THE SKIMMER ON MARINE ECOSYSTEMS AND MANAGEMENT

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Payment for ecosystem services: An idea whose time has come for marine resource management?

Healthy ecosystems provide a vast array of services to human society. Our coasts and oceans, for instance, provide us with food, recreation, carbon storage, trade routes, buffering against storms, and much more.

The UN's Millennium Ecosystem Assessment, which assessed the services provided by the natural world, found that ecosystems have changed extensively over the past half-century as a result of human demand for nature's products (www.unep.org/maweb/en). This change has contributed to substantial net gains in human well-being and economic development. But the gains have come at growing cost in the form of the degradation of many ecosystem services. The Assessment estimated that more than 60% of the world's ecosystems are being used in unsustainable ways.

Aside from being an environmental problem, this degradation is an economic problem. Stakeholders who depend on coastal and marine ecosystems suffer financially from loss of the ecosystem services.

Economics may hold a solution. What if stakeholders who benefit from certain ecosystem services helped pay for those services' protection? For example, if soil runoff from upstream farming were degrading critical fish habitat downstream, the stakeholders downstream (e.g., local fishers, or government, or NGOs) could pay the farmers to improve their methods, such as through planting riparian buffers. Another example: if a dive center wanted its clients to see more abundant fish, it could pay local fishermen not to fish in a certain area. The real economic value of these services (clean water and biodiversity, respectively) would be made apparent, and the cost of their protection would be met.

This concept is called payment for ecosystem services (PES). It holds promise as a strategy for management and conservation, and has been implemented widely in the terrestrial realm. However, PES has only relatively recently emerged in the marine realm. In part this is due to the lack of conventional property rights at sea, making it somewhat more challenging to "sell" the delivery of ecosystem services to potential buyers (e.g., should fishermen who have *access* to fish, but not a legal *right*, be paid not to fish in a certain area?). In addition, the science of assessing marine ecosystem services, determining their value, and identifying what factors affect ecosystem service delivery remains relatively new.

Still, progress is being made. New techniques and programs for quantifying and valuing marine ecosystem services are coming on line (see box at the end of this article, Resources for applying economic value to ecosystem services). These programs include several initiatives around "blue carbon", which seeks to finance the conservation and restoration of coastal vegetation as a carbon storage strategy (see box, Resources on blue carbon). The location of ecosystem service-delivering habitats can be mapped, as can the flow of benefits across broader landscapes. This can all set the stage for innovative financing mechanisms like PES.

Here, MEAM talks with several PES practitioners and researchers about payment for ecosystem services, and what this emerging tool holds for the field of coastal and ocean management in the years ahead. (Please note: PES does not suggest that certain user groups should be *expected* to pay for another group's externalities. Rather, PES is one option for addressing the decline of ecosystem services, and its economic applicability depends on each case's circumstances.)

I. Strengthening the business case for PES

Jan Cassin is project director for "Scaling up Payments for Ecosystem Services to Meet the Global Water Crisis", a Forest Trends project that focuses on investments in watershed services in particular. Forest Trends is an NGO that develops financial tools to help markets for carbon, biodiversity, and water produce good conservation results (www.forest-trends.org).

MEAM: Jan, you focus on investments in watershed services, which can hold downstream benefits for marine conservation and coastal communities. What are the most successful examples so far of such programs?

Jan Cassin: A number of emerging examples come to mind, although all of these have challenges related to scale and the difficulties of connecting inland and coastal communities. I think the slow to emerge, but expanding, efforts in the Great Barrier Reef watersheds to reduce damage to the GBR by better managing land use on a large scale in the contributing watersheds (controlling sediment, nutrient, and pesticide runoff from agricultural operations, primarily) is an example of a PES-like program. It is a mix of incentives and technical guidance on best practices to support upstream communities as they change practices that impact the coastal and marine environment. Ultimately both inland and coastal communities (including Aboriginal and Torres Straits communities) would benefit through more sustainable economic activities.

Probably one of the most successful examples of investment in watershed services is happening in Melanesia and the South Pacific. This is the work that Wildlife Conservation Society is doing with communities in Kubulau, Fiji. What started as an EBM approach to create an integrated system of terrestrial and marine protected areas has expanded into a scheme where payments from visitors to the reefs in a nearby marine reserve support upstream community conservation projects. Protecting both freshwater and marine waters is seen as two sides of the same coin: both are essential for the communities in this relatively small area. The fact that these communities live in close proximity and there is deep local knowledge about the linkages between land and ocean probably contributes to this success.

MEAM: What are the primary challenges involved in scaling up watershed and marine PES?

Cassin: One of our biggest challenges is demonstrating the business case for paying for ecosystem services. Even though valuation studies have progressed significantly over the past 15 years, the information on the economic value of services is still largely theoretical. It is not tied directly to the costs or risks that individuals or communities see in their daily lives, nor to the real economic decisions that individuals or communities have to make. This translates into weak demand, and finding buyers is one of the

major challenges that PES projects face.

Things that could strengthen the business case would be better economic decision-making tools that more directly link the costs and benefits of maintaining or restoring services with:

(1) The real direct costs of losing services;
(2) The costs and impacts of replacing ecosystem services with technology; and
(3) How the range of alternatives for providing services (ecosystems and technology) can best be compared to identify optimal mixes.

For example, the question is not really whether you protect a watershed to maintain clean water supplies OR invest in a water treatment plant to do the same. The questions really are: What else do you lose through impaired watershed health (e.g., downstream coastal fisheries, increased risk of flood damage to property)? How will a degraded watershed impact the cost and viability of existing or new "gray" infrastructure (like water treatment plants). And what mix of natural infrastructure and technology provides the greatest benefit to the stakeholders in the watershed, from ridge to reef?

MEAM: Where do you see PES for coastal and marine ecosystems 10 years from now?

Cassin: PES for coastal and marine ecosystems has great potential. There are clear cases where it should work: tourism businesses, for example, that rely on clear, clean water and controlling beach erosion. Or possibly shellfish growers relying on water free of toxins and excess nutrients. The demand for protecting coastal and marine services should increase as more and more people live along coasts and are aware of their dependency on these services.

For more information: **Jan Cassin**, Forest Trends, Seattle, US. Email: JCassin@forest-trends.org

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II. Gaining support from stakeholders for a PES program

Luis Bourillón is director of the Mesoamerican Reef Program at Comunidad y Biodiversidad (COBI), a marine conservation NGO in Mexico. In 2012, COBI studied the feasibility of a potential PES scheme involving a multi-use MPA near Puerto Morelos, a coastal town. COBI examined whether payments from the local tourism sector could sustainably support the management of a larger no-take zone within the MPA. The costs to the tourism sector would include paying fishermen to not fish in the expanded, and diving-friendly, no-take area. The feasibility study is at http://bit.ly/PuertoMorelosStudy.

MEAM: What is the current status of the PES project in Puerto Morelos?

Luis Bourillón: The results of the PES project in Puerto Morelos were presented to the advisory council of the marine park, which includes representatives of all stakeholders, because the implementation needed full support of the managers of the park (CONANP-National Commission of Protected Areas of the Mexican federal government) and the local fishing cooperative. COBI had already negotiated an expansion of the no-take zone with the fishing cooperative. However, the administrative process to allow this - which would have modified the zoning of the marine park - was considered too complex and dangerous by CONANP. This was because, during the same process, other stakeholders could request to lessen restrictions on their own activities. As a result, the park director decided to deny his support of the proposal of a bigger no-take, and the cooperative decided to withdraw its support to the PES proposal. So the project was suspended after that meeting.

MEAM: What other challenges face the potential application of PES to Puerto Morelos?

Bourillón: In addition to securing full support from the government agency and the proposed financial beneficiaries of the PES scheme (the fishing cooperative), the tourism sector needs to be convinced that paying for a service that now is obtained for free will benefit its industry. More outreach and clear incentives for all stakeholders are needed to take a step toward successful implementation.

MEAM: Ten years from now, would you like to see PES be widely applied throughout Mexico's environmental management?

Bourillón: I am convinced that PES will be widely applied in MPAs as a tool to compensate local communities that are investing time and money to protect biodiversity. PES will also provide avenues for the larger global community to be part of those efforts [through investment].

The tipping point for this will be having several successful pilot cases that show the potential of PES, and can convince policy makers to provide the legal framework to support PES in all MPAs of México. COBI is exploring the use of PES in the Gulf of California as a potential design criterion for an economically sustainable network of marine reserves. We're also examining ways to share operation costs among public and private sectors. We will have more information and practical experience to share with the growing community of theorists and practitioners of marine PES in the future.

For more information: **Luis Bourillón**, COBI, Puerto Morelos, Mexico. Email: lbourillon@cobi.org.mx

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III. PES as an application of the precautionary principle

Barbara Unmüßig is president of the Heinrich Böll Foundation (www.boell.de/en). She recently published an essay on the risks involved in applying economic values to ecosystem services, especially in the context of offsets for environmental damage caused elsewhere. She suggests that applying tradable prices to ecosystems - in effect, "monetizing nature" - reduces them to a set of commodities (www.greattransition.org/publication/monetizing-nature-taking-precaution-on-a-slippery-slope). However, she draws a distinction between the above and PES.

MEAM: In your essay, you suggest PES schemes are different from market-based environmental trading schemes, like mitigation programs for carbon emissions. How so?

Barbara Unmüßig: Most market-based environmental trading schemes, including carbon offset programs, are designed to allow the destruction of nature and the replacement of it elsewhere - not its preservation. However, PES schemes aim to preserve. They are an application of the precautionary principle. Through PES, policymakers prioritize biodiversity protection, and compensate farmers or other potential consumers of nature and biodiversity for forgone economic gains/income. Essentially PES is not so different from agricultural subsidies based on ecological criteria.

In contrast to PES, offset programs bring a problematic dependency into play: that is, the payment for nature conservation is tied to the destruction of nature elsewhere. This locks environmental policy into a path-dependency: through offsetting, the financing of nature conservation is tied to the destruction of nature. From my point of view, this is a perverse incentive and has nothing to do with the precautionary principle.

MEAM: Where do you see PES as a strategy 10 years from now?

Unmüßig: We need greater appreciation of the value of nature. We need stronger political will to stop its further destruction. We need new, more powerful political alliances to protect biodiversity and ecosystems. PES - as an incentive for such protection - can be a helpful instrument, but not the only or prevailing one. To stop doing harm will require strong politics and policies.

For more information: **Barbara Unmüßig**, Heinrich Böll Foundation, Germany. Email: unmuessig@boell.de

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IV. PES must complement other ecosystem services approaches

Linwood Pendleton is the International Chair of Excellence at the European Institute for Marine Studies and the University of West Brittany, as well as a Senior Scholar of Ocean and Coastal Policy at Duke University's Nicholas Institute for Environmental Policy Solutions. He also heads the Marine Ecosystem Services Partnership, a center for

information and communication on the human uses of marine ecosystems (www.marineecosystemservices.org).

MEAM: In your opinion, what are the most successful examples so far of coastal or marine PES in practice?

Linwood Pendleton: While traditionally left out of the PES discussion, user fees - such as those applied in many MPAs - are a direct payment for ecosystem services. Not only have MPAs done a good job of applying user fees, but MPA managers have used surveys to help determine appropriate fee levels, including charging different fees to different groups (local vs. foreign users, non-consumptive vs. consumptive users, and even photographers).

There are also payment schemes that may not directly be tied to ecosystem services but encourage reduced use of a resource. For instance, at least one pearl farmer in Taveuni, Fiji, pays the local village to not fish in the area where pearls are grown. The motivation behind the payment is to protect the pearls from theft. The outcome, though, is a reef that has recovered dramatically from overfishing, which has spillover benefits, benefits snorkelers (who often buy pearls on site), and is beneficial to the health of the oysters.

MEAM: How do you see PES fitting into a broader framework of ecosystems services approaches to coastal and marine management?

Pendleton: PES schemes must be complementary. They can cause problems if the incentive created by the PES is so great that it swamps traditional uses, sound ecological practices, or the careful management of other ecosystem services or biodiversity that don't benefit from a PES scheme. One reason I like coastal blue carbon as a potential source of PES is that the best way to protect carbon held beneath mangroves, salt marshes, and sea grasses is to protect the ecological health of the ecosystems themselves.

MEAM: Where do you see coastal and marine PES heading in the next 10 years?

Pendleton: I think the PES crowd has gotten hung up on the issues of *stacking* and *additionality** : basically, buyers are worried that they may wind up paying for an ecosystem service that someone else is already paying for. In reality, there are few opportunities for one PES arrangement to cover the full cost of resource protection. It is going to be important for local land and sea managers to be able to develop portfolios of PES (and other types of sustainable financing mechanisms) to ensure a sustainable and complete funding stream for marine management.

These portfolios also are important as a means of hedging against financial risk. Ideally you should have many types of buyers and many sources of revenue. Otherwise, if you have only one PES scheme and the market for it fails, you are in trouble.

For more information: **Linwood Pendleton**, Duke University, North Carolina, US. Email: linwood.pendleton@duke.edu

* Editor's note: *Stacking* refers to receiving multiple ecosystem services payments in return for a single activity. Critics of stacking suggest it amounts to double-charging for no additional ecosystem benefit. *Additionality* means that, in a PES scheme, any direct ecosystem service benefits generated by the scheme would not have happened otherwise under the status quo.

V. PES in fisheries

Katherine Short is Principal of F.L.O.W. Collaborative (Fisheries.Livelihoods.Oceans.Well-being -www.flowcollaborative.co.nz) and Partner in Terra Moana Ltd., a natural capital coaching consultancy (www.terramoana.co.nz). She is developing a panel on the use of ecosystem services in fisheries at the SeaWeb Seafood Summit, to be held this February in New Orleans, US. Annabelle Bladon is a Ph.D. candidate at Imperial College London studying the application of PES in fisheries in the developing world. Short is one of her Ph.D. supervisors.

MEAM: Annabelle, in your research you point out that PES in fisheries could take a number of forms, from supporting an overall management plan, to a specific management action, to the provision of a specific ecosystem service, or other forms. What do you see as its main potential value to fisheries?

Annabelle Bladon: I think a significant value of PES to fisheries lies in its potential to incentivize investment in, and alleviate the costs of, monitoring and enforcement in fisheries where it is lacking, as in much of the developing world. It will of course be a challenge, but it may also be a tool to drive the institutional changes needed in developing world fisheries.

MEAM: You've noted that, to date, the only example of a fisheries payment mechanism formally referred to as PES in the scientific literature is that of the Banc d'Arguin National Park in Mauritania. (There, the EU allocates part of its payment for the EU-Mauritania Fisheries Partnership Agreement to the management of the park, explicitly for the purpose of protecting nursery and breeding sites for fish.) Where do you see PES for fisheries 10 years from now?

Bladon: I think in most situations, real application will require a great deal of innovation in fisheries management and governance, so I'm not sure that we will see it broadly applied. I think a key area in which we might see development in the near future is international PES, where investment in developing world fisheries is channeled from the developed world. Developed countries obviously have more readily available sources of financing, and have a partial responsibility for supporting better stewardship of the foreign fishing grounds they exploit. The EU-Mauritania agreement over Banc d'Arguin National Park is evidence of the potential for success here.

MEAM: Katherine, how would you build on Annabelle's vision?

Katherine Short: I have a vision for how to address many of the current problems in the sustainable seafood movement, and it involves understanding how three worlds could intersect and strengthen each other: ecosystem services, seafood improvement, and transparent corporate reporting. The current sustainable seafood movement mostly focuses on individual elements of an ecosystem at a time, rather than the whole. The complexity, and to an extent the reality, are lost as a result. How do we assess what creates the greatest value from using an ecosystem, especially in a fluid realm?

A solid basis in ecosystem services can provide that. It allows for calculation of costs and benefits to all resource users over time, and enables decision-makers to make far more informed decisions knowing the tradeoffs and value propositions of different choices. It can also create a clearer investment framework - using ecosystem service valuation and payment for ecosystem services - to enable private sector contributions to be more clearly calculated and attributed.

For more information:

Annabelle Bladon, Imperial College London, UK. Email: a.bladon12@imperial.ac.uk

Katherine Short, F.L.O.W. Collaborative, New Zealand. Email: katherine.short@flowcollaborative.co.nz

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BOX: Resources for applying economic value to ecosystem services

There are several methods for placing economic values, or other values, on ecosystem services. The resources below walk readers through some of these methods:

- **The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundation**(TEEB, 2010). Chapter 5 is particularly relevant. www.teebweb.org/our-publications/teeb-study-reports/ecological-and-economic-foundations/
- **An Introductory Guide to Valuing Ecosystem Services**(Defra, 2007). http://ec.europa.eu/environment/nature/biodiversity/economics/pdf/valuing_ecosystems.pdf
- **Ecosystem Valuation** website, funded by the US Department of Agriculture and the (US) National Oceanic and Atmospheric Administration. www.ecosystemvaluation.org
- **The Natural Capital Project and its InVEST tool**(Integrated Valuation of Environmental Services and Tradeoffs).www.naturalcapitalproject.org
- **Payments for Ecosystem Services: Getting Started in Marine and Coastal Ecosystems - A Primer**(Forest Trends, 2010). www.forest-trends.org/documents/files/doc_2374.pdf

- **"Ecosystem services valuation and assessment: Is the process more important than the product?"** by Wendy Dodds (2014). https://www.openchannels.org/node/8034
- **"The value of valuing nature"** by W.M. Adams (Science, 2014). www.sciencemag.org/content/346/6209/549.short

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BOX: Resources on blue carbon

"Blue carbon" is the concept of offsetting greenhouse gas emissions through the conservation and restoration of coastal vegetation, which stores carbon dioxide. Here are three sources for more information on the concept and its application:

• **The Blue Carbon Portal**, a website by UNEP and GRID-Arendal. http://bluecarbonportal.org

• **The Blue Carbon Initiative**, a program of Conservation International, IUCN, and the Intergovernmental Oceanographic Commission. http://thebluecarboninitiative.org

• **Abu Dhabi Blue Carbon Demonstration Project** (Abu Dhabi Global Environmental Data Initiative, 2012). http://bluecarbonportal.org/download/11412/

BOX: A project to standardize the practice of PES

Carter Ingram is director of the Ecosystem Services/Payments for Ecosystem Services Program at the Wildlife Conservation Society (WCS). WCS has developed multiple PES projects around the world, particularly in the terrestrial realm. Now Ingram is co-leading a project with Earth Institute Center for Environmental Sustainability and partners to standardize the practice of PES. Here she discusses the project and its implications for resource managers:

> "The over-arching goal of the work is to strengthen the design and effectiveness of PES and PES-like mechanisms to support project developers, investors, buyers and other stakeholders. This project came about because there is often little or no information available or reported on PES initiatives with respect to the scientific principles or tools used. In addition, the way in which projects are described is often very heterogeneous, making it difficult to understand what is working and what isn't across different projects.
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> "My collaborators and I are addressing these challenges through the development of best-practice scientific principles, based on several years of discussions we've had with practitioners, thought leaders, investors, and funders. These principles may be used to design, implement, manage and evaluate PES projects and programs, while also providing a standard structure that can facilitate consistent reporting and evaluation of effectiveness across PES initiatives."

For more information: **Carter Ingram**, WCS. Email: cingram@wcs.org

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