatory, BioBanking will be cheaper than the alternatives.

In the state of Victoria, the BushBroker scheme is mandatory and applies to native vegetation. The principle is simple: whoever harms native vegetation in Victoria needs to offset that damage by creating or protecting the same type of vegetation in the same bioregion.

Applying this scheme, on the other hand, is extremely complicated. There are literally dozens of vegetation systems and bioregions, which makes finding the right match a daunting task. To address this problem, the government of Victoria is building a sophisticated computer matching system that it expects will be operational any day now.

The Challenge of Governance

While cap-and-trade regulated offset schemes to protect biodiversity can indeed create real markets and can be extremely powerful when used correctly, they also require strong government oversight, effective legal systems, enforcement of rules and regulations, and robust financial institutions.

These conditions may be found in some industrial countries, but they are not the conditions of much of world – especially in those parts that hold most of the world’s biodiversity, places like parts of Central and South America, Congo, China, Indonesia, Madagascar, and Mexico.

So, what can be done in those parts of the world? Fortunately, the underlying concept behind both conservation banking and wetlands mitigation banking – that is, putting a value on biodiversity – applies in all countries, even if the exact systems for providing these payments may not. Even the U.S. government has a multimillion-dollar-a-year program to help farmers and private landowners conserve.

It comes in the form of Farm Bill payments such as the Wetlands Reserve Program, the Conservation Security Program, the Conservation Reserve Program, and the Environmental Quality Incentives Program.

In Brazil, the government requires that a minimum amount of a landowner’s territory be kept in forest cover. There is also a law on Brazil’s books that requires compensation for damage to biodiversity, although the laws to determine that compensation are not adequately established yet. Similarly, in places as far afield as South

Africa, Colombia, and the European Union, laws requiring or encouraging biodiversity offsets are either being considered or already being implemented.

The Chinese government has long had a program known as Grain for Green (the official title translates as the Sloping Lands Conversion Program, or SLCP) that pays farmers to keep forest cover on hillsides. Its aim is to help conserve watersheds and prevent floods, but it also affects biodiversity conservation.

This is not a market-based system, however; it is a system of government subsidies and payments. The money comes directly from tax revenues and is redistributed based on certain established criteria. While the SLCP system does help increase the value of standing forests (and has an astounding budget of \$43 billion over 10 years), it does not directly link the users of the biodiversity services with the providers of those services. Government mediates the transaction, so the users of the service are not receiving information on the cost of their use.

Mexico is introducing a similar system. It was modeled on a program for water conservation in the country known as Pago por Servicios Ambientales Hidrológicos (PSAH, or Payment for Environmental Hydrological Services). The PSAH is interesting in that it collects a fixed amount of revenues from water users and then redistributes it to key targeted forested watersheds across the country.

The principle here is that by helping protect forested areas in key watersheds, the payments will help support the provision of water-related ecosystem services throughout the country. The program started in 2003 and pays between \$30 and \$40 a hectare for forest conservation, depending on the type of forest being protected. Currently the program is paying for the management of close to a million hectares.

Building on its success with water services, Mexico has received a grant from the Global Environment Facility to establish a similar program to make payments for biodiversity conservation. The problem with this approach is twofold. First, as in China, the money is coming from philanthropic sources or the government. Second, the payment and the payer are severed from the actual service being received. In other words, while all Mexicans contribute a bit of the money they pay for water to the PSAH, they often do not know they are making this contribution. And the money they pay is not necessarily used in the watersheds that supply those individuals with water. Again, the link between buyer and seller is not direct. This makes it difficult for users of the service to make decisions based on the economic costs of their use.

One of the most talked about payment for ecosystem services programs, as these are often called, is the Pago por Servicios Ambientales (PSA) program created by Costa Rica in 1996. Private landowners in Costa Rica who protect their forest cover receive a payment from the National Forestry Trust Fund. These payments are made at a base rate of \$40 per hectare but can vary depending on type of forest cover. Most of the money for this trust fund comes from a tax added to fuel sales in Costa Rica, but this is supplemented by “environmental credits” sold to businesses and other sources of international finance.

Between 1996 and 2003, the Costa Rican PSA program had enrolled more than 314,000 hectares of forested land, transferring more than \$80 million to landowners in the process.

Once again, this is a government-run program here the user and provider of the biodiversity services are not closely linked. Also, like China's Grain for Green program and Mexico's PSAH, the price per hectare of biodiversity is set by government, not via a direct market-based mechanism. They are in effect government

monopsonies (one buyer without competition, the opposite of a monopoly) for biodiversity services, and as such they may be paying too little or (though this is less likely) too much for the conservation of biodiversity. The price is largely arbitrary and based on the government's ability to pay rather than on supply and demand for the service.

Despite these drawbacks, the programs in China, Mexico, and Costa Rica have been extremely successful at giving added economic value to biodiversity and, some observers say, have also been successful in their overall goal of increasing forest cover.

A particularly interesting and different approach to payments for biodiversity services is found in Victoria in Australia. Through two programs there – known as BushTender and EcoTender – the state has established a reverse auction system for providing government payments to private landowners who conserve local biodiversity (among other goals).

The pilot for BushTender took place in Victoria in 2003, and according to Mark Eigenraam, one of its architects, it “used an auction system to distribute environmental funds to landholders who were interested in improving terrestrial biodiversity on their properties. The implementation of BushTender led to 5,000 hectares of native vegetation on private land being secured under management agreements. In economic terms, it created the supply side of a market for nature conservation and generated significant cost savings when compared with previous grant-based systems for distributing conservation funds to landholders.”

BushTender's success is now being followed up with EcoTender, in which the state is inviting local landholders to submit competitive “bids” for government funding to pay for improved management of remnant vegetation and re-vegetation on their properties.

“Where BushTender focused on a single environmental outcome (increasing terrestrial biodiversity), EcoTender aims to achieve multiple environmental benefits, including improvements in saline land and aquatic function,” explains Eigenraam.

What is interesting about BushTender and EcoTender is that they use government's monopsony buying power to invite bids that effectively serve to discover the “best” price at which biodiversity conservation will be achieved. Nevertheless, the buyer is once again the government using tax revenues, so the connection between the buyer or user of the biodiversity services and the seller is still not direct.

Voluntary Biodiversity Offsets

Beyond government regulation, numerous companies have begun to set up biodiversity offsets voluntarily in places like Qatar, Madagascar, and Ghana because they think it makes good business sense to do so. Like voluntary carbon markets, the number and investment in such offsets is presently modest. But they are likely to become much more widely used as a part of standard business practice.

Some observers believe that they could serve as the precursors to larger, more broad-based biodiversity markets in the long term. Essentially, they demonstrate that there can be a business case for investing in biodiversity conservation.

Expanding the Business of Biodiversity

To understand whether, when, how, and where voluntary biodiversity offsets should be undertaken, the Washington-based nongovernmental group Forest Trends established the Business and Biodiversity Offsets Program (BBOP). This is a partnership of over 50 companies, governments, conservation experts, and financial institutions from many different countries and led by Forest Trends and Conservation International.

The BBOP partners believe that biodiversity offsets may help achieve significantly more, better, and more cost-effective conservation outcomes than normally occur in the context of infrastructure development. The program aims to demonstrate conservation and livelihood outcomes in a portfolio of biodiversity offset pilot projects; to develop, test, and disseminate best practice on biodiversity offsets; and to contribute to policy and corporate developments on biodiversity offsets so they meet conservation and business objectives.

Companies undertake biodiversity offsets for one or more of three reasons: they are required to by national legislation (as in the United States, with wetland mitigation banking and conservation banking), they are encouraged to or facilitated by Environmental Impact Assessment legislation or other planning procedures, or they find a legitimate business case to get involved.

BBOP staff have identified numerous benefits for companies in doing this; namely, voluntary offsets can help companies:

- ensure continued access to land and capital and to the license to operate;
- bring competitive advantage or favored status as a partner;
- increase investor confidence and access to capital;
- reduce risks and liabilities;
- ensure strong and supportive relationships with local communities, government regulators, environmental groups, and other important stakeholders;
- influence emerging environmental regulation and policy;
- assure “first mover” advantage for innovative companies; and
- maximize strategic economic opportunities in emerging markets (for instance, establishing companies to implement offsets).

Currently, BBOP is working with partners on projects in a variety of countries, including Ghana, Kenya, Madagascar, Qatar, South Africa, and the United States, and is exploring projects in Argentina, China, Mexico, and New Zealand. Some of the companies the program is working with or in discussions with include Newmont Mining, Rio Tinto, Shell, and AngloAmerican.

As these experiences mount up, and as case studies become available on best-practice biodiversity offsets, it is likely that both the supply and demand for these offsets will grow. Countries that establish clear policies may improve land use planning and use market mechanisms to create aggregated offset areas that achieve significant conservation outcomes in high biodiversity-value areas.

How Much is Nature Worth?

Whether through voluntary offset mechanisms, government-mediated payment schemes, or full-fledged markets in offsets, the concept of payment for biodiversity services is beginning to take hold. More important, these approaches are beginning to subvert the current economic model that is blind to the value of biodiversity, to the services that species and ecosystems provide, and to the costs inherent in destroying the natural wealth on which human well-being depends.

The problem these systems are trying to address is self-evident: When iPods are valued over whale pods, the economic system will deliver ever more species of iPods and wipe out yet another species of whales. When wet-lands are seen as nothing more than mosquito-infested swamps, they will lose out to shopper-infested malls. And as land becomes ever more scarce, the problems will simply be aggravated.

The economic system is not broken. It is doing exactly what it was set up to do: deliver more of what people value – or at least more of what the imperfect price signals say people value – and less of what they don't.

The solution to the problem may actually lie in using markets and the economic system to our advantage. Imagine how powerful it would be if market forces – the same market forces that have inexorably pushed for the destruction of rainforests and the extinction of countless species – could be used to protect species, to give them a real value in people's everyday decisions of what to eat, what to wear, and what to buy.

To return to the questions at the start of this chapter: How much should society be prepared to spend to protect nature? The answer will in large measure determine whether humanity ends up living in a world of whales, wild tigers, and wetlands or a world of pavement, iPods, and pollution.

Better yet, we can hope that through a form of economic jiu-jitsu these market mechanisms will make it possible for the pavement and the iPods to co-exist comfortably with the whales and the wetlands.

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Water Trading: The Basics

By The Ecosystem Marketplace Team

Water trading has been hailed as the “next carbon”, and schemes for valuing and trading both water usage and water “inputs” are proliferating across North and South America, Asia, and Africa. The Ecosystem Marketplace reviews the fundamentals of this promising ecosystem market.

16 April 2008 | In the early 1980s, the de la Motte family realized that cow dung and fertilizers were finding their way into the aquifer that fed the family’s famous (and lucrative) mineral water plant in the town of Vittel, in northeastern France, after upstream farmers had replaced natural, filtering grasslands with corn.

By the end of the decade it had become clear the problem needed an innovative solution – one Vittel’s new owner, Nestle, spent the 1990s hammering out with local farmers. The company purchased 600 acres of sensitive habitat and signed long-term conservation contracts with farmers whose corn and cows had polluted downstream waters.

Nestle now pays these farmers to manage their animal waste, graze their dairy cows the old-fashioned way, and reforest sensitive filtration zones. Though costly, it’s a lot cheaper than the alternative. Competitor Perrier (now also owned by Nestle) once spent more than \$260 million on a global recall after benzene made its way into millions of its distinctive green bottles, and its market share has never recovered.

Payments for Ecosystem Services

Vittel’s action, like New York City’s payment to upstate farmers, has become a textbook example of a successful “PES” deal – short for Payments for Ecosystem Services – or, in this case, “payments for watershed services” (PWS). Such schemes, as frequent visitors to this site know, are based on the premise that ecosystems deliver valuable services that most of us take for granted – like filtering water in the above example – but whose value our economy doesn’t normally take into account.

PES schemes try to quantify the economic value of services that an ecosystem provides, and then either entice or mandate those who benefit from the service to pay the people who maintain them.

Unfortunately, for every successful PES scheme, there are scores of failures and near misses, and much debate about what works and what doesn’t.

Trading Water: Quantity and Quality

The Kyoto Protocol has put the trading of greenhouse gas emissions and offsets on everyone’s radar, but emissions trading actually began decades before the Kyoto Protocol was signed. The US Environmental Protection Agency’s (EPA) Emission Trading Program started in 1974, and allows a limited exchange of emission reduction credits for five air pollutants: volatile organic compounds, carbon monoxide, sulfur dioxide, particulate matter, and nitrogen oxides.

It kicked in at the height of the environmental movement in the United States. The first Earth Day was fresh in everyone's mind, and the federal Clean Water Act (CWA) and the Endangered Species Act were laying the groundwork for today's markets in water and biodiversity.

A Wetlands Savings Account

So-called "mitigation banking" covers the quantity of biodiversity and wetlands – which are more than just standing bodies of water. A well-functioning wetland plays a key role in filtering water and thereby "delivering" the ecosystem service of reliable water quality, as well as providing habitat for many plants, insects and animals that are part of the biodiversity of an area. These "services" are difficult to quantify – one reason environmentalists are up in arms over schemes that replace true wetlands with ponds and other bodies of isolated water.

Mitigation banking involves building up reserves of water capital, and is a key response to the CWA's section 404.

The Act mandates that anyone who plans to dredge a wetland that nurtures other waterbodies try to find a way to avoid its destruction. When this is not possible, the developer must first get a permit through a program administered by the U.S. Army Corps of Engineers and the US EPA. Then, if a permit is granted, the developer must "establish, enhance, restore or preserve" an amount of wetland equal to or greater than what is being dredged – usually in the same watershed.

Mitigation banks are essentially wetlands that have been pro-actively established, enhanced, restored, or preserved – in exceptional circumstances when the land was under significant threat – with the goal of generating credits that can be sold to developers later as offsets. The CWA requires mitigation banks to replace function as well as acreage of jeopardized wetlands, although many complain that the function requirement is often overlooked.

The Drive for Distribution

In addition, you have schemes that cover the distribution of water for drinking and agriculture, and no one has taken this further than the Australians, who've turned water into a commodity that is almost as easily-traded as electricity is in other parts of the developed world.

But it's in the developing world that such schemes could have their greatest impact. Studies show that the poorest usually pay the most for clean drinking water, while many industries simply waste it for free. Trading could put a uniform price on clean, delivered water, thus both reducing industrial waste and enabling delivery to areas that currently have poor access for drinking.

Using Markets to Control Pollution

So-called "nutrient trading" covers the bulk of the quality side – although the boundaries between quantity and quality blur and overlap.

Most watersheds contain two types of polluters – "point" sources and "nonpoint" sources.

Point sources are the ones we hear about the most: industrial enterprises or urban waste treatment plants that directly pollute a watershed from a single pipe or point. Most point sources are regulated by the National Pollutant Discharge Elimination System (NPDES), and have been the cornerstone of water pollution control in the US since the passage of the CWA.

Nonpoint sources, on the other hand, account for a whopping 80% of the nitrogen and phosphorous that ends up in US waters – and most of these are unregulated, for a variety of political, social, economic, and logistical reasons.

These sources include farms, such as those that leached into the de la Motte's watershed, as well as septic systems and new development whose pollution washes into a watershed over a diffuse area, usually in the form of run-off.

When run-off comes from agriculture, it's called a "nutrient" – but it's not the kind of nutrient your mother encourages you to eat with your Wheaties. Instead, these nutrients feed organisms that gobble up oxygen and lead to "dead zones" like those found in Europe's Black Sea. Such dead zones have been labeled a greater threat to humanity than global warming by the Millennium Ecosystem Assessment, a United Nations-sponsored project that engaged over 1,300 scientists and is easily the most extensive research program to date focusing on ecosystems.

The technology for alleviating the problem of agricultural run-off is readily available. Farms can reduce their run-off by changing the way they till, plant, or fertilize – at a cost of about 1/65 of what factories in the developed world would pay to reduce their levels of pollution emissions, according to one study.

That's where "nutrient trading" schemes come in. They put the reduction burden on factories and other point sources, but give them a chance to pay nonpoint polluters to reduce their pollution outtakes instead – so-called "point-nonpoint" transactions. In theory, industrial polluters will opt to pay farmers to reduce their pollution emissions along a river when those factories can't afford to invest in technology to further limit their own discharges.

This is the current holy grail of water quality trading, but most activity remains "point-point" – partly because nonpoint sources are difficult to monitor, but also because it's difficult to measure results. Also, non-regulated entities such as farms may be afraid of getting involved in voluntary schemes, no matter how lucrative, because they fear it will bring them into what they see as a regulatory boondoggle. In the weeks ahead, we will be addressing solutions on the table for addressing these and other issues.

The Beat Goes On

And there is, indeed, plenty on the table – with water schemes being proposed and implemented across Latin America, Asia, and Africa – as well as the United States, which got started in the early 1980's with point-point effluent trading on Wisconsin's Fox River and point-nonpoint trading on Colorado's Dillon Reservoir.

In 1996, the US EPA formally threw its support behind these trading programs, and several state initiatives have followed suit: Michigan with draft rules for nutrient trading in 1999, followed by the Chesapeake Bay Program in 2001.

The Chesapeake Bay Program, a multi-jurisdictional partnership that is working to restore and protect the Bay and its many resources, encompasses the three Bay states (Maryland, Pennsylvania, and Virginia), the District of Columbia, and the US EPA. But rather than being a unified trading program across the entire watershed, it is more of a hodgepodge of efforts with each state running its own trading scheme.

In early 2003, the US EPA released its Water Quality Trading Policy, identifying general provisions the agency considers necessary for creating credible watershed-based trading programs. Over a decade in the making, this policy identifies the purpose, objectives and limitations of these and other trading opportunities. The EPA has even gone so far as to publish a map of trading programs in the US and a trading toolkit.

The policy is flexible by design, letting states, interstate agencies, and tribes develop their own trading programs that meet CWA requirements and localized needs. Critics, however, say it's too flexible, failing to identify tradable pollutants and other basic parameters. This leaves the system undefined and fails to generate the kinds of certainty a true market requires.

Drivers for Water Quality Trading in the US

Two major factors in the mid to late 1990's prompted not only the rapid increase of water quality trading programs in the US, but also a fundamental change in the way that water quality trading programs are developed and implemented. The first factor is the highly-publicized success of the Acid Rain Program, which demonstrated the efficacy of market mechanisms when coupled with proper government enforcement mechanisms. This convinced many policy makers that emissions trading could be applied to water pollution control.

The second factor is the increasing number of so-called "TMDLs" (Total Maximum Daily Loads) being developed by states and US EPA as mandated by the CWA.

A TMDL is the maximum amount of pollution that a water body can assimilate without violating state water quality standards, and individual states determine the specific TMDLs for specific pollutants in specific bodies of water. TMDLs don't just cover chemicals, but also things like temperature. In theory, they can act as de-facto caps for emissions in cap-and-trade water schemes, and approaches based on TMDLs and a handful of other tools are already being tested across the United States.

The calculations themselves are complex and the subject of much debate, but the existence of TMDLs identifies the sources and estimates the quantity of pollutants targeted for possible trading. This debate, in part, helps create the driver for a market – for in a well-structured market, the price of a pollutant will be tied to the actual amount of reduction necessary to meet the TMDL, and not to an arbitrary cap.

Water quality trading can also occur on a "non-TMDL" waterbody (one that is not impaired or one that the government has not gotten around to developing a TMDL for), and trading can occur much sooner because nonpoint sources do not have to meet the TMDL minimum before a trade can occur. This is generally referred to as "pre-TMDL" trading.

This allowance was made because the TMDL minimum threshold may, in many cases, be too high and too expensive for nonpoint sources to meet, and could discourage them from pursuing a trade.

For a trade to occur in a TMDL waterbody, nonpoint sources must first meet their load allocation, then any additional amount of reduction they can accomplish can be sold to offset point source loads.

The TMDL trading unit is the specific pollutant identified in the TMDL. For example, in nitrogen TMDL, the unit is one pound of nitrogen removed from the waterbody; for a temperature TMDL, the unit is one degree of temperature lowered in the waterbody.

Despite the availability of these promising mechanisms, however, demand has been slow to materialize. For these markets to reach their true, enormous potential, awareness must be spread across both the private and public sectors – and to the community at large.

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Global Developments

Between Purity and Reality: Taking Stock of PES Schemes in the Andes

By Sven Wunder

Many people talk about payments for ecosystem services (PES), but how much is actually going on out there in the field? Sven Wunder, Senior Economist at the Center for International Forestry Research (CIFOR) in Belém, Brazil, tells the Ecosystem Marketplace what he found in their 2006 survey of field initiatives in the Andes.

27 October 2006 | Six years ago, the International Institute for Environment and Development (IIED) published a desk study assessing Payments for Ecosystem Services (PES) worldwide, and in 2006 the Center for International Forestry Research (CIFOR) and its partners concluded national-level PES reports that took IIED's effort one step further. In four Andean countries (Bolivia, Ecuador, Colombia and Venezuela), we field-assessed a series of PES schemes (incl. the ones reviewed by IIED). We were looking for real-world schemes that fit a simple, theoretically founded definition of PES: a voluntary, conditional agreement between at least one buyer and one seller over a well-defined environmental service (or a land use likely to produce the service). The results gave us a diagnostic of where PES implementation stands in the Andean region with respect to schemes dealing with carbon, watersheds, scenic beauty and biodiversity protection.

In **Bolivia**, our published report documented a growing demand for watershed protection and ecotourism (scenic beauty). But only a few genuine PES pioneers exist; most initiatives lean more towards traditional project approaches. There is an ideologically motivated skepticism towards PES as an alleged “neoliberal” approach to natural resource management, but also real concerns about disguised privatization of public-access resources such as water, or about lacking key preconditions for PES, such as secure land tenure. Future options for PES expansion are probably greatest in Bolivia's lowlands (“Media Luna”), where PES-like direct economic incentives are currently the most accepted.

Ecuador was the country with the richest portfolio of PES implementation. Two pioneer schemes that fully fit our PES definitions have been running for 5-10 years: the PROFAFOR carbon sequestration program and the Pimampiro municipal watershed scheme. These forerunners have now inspired a new generation of local, self-organized PES schemes covering all four service types. Although the central State plays no role in any of these initiatives, the political and ideological climate towards PES is much less hostile than in Bolivia, providing an optimistic outlook for PES.

Colombia was probably the most advanced Latin American country in terms of creating innovative mechanisms for domestic environmental financing. While Colombia thus widely charges its environmental service users, the country is less advanced than Ecuador in terms of compensating the service providers.

Most environmental resources go to traditional project activities, studies, and administration. A national scheme for protecting critical watersheds had been designed, but was never implemented. Significant PES potential seems to lie at the district level (corporaciones), where the bulk of environmental finance is administered.

In **Venezuela**, no genuine PES or PES-like schemes existed at that point, mostly because of political skepticism about the mechanism. However, a hitherto under-utilized national program (Subsidio Conservacionista) constitutes a potential legal framework for PES. Furthermore, increasing demand for environmental services, especially for watershed protection, suggests a large potential for (and local-level interest in) PES. In some of the six screened sites, PES would seem feasible, if the service users' willingness to pay can be captured. Unlike in Ecuador, in Venezuela this may only be achieved with close participation of the State.

In summary, PES development in the Andean region is uneven, with some countries (Ecuador, Colombia) being more advanced than the others (Venezuela, Bolivia) – and political-ideological factors explain much of the variation. Watershed services clearly dominate, and demand for them is rapidly expanding, followed probably by scenic beauty, carbon and biodiversity services (in that order). All running schemes are self-organized by buyers, sellers and intermediaries, circumventing the power of the central State. Basically all schemes are bilaterally negotiated deals, not genuine “markets”.

Furthermore, the bulk of real-world schemes are, at best, “PES-like” schemes, i.e. direct economic incentive packages that satisfy most but not all of the PES definitions. In particular, two shortfalls are common. First, many schemes have failed to cultivate buyers among the service beneficiaries, drawing instead on external donors' contributions. The second-most non-met PES condition is “conditionality”: most implementers seem to shy away from the business-like feature of only paying the providers if they actually deliver the agreed-upon service. In general, they are too concerned about disrupting their relationship with poor rural farmers to withhold payment.

Is it a problem that Andean PES reality does not live up to what the PES theorists had imagined in their scientific articles? In principal, it seems rational not to use the infamous one-size-fit-all model, and to carefully customize PES deals to local conditions instead. However, we believe that many of the existing PES-like initiatives could drastically increase their chances of success if they managed to adhere more closely to the pure PES principles. For instance, when service users do not pay, it is almost impossible to make a PES scheme sustainable, as the donors will sooner or later withdraw. And when there is no strong conditionality, service delivery will in most cases sooner or later become compromised. Hence, following a simple set of guiding PES principles is not just a question of academic grace; it impacts directly on the functionality of the implemented mechanism.

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Malua Wildlife: Orangutans in the BioBank

By Alice Kenny

Palm oil is a natural biofuel that also supports the economies of several developing nations, but growing it means chopping down the rainforests. That also means more carbon in the atmosphere, more global warming, and less habitat for countless endangered species. Now an innovative project in the Malaysian state of Sabah is betting that endangered species are worth more than palm .

30 September 2008 | The Eden of South East Asia, Malaysia's Sabah State provides refuge for one of the most intelligent animals after man: orangutans, as well as an assortment of other unique and critically endangered species. Its tropical rainforests grow lush with palm-oil plants, one of the most versatile forms of vegetation on earth. And its government, celebrating the land's fertility, brags that its citizens enjoy one of the developing world's highest per capita incomes (\$14,400 per year) in what is an otherwise largely impoverished region.

But as another resident of Eden, the biblical Eve, found, balancing a paradise's temptations can be tough. Malaysia's bounty comes bedecked with inherent conflicts that pump up one asset to the demise of others.

Palm oil plantations and logging, for example, form this economy's backbone – but they also destroy rain forests, digging up peat, an organic sponge that sucks up huge amounts of carbon. Destroying these forests causes far more global warming, experts say, than any benefits brought from substituting palm oil for fossil fuels.

More pressing still, these plantations have already destroyed essential refuge for the orangutan, man's closest mammal cousin. United Nations experts say that if nothing is done, these and other critically endangered species could disappear entirely within the decade.

The Value of Nature

Sensitive both to their bounty's precariousness and to threats of boycott from environmentalists, the Sabah State Government sought alternative revenue streams to logging and palm oil plantations, and one option was to sell development rights on the carbon credit market. But this would not restore habitat nor necessarily protect the orangutan and his fellow endangered species.

Moreover, as Harvard University environmental science professor and environmental trading guru John Holdren says, "valuing forests only for their carbon is like valuing a computer solely for its silicon."

So the government teamed up with Eco Products Fund, a private equity investment vehicle jointly managed by New Forests Inc. and Equator Environmental, LLC to test-run an innovative ecosystem banking plan they project will protect these endangered mammals while depositing funds into state coffers.

Swapping Plantations for Biodiversity

Specifically, the state banned the multi-billion dollar moneymakers of logging and oil palm plantations within its 80,000-acre Malua Forest Reserve. This area, roughly the size of Detroit, Michigan, is composed of totally logged, partially logged and completely preserved rainforest. And it launched the first-ever tropical rainforest conservation bank last month, a distant cousin to conservation banks that have sprung up over the past decade in the United States, making investing in endangered-species protection a potentially big money maker for the savvy green investor.

Scientists and environmentalists praised this environmental market innovation.

“Whenever someone’s willing to spend money to protect nature, it’s worth working with them to try to make it real,” said Bruce Hamilton, deputy executive director and climate adaptation specialist for the Sierra Club.

But Hamilton and others express concern that shortcomings in analyses and accountability that plague other environmental markets could undercut this new market as well.

“We need to look at what’s being promised versus what’s being sold,” he said.

The Superman of Veggie Oils

Closing the door on new palm oil plantations and logging propositions takes guts, most financial experts agree. The palm oil plant’s potential appears almost magical, making it the most productive oil seed in the world. Palm oil plants that were first imported into Malaysia in 1910 today provide more than half the world’s crop, according to the Malaysian Palm Oil Association. They are Malaysia’s leading agriculture export and its major generator of foreign exchange.

Versatile and cheap, palm oil is used in ten percent of all supermarket products – from chocolate to toothpaste to soaps. Multiplying this commodity’s rock-star status, palm yields nearly ten times as much crude oil per cultivated acre as its closest competitors, soybeans and corn.

The problem is that oil palm plantations have destroyed nearly fifteen thousand squares miles of Malaysia’s rainforests, an area roughly equivalent to the entire nation of Denmark or the states of New Jersey and Massachusetts combined. Rainforest loss, as most people who follow the carbon market already know, is bad news for global warming.

It’s also bad news for orangutans, balding beasts bedecked with tufts of reddish-brown fur that make tools such as leaf umbrellas, communicate through high-pitched howls and nurture their children nearly into adolescence. The world’s last intact population of orangutans has hung on so far in the land where the biobank is planned. But to survive long term, they need an expansive, connected canopy of rope vines and tree tops.

Palm plantations here also acted as death warrants for critically endangered Borneo pygmy elephants, gibbons, clouded leopards and hundreds of species of birds. And they have decimated the Sumatran Rhino; two of the remaining 40 Sumatran Rhino on the planet struggle to survive on land owned by the future Malua BioBank.

Cutting the Deal

Responding to these concerns, the Sabah State Government in Malaysia worked with Eco Products Fund to create a first-of-its kind business model for rainforest conservation called the Malua Wildlife Habitat Conservation Bank.

Investor insiders say that, from a financial perspective, the venture is high-risk, high reward. A \$10 million investment is slated to return \$36 million. Investors, who New Forests Director Radha Kuppalli said asked to remain anonymous, will reap this windfall within six years. But first, the conservation bank will use their investment to protect and restore habitat and maintain it in this condition for 50 years.

How it Works

To recoup its money, the bank divides the land into 100-square meter plots, selling interest in each restored plot as a “biodiversity credit.” The typical credit buyers are expected to be companies that use palm oil in their products, including soap and biofuel producers, Kuppalli said from her Washington D.C. office. She declined to name names since the Bank is in the midst of negotiations.

Unlike typical environmental markets including conservation markets in the United States that serve as a partial model for the Malua BioBank, the credits will not serve as offsets for palm oil produced elsewhere. Instead, they assign a value to environmentally friendly conservation and may green-up purchasers’ reputations.

Concerns

Scientists and environmentalists not involved in the deal said they felt encouraged that Malaysia, a nation that has supported its rainforests’ conversion to palm oil plantations and appeared to ignore the issue of illegal logging, may now be moving towards conservation. But many expressed skepticism about a deal drawn between a government with this history and private investors intent on making a profit.

Quantitative ecologist Dr. Robert Wagner, a consultant for conservation banks in the United States, cautioned that the “whole plan needs to be laid out so everyone’s aware of what the deal is.”

But the deal is difficult to completely assess because much still needs to be determined. Its conservation management plan already contains concrete requirements such as destroying creeping vines that choke the forest, replanting trees, building nests and creating rope bridges that enable orangutans to travel from treetop to tree top. Moreover, progress against key management goals and priority actions outlined in the conservation management plan will be reviewed annually by a steering committee composed of members of the Sabha government. and Malua biobank and by an advisory board composed of local and international NGOs and scientists, spokespersons say. If the agreement is breached, it contains stiff financial penalties against the government.

But because restoring rainforests for animal conservation is novel here, the BioBank describes its conservation plan as a “living document” that provides flexibility to react to unanticipated demands.

Still, one man’s flexibility is another man’s lack of accountability.

Dr. David Wilcove, a Princeton University biologist who specializes in endangered species in Malaysia, said he hoped this type of innovative partnership could reduce the worst outcomes for biodiversity that he has been tracking. But past precedent left him concerned, he said, that credit for this project could provide cover that would allow the Malaysian government and palm oil producers to destroy habitat elsewhere.

If additional rainforests are being cleared outside the Malua BioBank for palm plantations, other endangered species will likely be impacted. In carbon language, protecting one area at the expense of another is referred to as “leakage.”

Shouting to be heard as he got off a San Francisco subway while on a short vacation, Wilcove said that “you’re not being terribly green if on the right hand you support a forest restoration project while on the left hand you support conversion of a forest somewhere else.”

Moreover, unlike conservation banks in the United States that set up non-wasting endowments to protect land and species in perpetuity, Malua has a nonwasting endowment - equal to 20 % of sales revenue from biodiversity certificates - that can be used to pay for conservation and ongoing protection for the initial 50 years.

At the end of the 50 years when the endowment is fully capitalized, it could be used to renew the conservation lease. While the government is not required to renew this lease, if the endowment is sufficient to provide competitive fees as its sponsors expect, it could continue protecting the land. Moreover, if the area is no longer at risk, the money could be moved to other critical conservation areas to initiate the protection process again.

From one perspective, Malaysia’s recent actions offer reassurance that these uncertainties should not necessarily cause concern. The nation agreed last year to prohibit logging, and in June it announced a prohibition against further clearing of forest reserves for oil palm plantations. Only areas zoned for agriculture would be allowed to be converted for palm oil production.

But opponents point to export statistics that appear to belie the government’s earnestness. Just this month, Malaysia announced that palm oil exports rose 77 percent in value from the year earlier. The increase comes partly from higher prices responding to increased demand and partly from increased production either within or outside of forest preserves.

Not Easy Being Green

Perhaps more than any other country, Malaysia demonstrates the difficulty of finding valid green solutions in a green cash world.

Kuppalli has personally observed orangutans in Sabah and assessed their habitat’s destruction and planned for their protection. She points out that “Malua is a globally unique forest. We can’t spend twenty years coming up with a (perfectly quantified) model...because the forest would be logged off and the animals would be long gone by then.”

Global Developments

There is no time left for holding hands and singing Kumbaya. If nothing is done, experts agree, the orangutan, or “man of the forest,” as well as several other beloved but endangered species could disappear completely within the next few years.

The issue, Kuppalli said, is “whether the world is ready to be optimistic, think differently about conservation and give innovative forestry projects a chance.”

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New US Federal Office Puts Ecosystem Markets at Forefront of Resource Management

By Steve Zwick

Ecosystem Marketplace has long envisioned a world in which farmers and ranchers are paid to save natural ecosystems that filter water, sequester carbon, and preserve wildlife – in addition to growing corn and hay. Now the US Department of Agriculture has taken a giant step towards realizing that vision as part of a massive realignment of the management of natural resources.

18 December 2008 | It took the formation of the Securities and Exchange Commission to create a trustworthy market for securities in the United States, and it took the formation of the Commodity Futures Trading Commission to legitimize futures and options trading by offering clear regulations backed by the rule of law.

Now, a similar evolution is taking place in ecosystem markets, which supporters believe have the power to save the planet's natural resources by identifying their economic value and encouraging Payments for Ecosystem Services.

The concept has progressed dramatically over the past two decades, with burgeoning markets for biodiversity and water quality emerging from California to Dar es Salaam.

In practice, however, the only real successes have come in cap-and-trade emissions schemes like the ground-breaking reduction of SO₂ emissions in the United States and, of course, the massive carbon markets.

Time and again, experience has shown that such schemes hinge on government support and regulatory drivers - both of which have been sporadic in carbon trading and woefully lacking in both water quality and biodiversity trading.

Bringing Order Out of Chaos

That looks set to change in the United States, where the Department of Agriculture (USDA), under a mandate embedded in the 2008 Farm Bill to promote incentive-based conservation, has opened an Office of Ecosystem Services and Markets (OESM), headed by USDA Forest Service vet Sally Collins, who has won accolades for introducing market-based mechanisms into the Forest Service's sustainable land management policies.

She reports directly to the Secretary of Agriculture, and the new office is charged with providing “administrative and technical assistance to the Secretary in developing the uniform guidelines and tools needed to create and expand markets for these vital ecosystem services,” according to a press release posted on the USDA’s web site.

Department of Homeland (Environmental) Security?

The OESM also supports the Conservation and Land Management Environmental Services Board, a massive oversight board comprised of the Secretaries of Interior, Energy, Commerce, Transportation, and Defense – as well as the Chairman of the Council of Economic Advisors, the Director of the White House Office of Science and Technology, the Administrator of the Environmental Protection Agency, and the Commander of the Army Corps of Engineers.

Rio's Atlantic Forest Fund: Spreading the Environmental Wealth

By Steve Zwick

The Brazilian Biodiversity Fund (FUNBIO) is testing a new approach to disbursing funds collected under Brazil's Environmental Compensation Law. Dubbed the "Atlantic Forest Fund", it's designed to create a massive pool of liquidity for all forms of environmental finance impacting protected areas in the state of Rio de Janeiro.

12 March 2009 | When Carlos Minc needed someone to set up a mechanism for disbursing funds to worthy environmental projects under Brazil's *Compensação Ambiental* (Environmental Compensation Law), he called the Brazilian Biodiversity Fund (FUNBIO), a non-governmental organization (NGO) set up in 1995 to support government action in support of biological diversity.

True to that mission, FUNBIO's financial mechanisms unit responded with the blueprint for a project that has since become the "Atlantic Forest Fund", an ambitious endeavor that goes well beyond Minc's goal of creating a support mechanism for the *Compensação Ambiental* and is best described as a statewide ecosystem marketplace that aims to channel private money into ecosystem development projects, regardless of whether that money comes from Payments for Ecosystem Services (PES) or from philanthropy.

"It's called a fund, but it's not really a fund in the legal sense of the word," says André Ilha, who is Director of Biodiversity and Protected Areas for the state's Instituto Estadual do Ambiente (INEA), which was formed through the merger of several state environmental agencies over the past two years. "It's more accurately described as a financial mechanism which will provide the means of applying more efficiently and with more control and transparency all of the money assigned to the creation and implementation of parks and reserves administered by the state government."

The mechanism recently launched in pilot form after Manoel Serrão, who heads FUNBIO's financial mechanisms unit, and his team spent two years surveying the environmental and regulatory landscape of the state's protected areas – a process that involved documenting the threats to protected areas and their current state of degradation, identifying potential and existing solutions, charting potential and current income flows, and compiling an analysis of the various laws and institutions impacting the areas. Making that data freely-available became the first step in creating a mechanism that Serrão believes will lead to a more transparent and liquid market for ecosystem finance across the state.

“It was during this research phase that we realized what a tremendous opportunity exists now for non-governmental organizations (NGOs) to play a role in administering significant resources for protected areas,” he says.

Long Time Coming

The *Compensação Ambiental* came into force in 2000 and echoes other laws that promote species banking, wetland banking, and water quality trading – all of which are based on the premise that if you damage the environment, you should carry the cost of fixing it.

In the case of the *Compensação Ambiental*, payments are directed towards protected areas equivalent to the International Union for Conservation of Nature (IUCN)'s Category One (nature reserve, free of development) or Category Two (limited protection) Protected Areas, and money collected under the law is earmarked for five specific uses: studies for the creation of new reserves, the creation of management plans, sorting out land-tenure issues, purchasing goods and services necessary for managing an area, and management-related research.

Unlike most PES schemes, however, the *Compensação Ambiental* doesn't establish a price tied directly to the market cost of replacing damaged areas, but instead requires the assessment of a licensing fee based on the un-mitigatable impact of the project development, the proceeds of which are then channeled to conservation projects in protected areas.

Because the fee was initially based on a percentage of the project's development cost, some companies fought the law in court, claiming the fee was arbitrary and not related to environmental impact. Last year, the Supreme Court agreed.

Now the compensation fee is capped at 1.1% of the industrial project's development cost, and the court is overseeing the creation of an impact-driven process for issuing licenses.

All parties have already agreed that a “Compensation Chamber” made up of representatives from industry, academia, government, and the environmental community should review projects submitted for funding, but the Court has still not passed judgment on how the final guidelines should deal with funds already collected, as well as a variety of other issues.

Once these issues are resolved and the guidelines clarified, the federal licensing agency will adapt its formula according to the ruling. Then, because licenses are issued by either federal or state authorities (depending on the type of project and whether its impacts cross state borders), each state will transpose the federal formula into its own system.

Regardless of whether the licensing agency is state or federal, the money will flow to protected areas administered by the state or even municipalities, depending on which areas are directly impacted or near the project – but companies paying the fees have some leeway in determining how the money is spent.

Compliance Choices

Under *Compensação Ambiental*, a company has three ways to spend the licensing fee, provided the money goes to one or more of the five activities specified by the law.

The first option is for a company to execute the payment itself, which theoretically leaves the door open to something akin to US-style mitigation offsets, but in practice means companies administer every detail of the project themselves.

“Companies don't like this, because it means they have to put a lot of effort into an activity that is not core to their operations,” says Ilha.

So far, the only company to take this option is the private-public energy group *Petróleo Brasileiro* (PetroBras), which was able to sub-contract the environmental offset for a hydroelectric plant it purchased.

The next option is to deposit the fee into the responsible environmental agency, which Ilha and Serrão say would burden regulatory agencies with administrative tasks they are not designed to handle.

“You're taking money that's private and free and transparent and not burdened by administrative requirements imposed on governments and then putting it into that system,” adds Serrão. “Plus, if the money doesn't get spent by the end of the fiscal year, it is absorbed into the larger government budget and is no longer earmarked for environmental purposes.”

The final option is to put the money into a financial mechanism like the Atlantic Forest Fund.

Minc, who last year became Brazil's federal Environment Minister, had contacted FUNBIO because of the group's work in administering the Amazon Protected Areas Program (ARPA).

“With ARPA, FUNBIO managed to distribute R\$55 million among several NGOs without raising legal disputes or challenges,” says Ilha. “That indicates that they work competently and in a way that keeps all stakeholder happy, which is quite an accomplishment.”

The Role of the Fund

Under the scheme, FUNBIO opens a bank account in the company's name, and the company deposits its compensation fee into the account. FUNBIO then acts as the permanent administrator of the funds – but only under the watchful eyes of regulators and contributing companies.

“We and the companies are free of the burden of having to do this directly, while FUNBIO – which has the structure to administer the fund – does what it is good at,” says Ilha. “Every step is registered in the system, so that the environmental sector of the government has instant access, as do external organs such as courts and public ministries. You have absolute transparency, and projects are developed more efficiently than they have been so far.”

The Diversification Advantage

The mechanism is divided into several components, chief among them being the compensation fund for administering money collected under the *Compensação Ambiental* and the donation fund for administering money from philanthropic donors. Within the compensation fund, an endowment fund is to be maintained to cover recurring expenses such as maintenance and repair of facilities on protected areas.

“Money coming into the compensation fund for compliance purposes can only be used for a limited number of activities laid out by the law, while money coming into the donation fund can be used according to the donor’s own specific criteria,” says Ilha.

“When we talk about a fundraising strategy, we’re not interested just in the volume of funds, but in the diversity of the funding sources,” adds Serrão. “That’s because the source determines what can be done with compensation money. If it comes from the compensation scheme, it is limited to five uses, but if you have a diversity of donor sources, it’s possible for us to expand beyond these five things.”

That makes it easier for donors and NGOs with compatible but narrow mandates to find each other. The donation fund is even flexible enough to channel carbon payments and biodiversity payments – but individual states have to decide whether they want to recognize payments REDD.

“You have some donors that only want to support family farming around protected areas, for example,” says Serrão. “When we receive a request from the protected area to support family farms, we have the ability to point them in the right direction – even if we’re not administering the money.”

More Than Just Money

Indeed, Serrão believes that the overall transparency generated by the fund’s existence will have knock-on benefits that resonate well beyond the money it directly disseminates.

“Money doesn’t have to flow through the mechanism, but the mechanism has to know what is out there,” he explains.

That, he says, not only encourages NGOs across the state to communicate with each other and focus on common goals, but also creates the kind of transparency that private-sector donors increasingly demand.

The Benefit of a Guiding Principle

Then there’s the matter of focus: the fund’s existence has forced the development of a more coherent vision for all protected areas.

“It’s requiring the creation of a medium-term planning process, and forces us to take stock of what’s available on the resource front and what demand exists from the protected areas,” says Serrão. “We can design the fund with a clear idea of what the state of the protected areas should be in four years.”

That vision, and the promise of a concentrated pool of capital to help carry it out, is already providing an incentive for NGOs and others active in the protected areas to draw up detailed proposals designed to meet specific targets. What’s more, because projects proposed for compliance purposes have to be approved

by a governance council comprised of representatives from industry, government, and the environmental community, there should be more pre-vetted projects for non-compliance donors to choose from.

Cash Brings Cash

Early on, FUNBIO decided to design the fund's scope based on the most conservative estimates of the amount of money the compensation mechanism might deliver. That meant beginning with roughly \$R(

Brazilian Real) 75 million already sitting in escrow for *Compensação Ambiental*, and putting out word that roughly \$R100 million more should be available for conservation projects over the next four years from the *Compensação Ambiental*.

But there could be more cash in the kitty. While charting the landscape, FUNBIO found that protected areas in the state of Rio tend to attract significant amount of investment for environmental projects.

"It's an interesting perspective," says Serrão. "When you talk to a mayor, they're likely to say that protected areas cost money and take away jobs, but we've found the opposite: places with protected areas are getting investment because of compensation and complementary investments, such as royalty payments from petroleum – and environmental investments are the 10th largest economy in the state of Rio."

The Measure of Success

Because of its scope, the test of the fund's effectiveness will lie not in the achievement of individual projects, but in the state of the protected areas four years down the road.

"We will be able to evaluate how areas have progressed from no infrastructure in place to plenty of infrastructure to fully functioning protected areas. We will know if a protected area has progressed from being a paper park to a truly consolidated protected area."

The Pilot Initiative

Like the larger fund, the pilot project involves two mechanisms: one using the rules from the compensation fund, and one using rules from the donation fund.

The R\$3.1 million compensation payment comes from German steel and engineering giant Thyssen-Krupp, while the donation of R\$510,000 comes from Germany's KfW Bank Group (formerly the *Kreditanstalt für Wiederaufbau*, or *Reconstruction Credit Institute*).

"It's like hiring an architect to create a blueprint for house," says Serrão. "We've given the state of Rio a blueprint for the mechanism, and now we've offered to build a scale model – the pilot project – to put that into practice to show you what it will look like."

If the mechanism takes hold, you can bet it will spread to other states as well. At least four other Brazilian states have already begun the process of adapting the process to their own needs.

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Hydrological Services Payments in Brazil¹

By **Fernando Veiga**

1 April 2009 | Nothing is more necessary to human development than water—it is a part of our daily routines and used for a wide variety of purposes from drinking to cooking, personal hygiene, animal consumption, industrial use, and irrigation. There are few examples of natural capital so emblematic of the limitations for development as the decrease of water (in both quality and quantity) for human populations around the world.

Design and implementation of any Payments for Environmental Services (PES) scheme based on forest water services should be required to follow a number of guidelines: a) identification and quantification of the hydrological services; b) identification of key beneficiaries and the charge for the hydrological services; c) development of payments for environmental systems that work; d) addressing institutional and political economy issues (Pagiola, 2002).

Water-based environmental services markets differ from carbon-based markets in that their regional characteristics create a scenario where market construction does not demand institutional arrangements through international players. Therefore, water-based service markets can often be resolved at the watershed level, which is the most desirable scale when seeking to address water issues.

Economic Impacts of the Forest-Watershed Interface

While there is consensus regarding forests' role in mitigating climate change, there is not a similar agreement within the scientific community or among the public on the relationship between native forests and water services (quality and quantity) in regards to watersheds. Even in areas where science and the public are in agreement, there remains a high degree of uncertainty related to the intensity or magnitude of the effects of forests on water quality and quantity. This is largely due to the fact that in the case of forest water services, site conditions created by differences in altitude, topography, soils and other factors determine the final effects of any changes in forest cover or land use. As each case must be considered on a provincial level, local and regional studies are critical for a comprehensive understanding of this relationship.

Despite ongoing debate between forest hydrologists, some views remain undisputed, namely those involving the balance between a forest's primary purpose of evapotranspiration (the "pump" effect), and water infiltration into the soil (the "sponge" effect). The main relationships can be summarized as follows. Forests: 1) reduce water runoff in any watershed; 2) reduce soil erosion and sedimentation into rivers and streams; 3) reduce total annual flow; 5) increase or decrease the springs and groundwater recharge; 6) can influence rainfall patterns on a regional scale. Additionally, forest loss alters freshwater biodiversity, and forest soils filter water contaminants. (Johnson & Perrot-Maitre, 2000).

Based on the relationships described above, we can say that hydrological services from forests are categorized into water quality, flow regulation, water supply, and water resources productivity. Any PES market or scheme developed will by design be linked to one or more of these services. One of the first steps for the establishment of a PES scheme is to identify which service will be the focal point and who will be the

¹ This paper is based on the author's thesis titled "The Institutional Construction of Environmental Services Markets and Its Implications for Sustainable Development in Brazil"

primary beneficiaries. Beneficiaries could be any number of a diverse group of stakeholders, including hydro-electrical power companies, water suppliers, sport fisherman, and others.

After the identification of services and beneficiaries, the next step is to evaluate the potential economic impacts of forest conservation and/or restoration measures on each of the economic activities that would be affected by forest loss. Such impacts include any decrease in capacity of hydro-electric power generation; costs associated with dragging reservoirs and maintaining ports; increase of water treatment costs; decrease of commercial fisheries production; and decrease in revenues from recreational activities, etc (Aylward, 2002).

Development of Payments for Environmental Services Schemes

Following the perception of the economic importance of forests for water issues, a series of PES experiences have been developed in different parts of the world, due to the central importance of water for human societies and the understanding that hydrological effects downstream are caused by decisions made by landowners upstream. The impetus for these programs is an increased understanding that water is essential for all human societies, and that the hydrological effects downstream are caused by decisions made by landowners upstream. Given the economic impacts of those decisions, PES schemes can be integrated into landowners' decision making processes, and the potential benefits of these decisions may lead to the best (or at the very least, a good) solution for watersheds management.

Payments of Hydrological/Watershed Services schemes are generally classified into three categories, distinguished by level of government participation (Powell & White, 2001):

- private agreements between the services' providers and the beneficiaries, where there is no need for new legal or regulatory arrangements.
- trading schemes, where after the establishment of an environmental standard by any regulatory agency, parties trade among themselves in order to reach the set standard at minimum cost.
- public schemes, where payments are made by the public sector, a government entity or a public institution such as a Watershed Committee pays for the environmental service

Legal and Institutional Frameworks in Brazil

In Brazil, several legislative instruments offer legal and institutional support to the implementation of PES schemes throughout the country. The first and most significant is Law 9433, which regulates the National Water Policy and also establishes water user fee rates, allocation of resources to the maintenance or increased health of watersheds for which funds have been earmarked, and gives the Watershed Committee the legal power to decide the best way to spend these resources. The implementation process of Law 9433 has been occurring gradually throughout the country in the main federal watersheds and in some of the urban states such as São Paulo, Minas Gerais and Rio de Janeiro. The potential of these watershed schemes is significant. One example is the Piracicaba-Capivari-Jundiá (PCJ), one of Brazil's key watersheds, which in 2007 raised approximately US\$ 11 million in funds.

Other potential sources of funding for PES schemes in Brazil are the royalties and financial compensations paid by hydro-electricity companies to states and municipalities to compensate for the economic impacts of sedimentation caused by dams as well as land loss due to dam construction. In these instances, where

payments are already taking place and there is no obligation to protect resources in order to prevent environmental damages, PES schemes may still be implemented. Municipal decision makers involved in a PES scheme must consider the forest-water relationship, including an upstream forest's role in decreasing sedimentation in downstream reservoirs. It is also crucial that the municipalities' decision makers realize the economic benefits related to the prevention of sedimentation within the life-span of a dam. Funds can be significant; in the Paraguai-Paraná River Basin, approximately US\$ 195 million is paid annually to municipalities that have reservoirs within their territories.

An additional opportunity for building PES schemes based on the hydrological services of forests can be found in the regulation and implementation of two articles of the National Protected Areas System law. This law states that the water supply and energy companies that benefit from the water services provided by Protected Areas should contribute financially to their maintenance. As an example of the potential resources available to develop this kind of scheme, a study performed in the Tijuca National Park located in Rio de Janeiro accredited a value of US\$ 240,000 a year to be paid by the city water supply company for the water services provided by the protected area (May, Santos e Peixoto, 2006). Aside from public protected areas, additional candidates for these schemes are private reserves, which also provide water services for water supply and energy companies.

It is also important to highlight the role of municipal, state and federal laws explicitly focused on developing PES schemes. These laws are important for two reasons, the first being that they can provide a legal framework for PES implementation and lay the markets' foundations. Secondly, these laws can enable and facilitate the use of public funds for PES schemes. The first concrete case of PES based on water services in the country (located in Extrema municipality) was the result of a municipal law passed in 2005.

In addition to Extrema, other state- based PES services have been starting to develop throughout the country. The state of Espírito Santo passed a law in 2008 that created a water fund called FUNDÁGUA, primarily funded by a percentage of oil royalties collected by the state. FUNDÁGUA stipulates that most of the fund's revenues should go towards paying landowners in priority watersheds for the water services they provide. The first payments started in March, 2009.

In 2008, the state of Minas Gerais passed a law creating the "Bolsa Verde" Program, which intends to pay for environmental services provided by forest conservation and restoration. It will be funded by the State Water Fund, which in turn is funded through compensation payments and royalties paid by energy companies for economic loss caused by dam's inundation areas.

Several other municipalities and states have been discussing laws and programs at a local government level. For example, the state of São Paulo, the most developed in the country, has been discussing a Payments for Environmental Services Law for the state. At the federal level, there are a number of bills proposed to the National Congress. The Ministry of Environment is in charge of aggregating the various bills into a unified proposal for a nationwide PES policy.

First Examples from Brazil

The first Brazilian Payments for Water Services projects are predominantly based on the "Water Producer" concept developed by the National Water Agency - ANA (ANA, 2003). One such example is the PCJ Watershed, where funds for payments originate in fees leveled at water users, directly linking services

providers with the beneficiaries. Aside from water user fees, this project received significant financial and technical input from government agencies as well as NGOs.

In the PCJ Watershed case, the main goal was to begin forest restoration activities in the Permanent Protected Areas (riparian buffers) of the Cantareira System, the country's largest water supply system. Cantareira provides water for 9 million people (half of the São Paulo Metropolitan area) through projects in three micro-watersheds: two in the state of São Paulo and one in Minas Gerais. Partner institutions in the São Paulo micro-watersheds included the National Water Agency (ANA), the Environmental and Agricultural State Agencies of São Paulo State (SMA-SP and SAA-SP) and The Nature Conservancy (TNC); the groups proposed a PES Project to the Watershed Committee in 2006. The Committee approved the proposal and allocated US \$250,000 from water user fees for the first pilots, matching funds allocated by the coalition of partners proposing the project. The main objectives of the proposal were to 1) define the amount of payments and the specific agricultural and forest practices to be paid and 2) create a contract to outline specific standards and procedures and define legal issues related to using water use fees to fund PES projects. Recommended payment for soil conservation practices was from US\$ 28 to 85 acres per year for three years, and proposed payments for forest conservation and restoration activities from US\$ 47 - \$140 per acre annually for three years. .

The same PCJ basin also contains the micro-watershed located in Minas Gerais's Extrema municipality. This project is unique, created through an innovative initiative that passed an Environmental Services Municipal Law which gave the municipality the ability to pay landowners who achieve specific targets related to soil conservation measures, rural sanitation and forest conservation and restoration. Besides direct payments for environmental services, the landowners may also receive financial, technical, and in-kind support to achieve the necessary steps to reach conservation targets. Partners in the Extrema case are the National Water Agency (ANA), TNC, and the State Forest Agency of Minas Gerais (IEF-MG), with additional support from the Watershed Committee. Landowners that participate in the scheme receive US\$ 190/acre/year for up to four years. This payment is higher than current land opportunity costs based on low-tech grazing of dairy cattle, but significantly less than the opportunity costs of competing land use in the region, namely the increasing suburban development. In the case of Extrema, payments have been made since April 2007. This case is considered Brazil's first Payments of Environmental Services project based on hydrological services.

Conclusion

In conclusion, it is important to recognize the growing attention that these programs are garnering throughout the country, and the resulting increase in PES water projects that are starting to take place. Another PES project by the Guandu Watershed Committee in the state of Rio de Janeiro has been approved and is the result of a partnership between the Rio de Janeiro state environmental agency, the Rio Claro municipality, TNC, Instituto Terra and the Watershed Committee. Numerous other municipalities – from small cities such as Casimiro de Abreu to São Paulo—have been inspired by Extrema and are also beginning to discuss the possibility of PES municipal laws and programs. In São Paulo, numerous voluntary private initiatives, similar to those developed by the Boticario Foundation, are being developed within the city.

The growing interest in the replication of these projects signifies an increasing awareness that PES schemes represent an important strategy for watershed management and forest conservation. This is an approach that can provide potential economic benefits, a new source of income for landowners located in strategic water

supply sites, and an alternative to traditional urban civil engineering solutions that are not always sufficient to preserve healthy watersheds or the landscapes that contain them.

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