Diving into Water Markets

Taking Stock of Water Markets and the Future of Payments for Ecosystem Services

THE KATOOMBA GROUP'S
Ecosystem Marketplace

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 has gained a solid foothold through both the regulated and voluntary carbon markets and is rapidly gaining traction in the water markets. Furthermore, it is a trend 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.

Payments for Watershed Services (PWS) encompass innovative private deals, trading schemes, and government programs that have been structured around the concept that watersheds provide valuable services, such as the natural filtration through wetlands, which, if marketed correctly, these services might help watershed conservation pay for itself and generate income for those willing to participate.

In order to get a stronger sense of how these markets and market-based mechanisms work in practice, the Ecosystem Marketplace has compiled in this volume selected articles from its website focused on aspects of the emerging water markets on critical issues such as the nuts and bolts of water trading schemes, and on the challenge of creating demand in voluntary trading markets (Part I). Those foundational articles are complemented by a view into payment schemes in the New York City and Chesapeake Bay watersheds (Part II). Finally, in Part III, we turn a critical eye toward Africa for a look at how best to adapt successful PWS schemes to fit in the developing country context.

In reading these articles and examining the work of others noted in Part IV, we hope to demonstrate cases where market-based mechanisms can play a critical role in the protection, restoration and sustainable management of the world's most essential commodity—water—for which there is no substitute.

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Part I:
The Early Precedents

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.

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.

A well-functioning wetland plays a key role in filtering water and thereby "delivering" the ecosystem service of reliable water quality.

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.

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 (available online at www.epa.gov/watershed/trading).

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.

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.

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 TDMLs 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.

This overview was compiled from essays submitted to Ecosystem Marketplace over the past two years, and we would like to thank Mark S. Kieser and "Andrew" Feng Fang of Kieser & Associates, Ricardo Bayon of EKO Asset Management Group, Amanda Hawn of New Forests, and regular Ecosystem Marketplace contributors Alice Kenny and Erik Ness.

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Ecosystem Services in the New York City Watershed

by Alice Kenny

Nine years ago, New York City launched a revolutionary project to protect its drinking water by protecting the ecosystem services of its watershed. The Ecosystem Marketplace checks up on the most famous ecosystem services project in the world.

A black Labrador puppy romps through a woodland clearing near the Croton Reservoir, her yelps masked by the roaring overflow of thousands of gallons of freshly melted snow pounding down the dam's 18-story hand-hewn stone wall. The reservoir's underground pipes, meanwhile, pull water along the first lap of its gravity-powered exodus from this postcard-pretty upstate town to distant spigots in New York City.

For nearly two hundred years, City residents depended on upstate communities to contribute to the largest unfiltered water system in the world. The City's watershed spans nearly 2000-square-miles, an area roughly the size of the state of Delaware, with a labyrinth of 19 reservoirs and aqueducts cutting across nine counties to provide 1.2 billion gallons of drinking water daily to 9 million New Yorkers.

For nearly 200 years, City residents depended on upstate communities to contribute to the largest unfiltered water system in the world.

Having invested heavily in this delivery system, New Yorkers appreciated their water, once considered the purest in the nation. But when the federal government adopted the Safe Drinking Water Act mandating that all major surface-water systems filter their water or prove they could protect the watershed producing it, New Yorkers also began valuing the upstate watershed from where it came.

A filtration plant large enough to clean the City's water supply would cost between $8-$10 billion in today's dollars, approximately $6 billion to build and another $250 million annually to maintain. Preserving the watershed, conversely, was estimated at $1.5 billion, just over a dime invested on ecological preservation for every dollar that would have been spent on a filtration plant.

So in 1997, New York City embarked on a monumental plan to buy thousands of upstate acres, shield its reservoirs from pollution, improve treatment plants and septic systems and subsidize environmentally sound economic development. Its success depended on convincing historically disparate parties –beleaguered farmers and inner City taxpayers, federal regulators and City administrators, environmentalists and economists – that the plan would benefit them all.

Offering something for nearly everyone, the City's watershed plan soon became the darling of

environmentalists and economists alike. Now, with this novel scheme reaching its maturity, experts are examining whether the City's ecosystem approach actually proved to be the more economic choice. And, with so many competing priorities, many wonder also whether the watershed program has a future others can emulate.

From the perspective of William Harding, a biologist and executive director of the Watershed Protection and Partnership Council, a state agency offering a forum for the varied partners, the ecosystem solution could last indefinitely, "as long as the watershed doesn't make the same mistakes as others have, believing they could adequately attenuate the affects of overdevelopment."

An Unhappy History

Already the City was too late to avoid having to build a half-billion dollar filtration plant to clean water from reservoirs east of the Hudson River where the puppy romped. Although the puppy's playground appeared bucolic, the water nearby was tainted from the byproducts of suburban growth – failing septic systems, overwhelmed wastewater treatment plants and polluted runoff that slipped from streets to reservoirs. In this commuter's haven, explains David Warne of New York City Department of Environmental Protection, the City could not plausibly argue that it could control water quality.

But if it worked quickly, the City could preserve the newer portion of their watershed located west of the Hudson River in mostly farm land. Since this supplied 90-percent of City water, it could avoid building the larger budget-busting filtration plant.

Striking a deal to protect this land mass, however, would not be easy. Some would say that the City had already overplayed its hand.

During its century-long, reservoir-building spree, the City generated enormous antipathy using the bully power of eminent domain to evict entire villages. Laying claim to their water sources, the City took prime land from farmers, closed mills and moved schools and churches. From a distance, this could be viewed as an historical curiosity, a price to pay, perhaps, for a higher goal. But in upstate communities where New York City's newer reservoirs displaced current residents' parents, grandparents, uncles and aunts, the anger remains raw.

"Our shared history is not a happy one," says Alan Rosa, who represented upstate watershed residents during negotiations leading to the 1997 watershed agreement. He now directs the Catskill Watershed Corporation, the agency that implements the agreement's regional environmental protection and economic development programs. With eminent domain a continuing threat and industry sparse, Rosa grew up in a region whose main streets were dominated by boarded up buildings and aging for-sale signs.

To keep the region from following the path of its neighbors across the river, the City would have to win over wary upstate residents, using diplomacy and cash instead of the single hammer of eminent domain. While clearly more land adjoining reservoirs had to be purchased, communities also had to be convinced to change their zoning to minimize population-growth and provide run-off protection

measures. Farmers had to be cajoled into altering pastures so that animal dung did not flow straight into reservoirs. Waste water treatment plants had to be upgraded. And septic systems needed fixing.

Finally, after seven years of tense negotiations documented in a file stretching a foot-wide, the City brokered a deal with the disparate stakeholders to preserve and enhance the upstate watershed.

Ecosystem Services: Parable or Reality?

Overcoming upstate objections was the City's first hurdle. Next they had to convince naysayers that the City's watershed plan, a groundbreaking effort in the new concept of ecosystem services, or letting the environment do the work, was based on concrete accounting. Some still argue that these services, particularly as they relate to the City watershed, have limited value.

Rainwater is not distilled water. "It carries a lot of unpleasant things such as acid rain, mercury and pollution."

Mark Sagoff, acting director of the Institute for Philosophy and Public Policy at the University of Maryland, disparagingly labeled the idea of a market for ecosystems services the "Catskills parable," after the region housing the watershed.

Reached by phone at his Maryland office, Sagoff expounded on his perspective, discussed in an article he wrote for Politics and Life Sciences Magazine and excerpted last June in PERC magazine.

Sagoff argues, in essence, that the City's watershed did not need protection because it was never actually threatened. The City preserved the ecosystem to obtain EPA approval to forego building a filtration plant, he says, not to obtain ecosystem services disinfecting water. "It is not clear that rainwater needs to be purified or filtered by the Catskills ecosystem," he says. The City's upstate reservoirs met Clean-Water standards before the watershed agreement was signed and may be compromised, he said, by the City's push to preserve open-space.

Rainwater, he says, "approximates distilled water...so impurities...are more likely to come from, rather than be removed by, the landscape onto which rain water falls." Wildlife, specifically deer and beaver running rampant in undeveloped forests, drop fecal matter into soil that leaches into upstate reservoirs. None-the-less, he added, the City's long-standing chlorination system destroys these and other impurities.

Harding, the biologist directing the Watershed Partnership Council, strongly disagrees. "There are reams of good science showing the demonstrable effect of watersheds on good water quality."

First, rainwater is not distilled water. "It carries a lot of unpleasant things such as acid rain, mercury and pollution," he says. Land, he added, as opposed to paved roads or concrete spillways "is the only stop gap between dirty water getting into receiving bodies." City-funded pathogen-transport studies demonstrate that germs can travel no further than 150 feet through soil. "If dirt didn't purify," he adds, "then septic systems wouldn't work."

Sagoff overlooks the preventative aspect of clean water legislation, Harding argues. Although chlorine destroys most impurities, studies show that water quality is heightened by keeping impurities out of the water in the first place.

“Just because water is safe to drink today,” Harding adds, “doesn’t mean it will be safe five-to-ten years from now.”

None-the-less, water flowing from reservoirs west of the Hudson River is safer today than when the watershed agreement was signed nine years ago. And nearly every stakeholder involved deems the agreement a success, although most stress that ongoing efforts are needed. Water is cleaner, with one fewer reservoir labeled as having excess amounts of nutrients. Farmers are pocketing profits. And environmentalists are pointing to the City’s watershed agreement as the prime example of how ecological solutions reap financial benefits.

Financial Report Card

The City’s daring promise to save taxpayer dollars by underwriting the environment proved accurate, according to a recent audit. The City spent or committed between $1.4 - $1.5 billion in watershed protection projects so far, says City EPA spokesperson Warne, averaging $167 million in expenditures per year.

Had the City opted instead to build the filtration plant, taxpayers would have already dished out approximately $6 billion to build the plant plus another $250 million per year for maintenance.

Since the City completed the bulk of its capital-intensive programs, Warne adds, savings on future watershed protection costs will be even greater. Specific future financial expenditures will be determined after the federal Environmental Protection Agency’s upcoming ten-year review.

Meanwhile, rural New Yorkers found a market for the ecosystem service they house.

Meanwhile, the federal EPA gave the project high marks on interim report cards, noting that five new sewage treatment plants have been built and hundreds have been rebuilt. More than 2000 septic tanks have been replaced or repaired. Three million dollars have been spent and seven times that amount has been committed to stream water management to lessen the threat of flood damage, reduce erosion and improve stream ecology.

The City purchased 70,000 acres of land, “one of most effective and crucial tools for permanently protecting water,” according to the Watershed Protection and Partnership Council. Money needs to be set aside for further purchases, Warne says, although specific acreage requirements have not been set.

The effort to purchase land is chugging along, says Eric A. Goldstein, a lawyer for the Natural Resources Defense Council. “But developers and bulldozers are also moving along. I view the next ten years as the last opportunity to acquire priority lands.”

"We've become a water-exporting region," says Catskill Watershed Corporation director Rosa.

The watershed agreement boosted the upstate economy, with money pouring in at a rate of $100 million a year. It provided employment, invested in local businesses and promoted ecotourism. The City pays local contractors to install septic systems, upgrade wastewater treatment plants and set up storm-water-protection measures. Locals land jobs with the City and state Department of Environmental Conservation. Farmers receive reimbursements for building fences and bridges that herd their livestock away from waterways. Landowners are paid to keep forests undeveloped.

Work in Progress

Although the benefits are clear, says Al Appleton, the former Director New York City's Water and Sewer System who helped initiate parts of the watershed agreement, the cost/appreciation equation of this ecosystem investment is not as simple as it looks. "You can't make a single investment and expect to be done. It remains a work in progress requiring nurturing, monitoring and money."

None-the-less, he continues, the program already established that "ecosystem services not only produce superior environmental and social results, it produces them far more cheaply that traditional environmental strategies."

The watershed agreement's documented environmental and economic achievements sent ripples throughout the United States. More than 140 cities are now considering watershed conservation instead of building filtration plants.

As for the program's future, it could go on indefinitely, Harding says. More land is being acquired, better scientific advances have been made and increased funding is coming from the federal, state and local government. "We're not running out of time, steam or money."

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Part II:
Lessons from the United States

Voluntary Water Markets:
The Demand Dilemma

Who you are, how you pollute determines why you participate in WQTs

by Rob Luke

Farmers and other diffuse polluters should, in theory, welcome money from industry for voluntarily reducing their runoff – but high commodity prices and a fear of regulatory entanglement has put a lid on demand in water quality trading in the US. The Ecosystem Marketplace examines the challenge of stimulating WQT demand.

Figuring out how to encourage individuals to do something voluntarily for the greater good has perplexed philosophers for centuries, and the nascent market for Water Quality Trading (WQT) in the US is bumping up against a more prosaic version of the same dilemma.

WQT schemes aim to do for water what emissions trading schemes have done for air pollution: drive down levels of water pollutants, especially agricultural "nutrients" (nitrogen, phosphorous, and potassium), by letting emitters trade credits among themselves to find the most cost-efficient way of reducing them.

Voluntary water-trading schemes have spread in recent years, with a June, 2007, survey by the US Environmental Protection Agency (US EPA) identifying 23 WQT programs operating across the US that have traded credits at least once.

But WQT faces the same problem globally as the carbon-trading market does at present in the United States: participation isn't yet mandatory, and polluters have different reasons for deciding whether or not to participate in local voluntary WQT schemes.

So, what's driving them there? And will more incentives to trade bring laggards on board? For that matter, are voluntary drivers alone incentive enough to keep trading viable – or can WQT schemes fully succeed only when accompanied by strict enforcement of clear limits on specific pollutants by all emitters?

The answer appears to be somewhere in the middle.

"Pointed" Argument

Industry and agriculture typically represent the two major types of tradable water pollution. The first, called "point source", is easily recordable from definable outflow points like discharge pipes from industry and municipal wastewater treatment plants; the second, called "nonpoint source" is spread across areas like fields and pastures and is therefore difficult to measure.

Not only that, but point sources tend to be regulated under the Clean Water Act (CWA) in the United States, while nonpoint sources are not - for reasons covered in Water Trading: the Basics.

The Meaning of the Word "Voluntary"

People often compare the burgeoning water markets to the booming carbon markets – but that comparison can be taken only so far before creating a distorted view of how WQT schemes work. Nowhere is this truer than in the use of the term "voluntary" trading.

In carbon markets, a "voluntary" offset is just that: a transaction that happens because people want to do it, and not because the Kyoto Protocol or another mandatory cap-and-trade scheme has forced compliance (although even voluntary offsets need to meet certain standards to be credible).

The 2006 Soccer World Cup, for example, was subject to no mandatory carbon cap, but went carbon neutral anyway.

The 2006 Soccer World Cup, for example, was subject to no mandatory carbon cap, but went carbon neutral anyway by funding clean development projects in Africa and India that would have passed muster under the Kyoto Protocol's Clean Development Mechanism (CDM).

Purely voluntary schemes exist in water as well. The classic example is the Vittel bottling plant's payment to French farmers to protect the watershed feeding the aquifer that feeds the wells from which it draws its mineral water.

But that oft-cited example is the exception that proves the rule. Voluntary water transactions are rarely served up with a single entity so clearly willing – let alone able – to pay for reductions from scores of smaller entities dribbling gunk into their water.

All in the Watershed

What's more, unlike greenhouse gas emissions, water pollution doesn't spread itself equally across the world, but instead kills some bodies of water while sparing others. A polluter in the Red Sea does his neighbors no good if he offsets his emissions by reducing runoff into Lake Victoria (although polluters in Ohio do have an impact on, say, the Gulf of Mexico).

For now, WQT schemes focus on a single watershed, and the big focus is on promoting transactions between regulated point-source entities and unregulated nonpoint-source entities. These hybrid point-nonpoint schemes are "voluntary" in the sense that credit sellers aren't regulated, but the key driver is almost always a law mandating a reduction by point-source emitters. In this sense, they are analogous to the CDM: buyers of credits in a compliance regime are working with

sellers of credits that are usually outside of the regulatory protocol – and in water "We've become a water-exporting region," says Catskill Watershed Corporation director Rosa. trading, those outside the regime usually want to stay there.

In "voluntary" WQT schemes, the sellers of credits are in the same watershed as the buyers – but outside the regulatory apparatus. Nevertheless, it is the regulatory pressure on buyers to reduce emissions that drives demand.

No Regulatory Driver, No Market

Indeed, as we saw in US WQT: Growing Pains and Evolving Drivers, many schemes that are "failing" are doing so because they were implemented in anticipation of mandatory emission limits that never materialized.

"It's a heck of a lot harder getting non-point sources involved in water quality trading,"

Under the types of "voluntary" WQT schemes that comprise the bulk of transactions taking place now and presumably in the future, regulated point source emitters pay unregulated nonpoint emitters to reduce their pollution. If the amount paid is higher than the cost of implementing the reduction, you'd expect farms and other nonpoint source emitters to be scrambling for WQT money. But luring them into such schemes is proving to be more difficult than many had anticipated.

Bringing in the Nonpointers

"It's a heck of a lot harder getting non-point sources involved in water quality trading," said Tracy L. Stanton, Water Programs Manager with environmental consultancy Forest Trends (parent organization of the Ecosystem Marketplace). "Point sources have no choice but to meet water-quality standards and are governed by a regulatory scheme that can be quite tedious to deal with."

The US EPA considers regulating discharges of specific pollutants a significant factor in successful WQT programs. That works fine at places like already-regulated factory outflow pipes, where each pollutant can be easily tested for and its source held accountable. But it's not so easy along a stream bank where the emissions of several different unregulated land users, not just the landowner, probably contribute to downstream water degradation.

"Trading works best when there is a 'driver' that motivates facilities to seek pollutant reductions, usually a Total Maximum Daily Load (TMDL) or a more stringent water quality-based requirement in an NPDES permit," the EPA stated in a 2007 WQT document posted on its website.

Point-Point Bonanza

Not surprisingly, some of the most widely-touted success stories among WQT schemes are between one point-source emitter and another – so-called "point-point" transactions.

The EPA's inaugural Blue Ribbon Water Quality Trading Award went to Connecticut for a much-cited WQT project that lowered nitrogen levels in Long Island Sound. Among the 79 sewage-treatment

plants in the scheme, more than a third had lowered their nitrogen discharges below permit levels and were selling credits within three years. “Nitrogen trading has accelerated the State’s schedule to meet the nitrogen targets,” the EPA noted in its award.

Why Not Regulate Nonpointers?

So, if regulation works on the point emitters, why not just regulate the nonpoint emitters?

“To have a hope of making (WQT) work, you need more regulation, not less,” says Dennis M. King, Research Professor at the University of Maryland’s Chesapeake Biological Laboratory. “For the climate around water trading to improve significantly, there must be more restrictions on agricultural pollution.”

He says that 30 percent Chesapeake Bay bay’s nutrient load is being contributed by agriculture, which contributes just 0.5% to the area’s economy. And he doesn’t think money alone will be sufficient to lure farmers into a voluntary WQT scheme that requires any documentation of their anti-pollution efforts. “Some see WQT as another way to get money to farmers, but the idea of having some verifier on their farm – they just won’t have it,” King says.

“Water quality trading offers a voluntary option for point sources to meet their water quality obligations at a lower cost than traditional ways."

And they know how to lobby – a skill they deployed quite effectively in the passage of this year’s Farm Bill.

“Regulating nonpoint source pollution isn’t the answer,” says Carl Lucero, National Leader for Clean Water at the USDA’s Natural Resources Conservation Service (NRCS). “Instead, water quality trading offers a voluntary option for point sources to meet their water quality obligations at a lower cost than traditional ways.”

He points out that the main drivers for point sources are regulations and costs. “They want to find the cheapest way to effectively meet water quality limits set in their permits,” he says. “If water quality trading is the most efficient way, then it makes good business sense to go with it.”

In Ohio, the Great Miami River Watershed Water Quality Credit Trading Program was able to persuade farmers to join the program by assuring them in writing that they would be exempt from any regulation for the next ten years – but, as we will see later in this series, that project is in jeopardy because anticipated limits on point-source discharges have so far failed to materialize.

Bigger Fish to Fry

And even if supporting regulation materializes, it’s not clear the potential new income stream will seem worthwhile in an age of steadily rising prices for agricultural commodities and farmland – especially if that money is coming from a potential regulatory quagmire like pollution control.

"Farmers appreciate the fact that they're not regulated and would rather stay under the radar screen than get involved in WQT," says Stanton. "Even if you show them they can reduce pollution cost-effectively, some fear involvement now means regulation in the future."

Bank on it

The Miami Conservation District (MCD), for example, took pains to ensure that its Greater Miami River Watershed WTQ program would be "farmer friendly". The district kept bureaucracy to a minimum by paying farmers to complete mitigation projects rather than by selling credits directly and it accumulated a pool of credits to avoid shortfalls.

Despite what appear to be intractable issues, a WQT project manager can set policies that maximize incentives to getting polluters in to trade water quality.

Bundling Credits

Farmers might also be more amenable to trading a system that would "bundle" a credit like water quality with other environmental credits, Lucero notes. Such bundling could involve assigning different environmental credits, like WQ and carbon-offset, for single practices like cultivating vegetative buffers along streams that reduce nutrient run-off and store carbon. Those reductions or "credits" could then be sold to multiple buyers in different markets like publicly owned water treatment plants and the Chicago Climate Exchange, he adds.

Such a scheme requires help to get the timing and acceptance right, Lucero points out, and that's where larger 'third-party aggregators' like local resource conservation and development councils and conservation districts can help create a stable market. He also sees financial institutions like local mitigation banks playing a role in creating WQT markets in much the same way they were created for wetlands around the country, thereby injecting more confidence into local WQT markets.

"Many are landowners themselves who know everyone in the watershed and can bring buyers and sellers together," he said. "Some have done mitigation banking but water quality trading can be a whole new business for them."

WQT can also encourage point sources to join the local WQT party early by dangling the right carrots at the right time. For example, setting the right 'trading ratio', or amount of emissions measurement allowed for each offset measurement funded - a key concern for point source polluters - at an attractive level at an early stage can establish a viable trading market more quickly. The Miami Watershed WQT scheme did so by setting trading ratios at 1:1 (2:1 in poor-quality water) for early movers, meaning wastewater plants that signed on first could buy a 1,000-pound phosphorous credit to offset 1,000 pounds of phosphorous emissions. Slower movers could only trade at ratios of 2:1, so needed twice as many credits for the same offset, and 3:1 in poor quality.

State of Play

Politics also has a way of seeping into the WQT debate, creating its own sets of incentive for participating in water trading. In a 2005 article entitled Crunch Time for Water Quality Trading, King referred to the 2004 demise of a Chesapeake Bay project, where in 2003 a partnership of public agencies and private stakeholders drew up an agreement to launch a watershed-based WQT scheme after three years of preparation.

But one year later, the Maryland state legislature responded to public concern over water pollution with a monthly tax on urban sewer users and rural well-users to fund new discharge technologies and agricultural mitigation practices. The so-called 'flush tax', King noted, almost wiped out all demand from treatment facilities for WQ credits while continuing agricultural subsidies restricted supply. "With the stroke of the governor's pen, prospects for WQ trading any time soon in Maryland evaporated," King wrote.

Nonetheless, the Chesapeake Bay WQT project, covering an area of 64,000 square miles, is now back on the agenda and will be the subject of several environmental get-togethers over the next few months, Stanton said. But with seven states and their governments involved and not all of them seeing eye-to-eye on the issue of neighborhood water quality, she adds, nothing can be taken for granted.

"State agencies often work against other states (on water quality), and that may create different incentives and disincentives to launching a water trading scheme," Stanton said. "The stakes are really high."

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The Interconnectedness of Chesapeake Ecosystem Markets

by Douglas Lashley

With the US EPA's new mitigation rules taking effect this weekend, GreenVest CEO Doug Lashley tells the Ecosystem Marketplace that what's needed to save the Bay are not more ecosystem payment tools, but broader understanding of how existing tools work – alone and together – and the mechanics for implementing their use.

The Chesapeake Bay is the largest estuary in the United States. The land mass of the watershed that feeds it covers some 64,000 square miles in parts of six states, housing 17 million people. That population is growing. Although resilient, the estuary has deteriorated to the point where its health does not allow much of its natural habitat to survive – much less repopulate.

Late in 2007, the Chesapeake Bay Foundation issued its annual State of the Bay Report, and the grades were far from impressive: none of the 13 health indicators had improved from one year earlier, and three actually fell. The overall grade of 28 leaves the bay in the category of "dangerously out of balance", although each of the principle Bay states have passed legislation designed to bring the grade up to 40 – or "improving" – in the next few years.

The Keys to the Shed

Much of the recent legislation that has been passed in an effort to protect the Bay contains enlightened market-based tools that can promote the Bay's revival efficiently and without cumbersome regulation, but few of the policy makers in a position to implement these tools have been given the keys to the shed – let alone the operating instructions.

Chief among these tools is mitigation banking – a recognized and accepted method of negating the adverse environmental impacts of what has occurred in the past, but a method that has been woefully underutilized – for a variety of reasons.

Lack of Coordination

The United States needs to better coordinate economic growth and environmental quality objectives at both the Federal and State levels. At present, these goals and objectives are uncoordinated – or, worse, in direct opposition to each other. This stems from competing objectives among

The United States needs to better coordinate economic growth and environmental quality objectives at both the Federal and State levels.

the Federal Government and the States, as well as among politicians, citizens, industry and planning officials.

Unfunded Mandates

But most importantly, financial resources are shrinking at all levels, including those deployed by government entities with enforcement power and stakeholders who protect their own turf. There simply is not enough public sector money to properly address the host of significant events and activities that negatively impact our most important natural resources.

A graphic example is what happened in March, 2008, when the Maryland legislature approved a budget which cut the new Chesapeake Bay 2010 Trust Fund by half – or a whopping $25 million.

Re-Thinking the Public-Private Divide

The health and welfare of the environment has long been considered a social dilemma, and social dilemmas are traditionally the financial responsibility of government, and not of individuals. However, the quality of our resources is dwindling, and time does not allow continued inaction. As a society we should adopt intelligent and relevant measures to rectify the problem rather than force government to tax, regulate, and remediate.

We are in the midst of this very dramatic transition from government to society taking responsibility for a problem and correcting it. The private sector is best suited to solve the issue with support from the government. We have tried the opposite approach and it has not worked. The fundamental reason is that the government has neither the human or capital resources to implement in the field the restoration of ecological values. They know what they want, but they cannot implement.

Current Initiatives

In 2006, Maryland Governor Robert Erhlich signed legislation mandating state participation in the Regional Greenhouse Gas Initiative (RGGI, pronounced “Reggie”), which contains a provision for obtaining mitigation credit. This initiative was an important first step towards reviving Chesapeake Bay, but it has been too long in coming and is being too slowly implemented.
The current Congress has taken steps through the US Dept. of Agriculture to further facilitate and elevate the conservation banking market. The recently-enacted 2007 Farm Bill, for example, allocates $50 million to enhance the environmental credit market by establishing broad standards for the transactions and markets referred to above – but the devil, as always, will be lurking in the implementation.

The Solution

After 12 years engaged in the development of conservation banks and brownfield projects with GreenVest and its predecessor, The Triangle Group, I have come to believe that tunnel vision on any single mechanism will fail to yield results. hat we need is an innovative solution that can serve as a model for taking care of this delicate ecology. Specifically, we need a trading system that is “multi-

tiered", one that encompasses all ecosystem resource values found within a defined area, such as soils, habitat, water and air.

Tailor-Fitting

Such a system must recognize that each acre of ground is different and presents unique opportunities to protect and restore these resource values. A concept plan that restores, enhances and protects these values in perpetuity must be adopted and implemented. It must be grounded in both the physical sciences and economics – meaning it must provide a financial incentive to undertake the restoration work as well as pay the landowner for its property.

Mitigation banking provides this reward in the form of credits tied to the type of restoration work implemented.

Where Regulation Meets Markets

This is a market-based incentive, but it cannot occur without regulations to create and promote the market. In May, 2008, the United States Environmental Protection Agency (US EPA) as well as the United States Army Corp of Engineers announced the adoption of new compensatory mitigation rules that take effect June 8, 2008.

This is the first significant Congressionally-mandated change to wetland laws in almost 30 years. It will, if properly implemented and promoted within the agencies regulating the environment, promote consistency, predictability and more long-term protection and success restoring wetland and water quality values.

The solution is a balance between economic incentives and inducements to the private sector with existing environmental laws and regulations. This solution has the potential to improve water quality, enhance wetlands, re-establish habitat and expand forested systems more quickly thereby hastening the pace by which we clean up negative impacts to these critical assets. The new rules will help accelerate this process.

Step One

Environmental protection can be addressed through a multi-credit market made up of a host of credit values. Multi-credit markets can streamline many of the program-integration issues that get in the way of action and progress. These markets also can reduce significantly the cost imposed on regulatory management and compliance helping eliminate one excuse about why things to do not get done.

Step Two

Multi-credit markets must, by definition, involve the trading of pollution credits and ecosystem values across multiple environmental media. This approach will recognize all of the ecosystem values that the Chesapeake Bay Watershed provides: its water, its wetlands, its habitats, and its riparian forests,

among others. It must, in other words, provide multiple incentives for restoration and improvement of ecosystem functions. These in turn will financially supplement the existing government and non profit programs. The goal is to always consider the "downstream" impact.

Step Three

A successful multi-credit trading system must be well-grounded in science and be endorsed through a stakeholder-driven process. Good science will be used to assess problems, identify opportunities, and define credits associated with Total Maximum Daily Loads (TMDLs), wetlands, habitat, and carbon. This will create incentives for ecosystem restoration and allow for cost-effective economic development.

Stakeholder processes will prioritize needs, establish the incentive system, and provide the mandate for the institutions that will be needed to support trading activities. Using science, stakeholders will have identified the zones within a watershed where action is most needed, and where improvements have the highest value.

A zone along stream corridors of the watershed, for example, provides a coincidence of soils, habitat, water, forests and wetlands that provide multiple values to people. We call this zone a "value tent." The tent concept shows that the greatest values usually occur along the edge of the stream and decrease as one moves upland (although in some unique systems, including those with significant groundwater influence, the tent may extend farther into upland areas).

The values and shape of the tent will vary with land use, soils and slope. Many of these concepts are in place based on all of the work accomplished under the Chesapeake Bay Critical Area Relief Act. The inspection, certification and trading program can be established based on successful programs carried out in other parts of the country.

Step Four

A properly designed and implemented watershed-based environmental credit trading program will provide an incentive for businesses, utilities and municipalities to act in ways that further not only their own financial goals, but also improve environmental quality.

In addition to reducing environmental compliance costs, multi-credit trading programs may encourage pollution prevention, promote development and the installation of more efficient abatement technologies, and reduce pollutant loadings from previously unregulated sources.

By implementing projects that create multiple benefits, the watershed manager or landowner can leverage a single project into multi-credit opportunities. As discussed above, this creates incentives for watershed restoration by allowing project owners to sell credits for any and all services created for which there is market demand.

Summary

We can't wait another five years to see if current programs and practices can fulfill the promise of helping the Chesapeake Bay achieve a sustainable balance between economic development and environmental quality. The "State of the Bay' demands a more concerted and wide spread initiative. People tend to gain courage by watching the innovation of others particularly if success occurs. To make a change in the world and to more effectively address what has gone wrong with the Bay we must creatively employ capital as well as exercise innovation and creativity that has enjoyed some success.

We learn best by example but must translate these examples and successes to date into further action. The proposed solution above is the best way to learn from what has worked and under what circumstances, so that leaders and followers can uniformly employ initiatives that will help curtail further abuse of the Bay as well as enhance the prospects that quality will be restored.

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Part III:
Pathways Forward in Africa

Mainstreaming Payments for Ecosystem Services in the Developing World

by Sissel Waage

Forest Trends recently conducted a study of the obstacles impeding the uptake of Payments for Ecosystem Services (PES) in the developing world. The Ecosystem Marketplace asks Sissel Waage, consultant with Forest Trends, what these obstacles are and what is needed to overcome them.

In Kenya, growing flowers has become a lucrative international business. Given the contribution of horticulture to the economy, ministries of economic planning and finance would be judicious to consider a basic need for maintaining the sector: water.

Ensuring the success of any natural resource-based business over time requires attention to the predictable ecological flows on which it relies. Horticulture, agriculture, and forestry all need water and good soil, yet water is becoming increasingly scarce at key times in the growing season in many regions. Soil erosion is also a growing problem.

The biggest barrier to mainstreaming PES in developing regions of the world is the lack of buyers.

While payments for ecosystem services (PES) offer a new approach to securing revenue streams for maintaining, conserving, and restoring ecological functions globally, its uptake remains significantly hampered – particularly in Latin America, Asia, and Africa.

In order to better understand why PES is not currently a common tool for conservation, Forest Trends conducted a study focusing on what is required for deals to work on the ground in Latin America, Asia, and Africa. 57 interviews were conducted with NGOs, governments, and businesses working on the establishment of PES globally.

Mobilizing Buyers

The biggest barrier to mainstreaming PES in developing regions of the world is the lack of buyers.

Some buyers are simply unaware of the PES concept, while others feel it is too risky a mechanism to trust. Many potential buyers lack a clear understanding of what they are buying, as

the linkages between specific management practices and ecosystem services outcomes are often unclear. This is particularly true for watershed services and the soil sequestration of carbon. Addressing these issues often requires specific technical skills. Ideally, a base of intermediaries would exist with the skills to assess linkages between management and ecosystem service outcomes, either in-country or at least in-region. At present, however, such technical assistance is limited and tends to be costly.

Connecting Buyers and Sellers

Once willing and able buyers exist, they must be connected to sellers of ecosystem services quickly and efficiently. Today, the transaction costs associated with identifying sellers are significant. In order to assist with the due diligence process on both buyers' and sellers' sides, effective intermediary organizations still need to be developed.

Structuring Deals

Even after buyers and sellers have identified one another, the issue of negotiating and structuring deals serves as another barrier to the development of PES. Structuring payments for ecosystem services requires specialized knowledge of the relationships between natural resource management practices and the desired flow of ecosystem services. In addition, communities may face barriers to the negotiation of deals stemming from a lack of tenure rights, literacy, or familiarity with contracts. Communities can also encounter unfamiliar terrain in terms of the logistics related to receipt and expenditure of funds, particularly when revenues are paid to the community as a whole, rather than to individuals. Further, and even more importantly, rural community members and rural development advisors – in areas around the world – have expressed fundamental concerns about the establishment of markets for natural resources, and the prospects that the truly poor will not accrue benefits or may even find they become dispossessed of current resource tenure and/or access rights. These concerns, and the lack of trust they fuel, must be addressed to establish PES fully and effectively in many locales.

Transparency and Security

The fourth barrier is related to the third, but important enough to flag separately, in that it focuses on establishing the accountability and transparency mechanisms for money exchange and deal security over time. These mechanisms may be sanctioned by government and could be run by ministries or agencies. Alternatively, NGOs, for-profit companies, or multi-entity hybrid models could emerge. The essential element is to create a context in which the parties entering into deals feel confident that revenues generated by the PES scheme will be administered appropriately and will go to the uses outlined in the agreement.

If this fourth barrier is to be overcome in a way that will stand over time, it will have to mesh effectively with the current institutional context, both formal and informal. Without consideration of

how institutional interactions will occur – between new and old oversight practices within existing entities and/or across new and old entities – it is likely that unintended institutional complexities and consequences will occur. Therefore, the challenge of meshing PES accountability and transparency mechanisms with existing institutions – from a government through a rural community level – is a related barrier to overcome.

Next Steps: Capacity Building

The barriers described above led us to identify a core set of capacity building needs.

First and foremost, people need to be given the tools to assess PES opportunities under a variety of circumstances. When and where is PES appropriate? Buyers, sellers and regulators need to be able to answer this question at any given point in time.

Practitioners also need to understand a range of issues, including: the relationship between management practices and maintenance of ecosystem services; how to conduct baseline studies; and how to structure monitoring plans. People from the business, community, and government sectors will all have distinct interests, levels of expertise, and specific needs in terms of what they need to know and understand, given their different roles. Therefore, capacity building efforts surrounding ecosystem dynamics and best management practices are likely to be related but distinct for the various audiences.

Third, all parties involved in a PES scheme will need to learn how to administer and manage the scheme over time. As with the technical issues, various parties are likely to have a range of needs that will have to be tailored to the specifics of certain services (water vs. biodiversity) and particular deals. For example, for private deals, government entities may only be concerned with enabling policies and laws. Communities may require much more detailed capacity building in terms of fund management if they are to receive the revenues. For public schemes, complex questions related to moving earmarked funding in and out of the central treasury may emerge for government agencies. Therefore, the most effective capacity building will be audience and issue specific.

Fourth, and finally, capacity building is needed in PES-related systems thinking. This need stems from the importance of ensuring that PES have positive impacts, which are not overburdened by transaction costs and do not result in unintended adverse consequences. This need can be addressed by adapting the well-developed domains of work related to community interactions (and participatory methods for identifying socio-economic dynamics, such as PRA and RRA), ecosystem dynamics and institutional incentives (especially related to governments and businesses involved with deals).

Without serious efforts to highlight the dynamics of the human, ecological, and economic systems that are at play within PES, it is possible that the design will overlook key issues and result in unintended consequences. Specifically, the concern is that without addressing potential negative ripple effects of the projects, equity issues will be overlooked and poverty further entrenched. Therefore, a key element of fully empowering and enabling all players in PES will require understanding a set of clear frameworks and approaches that provide a structure in which everyone

involved – from business through community and government – can openly discuss the many issues that PES raises.

Following from this research, we feel that a program that begins to address the core barriers to PES methodically – through building capacity among the key players in regions and countries – will lay the foundation for significant new revenue streams for ecosystem restoration and conservation well into the future.

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Ugandan Water Markets: What Businesses Know (and Don't)

by Alice Ruhweza

Water markets can help provide a solution to Uganda's looming water crisis – but only if buyers understand the stakes and the dynamics. Alice Ruhweza, East and Southern Africa Katoomba Group Coordinator, says Ugandan water users understand the crisis but haven't yet explored market-based solutions. The Ecosystem Marketplace summarizes her findings.

Massive Lake Victoria spreads thinly over nearly 70,000 square kilometers in Africa's Rift Valley, covering more surface area than any other tropical lake in the world. Millions of people and thousands of businesses in three nations depend on this vast but shallow body of water for survival – but huge parts of the lake are themselves "dead zones", devoid of oxygen and barely capable of supporting what little life remains below the waves, let alone supporting humans on the shore.

Key among these humans on the shore are Ugandan brewers, bottlers, flower exporters, electric companies, and of course municipal water plants – all of which are not only dependent on clean water, but also have the economic and political clout to promote change.

But do they understand the importance of ecosystem services to their business, and are they willing to put their money where their menace is and support efforts to clean up the water? These were the key questions the East and Southern Africa Katoomba Group put to more than fifteen leaders of Ugandan industry in a survey conducted last year, the results of which have been published in Assessing the Market: Conversations with Private Sector Businesses About Payments for Ecosystem Services – A Letter from Uganda.

The answers are, in a nutshell: yes, they are aware of their dependence on this fragile resource, but no, they do not have concrete plans to invest in the lake's future.

These findings were echoed in a survey of Fortune 1000 executives carried out by the Marsh Center for Risk Insights. Forty percent of the companies surveyed said the impact of a water shortage would be severe or even catastrophic, but less than one-in-five (17%) say they have prepared for such a crisis.

Identifying Key Ecosystem Services

All companies surveyed named water as the resource most critical to their business, and most of

them draw their water from Lake Victoria. Those that aren't directly dependent on the lake, such as some district or municipal water companies and flower exporters, draw their water from aquifers through the use of boreholes. Some companies also mentioned shallow wells and rainwater collection.

Energy or electricity came second on the list, but it is also directly tied to water and hydro-power.

Lake Victoria: an Overview

Despite its massive surface area, Lake Victoria has a mean depth of just 40 meters (131 feet), leaving it susceptible to both climate change and conventional pollution. Indeed, inflows of farm run-off and untreated effluent have led to fish die-offs, algal blooms and the spread of water hyacinth (a waterweed), which in turn depletes dissolved oxygen, blocks sunlight, and impedes water transport.

A recent survey by environmental engineering group Air Water Earth (AWE) concluded that Murchison Bay, where the Ugandan capital Kampala is located, has only about half the dissolved oxygen needed to support most species of fish; while all along the Lake Victoria shoreline, hyacinth provides habitat for malaria mosquitoes and snails which harbor bilharzia parasites.

The key drivers are easy to identify, but that doesn't mean they will be easy to reverse. Kampala's sewer system, for example, captures just ten percent of the city's waste, and most of Lake Victoria's pollution flows in from nonpoint sources that are almost completely unregulated – such as small-scale workshops, parking lots, and car repair garages. Furthermore, guesthouses, slum dwellings and industries discharge untreated wastewater directly into the Nakivubo Channel, an artificial stream that drains Kampala and its suburbs.

The channel flows directly into Murchison Bay, and is responsible for roughly 75% of the nitrogen and 85% of the phosphorus discharged daily into the bay daily, and these nutrients are largely responsible for the eutrophication and algal blooms that clog water treatment plants and extract oxygen from water.

The Consequences

Uganda's National Water & Sewerage Corporation (NWSC) says that the worse the water gets, the more expensive it becomes to make it drinkable. Ironically, NWSC's own sewage treatment plant at Bugolobi discharges 15,000 cubic meters of inadequately treated sewage per day into Murchison Bay, and has been named the lake's single largest polluter.

Uganda's National Water & Sewerage Corporation (NWSC) says that the worse the water gets, the more expensive it becomes to make it drinkable.

The Nakivubo Wetland and other major catchment wetlands, which once played the vital role of filtering effluent and storm water discharging into the lake, have long ago been encroached and degraded by settlement and cultivation. Widespread lakeshore cultivation and soil erosion also contribute excessive sediment and nutrients into the lake. Storm water flowing through Nakivubo Channel now carries tons of soil and waste straight into the lake.

Climate Change and Low Levels of Water

All companies surveyed cited climate change as a serious threat, as lower levels of water not only leave more concentrated pollution, but also leave a loss of other services that water bodies provide. The flower exporters and the district water supplier, for example, said they fear canals drying up during ever more-frequent periods of prolonged drought.

The lake also acts as a reservoir for hydropower, and falling water levels have reduced water available for generation.

This situation is becoming an issue for businesses, because diesel-generated power is expensive and electricity tariffs have increased recently. Already, some companies require water use permits from the Directorate of Water Development which now have even more strict approval conditions to use water.

Further compounding expenses, severe power outages in 2005 resulted in business disruptions. For example, exporters of cut flowers exporters failed to meet their customer orders, and Uganda's overall revenue from flower exports dropped from US$ 24 million in 2005 to US$ 20 million in 2006.

Other Ecosystem Services

Good electricity poles are also in short supply in Uganda, due to deforestation. Therefore, at present, most poles are imported from South Africa at a cost of roughly 1,200,000 Ugandan shillings (approximately US$ 750) each. Recently, the Parliamentary Committee on Natural Resources raised concerns about these costs and asked Uganda Electricity Distribution Company (UEDCL) to find a solution.

Furthermore, due to land shortage from high population growth, no land will be allocated for growth of wood for poles and the shortage will continue. Eucalyptus poles have high nutrient and water demand, and are not a sustainable option. PES approaches that could rectify this situation need to be explored. For example, a group of land owners could be given an incentive to plant fast-growing native trees.

The Corporate Response

Most of the companies surveyed have made investments to respond to ecosystem changes, but these are focused on meeting their own, individual, needs - and do not address macroenvironmental issues.

Beverage manufacturers, for example, have built water reservoirs on their plants which store water for up to two days. They also recycle 80% of the water that they use, and maintain water treatment plants and waste treatment plants. In the future, many plan to minimize water usage by modifying technology.

Flower companies have supplemented the water shortages by drilling bore holes, constructing water collection reservoirs for rain water harvesting, and planting trees.

The district water system is advising communities to form water user committees to be proactive in address soil erosion threats by planting grass, and digging terraces in gardens.

Some of the companies also have a policy of training employees in safety and environmental management, but implementation is costly and policies are often not implemented.

Surprisingly, the electricity sector has not yet articulated a strategy to deal with various environmental service shortages, especially related to water, although the Ministry of Energy is promoting other sustainable alternative sources of energy such as mini-hydropower generation on small rivers, solar power, wind power, biomass energy, and biogas. In addition, most companies are engaged in some form of public outreach, detailed in the full report.

Payments for Watershed Services

All companies said it was critical for natural resources management to be integrated into the company strategies. This would enable market-based mechanisms to be part of the company programs.

The easiest way to incentivize this is to begin charging for water, the delivery of which is currently supported through very low tariffs. This approach, however, would likely face stiff resistance from water users, many of whom assert that natural resources are free and should not be paid for.

The Payment for Watershed services (PWS) concept exists in Uganda, but has not been incorporated into the present models of water management. Based on the survey and roundtable discussions, payments for water to also cover the cost of maintaining and restoring watershed services would constitute a general shift in company policy.

For a payment scheme to succeed and endure, the actions and change brought about by upstream land and water managers should result in identifiable benefits for downstream water users. Therefore, clear cause-and-effect relationships between upstream land and water use practices and the provision of watershed services for downstream users needs to be identified. The degree to which this is possible varies considerably from case to case.

A key policy question of how competing users should pay for the services of one watershed may arise. A decision based only on willingness-to-pay may lead to the exclusion of those who have less ability to pay, or to free-loaders who enjoy the benefits of the watershed without paying for them

There is, therefore, a need for more site specific analysis in order to determine whether a particular site is feasible for PWS.

Why Take a Market-Based Approach?

Those who own or manage upper watershed land often have little incentive to provide watershed services because the benefits occur downstream, so upper watershed actors don't receive

compensation for providing them. Development of incentives for appropriate land use practices therefore require finding ways for upstream landholders to be compensated for their costs.

This is where a more broad-based Payments for Ecosystem Services (PES) scheme could help alleviate the problem. Paying land owners in the upper water catchment to maintain existing forest cover or vegetation, for example, could maintain stable stream flows and reduce sedimentation. Likewise, a small fee could be added to the monthly water bill, with the funds being set aside for conservation and watershed protection projects.

What Should Companies do Next?

Based on our conversations, we have mapped out a three-phase approach that would have to be carried out with the cooperation of private, public, and community stakeholders.

Phase 1:

Exploring the potential for – and returns on investment related to – payments for watershed services in key areas of Uganda relevant to business, which would include identifying and locating specific areas within targeted watersheds that contribute the most to the water problem (such as water shortages or poor water quality). These studies would also indicate where and how land-use changes must be introduced in order to reduce and eventually eradicate the sources of such problem.

Phase 2:

Designing a pilot PES project for private-sector investment. Based on Phase I findings, a pilot test of changed watershed management practices can be designed for private sector investment and collaborative implementation and study. Such a pilot would include a cooperation agreement (or memorandum of understanding) between upland watershed service providers and downstream service users (the companies/businesses), whereby the upland providers would agree to carry out certain activities to ensure water quantity and quality in return for an agreed amount of money or form of compensation. Monitoring and verification can be undertaken by a third party.

Phase 3:

Implementing a pilot PWS project (or portfolio of projects) and assessing results, including return on investment (ROI). The last stage would be implementation of the agreement for an agreed period of time (with continuous monitoring) that would enable private sector partners to assess if payments for watershed services offers improved reliability of water quantity, quality and/or cost savings.

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Valuing the Arc: An Experiment in PWS

By Steve Zwick

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

If anyone knows the value of the Eastern Arc Mountain ecosystem, it would be George Jambiya and Neil Burgess. Together, they've spent more than three decades helping WWF and the Tanzanian government document thousands of rare plant and animal species that populate the Arc, not to mention the ecosystems they support and the animals and economies that depend on them. Neither of them, however, can tell you with scientific certainty the value of the ecosystem services that flow from those plants and animals.

"On the one hand, you can say, 'Look, we all depend on these services, so the value is inherent,'" says Burgess. "But we can't go to Coca Cola and say, 'This catchment delivers this amount of clean water, and has this value to you.'"

The ability to make that statement with confidence, however, would help save life-supporting ecosystem services that support – and, in our economic system, compete – with tangible hard commodities like timber and food.

"Right now, a lot of the values that are being applied to forestry management and water management are only taking into account things like timber prices and logging prices," says Jambiya. "Things such as carbon sequestration and hydrological services don't come into play, and the value of water is not determined by the market or even by supply and demand – but by an arbitrarily-set figure, which is probably very much on the low side. The values of biodiversity are even worse."

The two are among a handful of experts spearheading a five-year research and policy project called "Valuing the Arc", which began in January, 2007, and runs until December, 2011. Its mission is to quantify the economic value of specific ecosystem services in the Eastern Arc Mountains, and it harvests expertise from five UK-based universities (Cambridge, East Anglia, York, Leeds, and Cranfield), two Tanzanian universities (University of Dar es Salaam and Sokoine University of Agriculture), the WWF Tanzania Programme Office, and the Natural Capital Project.

Along the way, they've begun to identify and educate potential buyers and sellers of ecosystem services and provide fodder for a CARE-WWF partnership that's priming the pump for a viable system of Payments for Ecosystem Services (PES) in the Arc.

Katoomba in Uganda

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

First the Price, then the Payment

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

Over the years, Burgess and scores of other researchers had taken a shot at mapping the ecosystems of the Eastern Arc Mountains, and several facts were clear: First, they knew that foliage in the fog-enshrouded, moss-laden "cloud forests" that capture and store moisture high in the mountains was declining. Second, they knew that farmers were both tapping the mountain streams for agriculture and letting their fertilizer run into the waters.

They also knew that downstream rivers were running faster in the wet season and slower in the dry season – and muddier all year long. But they didn't know the extent to which each problem could be attributed to specific practices, and they couldn't determine the value of maintaining the upper catchments to end users such as breweries or water filtration plants.

Building the Team

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

"That's where we come in," says Ricketts, whose Natural Capital Project (NatCap) supplied a tool called InVEST (Integrated Valuation of Ecosystem Services and Trade-offs) – a software package that maps ecosystem services and their economic values. As NatCap was joining the project, Ricketts applied for and won a grant from the Packard Foundation that complemented the Leverhulme grant – and set to work delivering their piece of the puzzle.

"We've basically built a program that plugs in to the industry-standard GIS tool," he explains. "You can map how much carbon is being stored in forests and woodlands, for example, or where people harvest products like medicinal plants directly from ecosystems." InVEST also offers modules that map important areas for water supply, flood control, timber harvest, crop pollination, and other

ecosystem services. "You can use only the modules you care about, and customize those to your situation," he says.

Laying the Groundwork and Priming the Pump

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

We're All Connected

The second phase has just kicked in, along with a tangential partnership between WWF and CARE designed to take the PES scheme to the next level. That partnership secured financial support from Coca Cola and the Dar es Salaam Water and Sewerage Company and completed four studies: a livelihood study, a hydrology study, a vegetation-cover study, and a business case study.

Jambiya says that, in the intermediate term, the WWF-CARE project will focus on building the base for a viable water quality trading (WQT) scheme. A water quantity scheme will follow down the road. "We feel we can get results on water quality within two or three years," he says. "We intend to set up monitoring stations at critical locations within a sub-catchment we are working on, and we will also have monitoring stations in other catchments."

As anyone who knows the evolving science of measuring water quality can tell you, that task is easier said than done – and is only one of three challenges, the others being building the institutional and legal framework within which a scheme can work, and finding buyers and sellers.

Bringing in the Buyers

Jambiya says government administrators aren't key participants in Valuing the Arc – but they are a key target audience, as well as key participants in the WWF-CARE partnership. "The whole intention of Valuing the Arc is to try to establish the true values of these resources and the services that they offer, and through that make arguments for greater investment on the government side for conservation efforts," he says, adding that he's not adverse to luring private-sector investors – just that he feels the near-term damage control can best be handled by government.

"We have two private-sector buyers already, in the form of Coca Cola and the water company," he says. "These buyers can afford more, and hopefully will, over time, dig deeper – but we also need a lot more buyers, and that is proving difficult to achieve."

They've pitched the concept to scores of other water users including Swaziland Brewers Ltd, which is owned by South Africa-based SAB Miller. A spokesman for SAB said the company is evaluating payments for watershed services schemes at the plants around the world, but would not comment on any project specifically.

Selling the Sellers

WWF and CARE, meanwhile, have been working the mountains to persuade subsistence farmers to give up a piece of their yield in hopes of a longer-term ecosystem services payout. “On both sides, we’re finding a lack of understanding,” says Jambiya. “You try to tell sellers they can get money from not chopping down the trees, and it pretty quickly becomes abstract, especially when they know what they can get right now for doing what they are doing.”

Indeed, he says, the concept of PES flies in the face of centuries of conditioning – not just in Tanzania, but around the world. “You go to buyers and explain what you’re doing, and they basically see that water is collected in the catchment, that it drains this way, and they say, ‘I’ll pay for the pumping costs, but why should I pay for catchment management costs?’” he says. “And that’s why the science behind it and the evidence behind the science is extremely important.”

Steve Zwick is the Managing Editor of the Ecosystem Marketplace.

Part IV:
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