

## **Payments for ecological services and the issue of compensating for avoided deforestation.**

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Ecosystem services are services, such as water purification, nutrient recycling and soil generation, that the biosphere and global biogeochemical cycles have provided as long as there has been life on the planet, like planet sized utilities that don't send you a bill and ask only that you don't disrupt operations. Flood control, soil retention, pollination, climate stability, coastline protection, nutrient recycling, food, water, fiber, timber, recreational and cultural values, etc. are all goods and services that we get from nature. With the advent of international climate agreements and market mechanisms to limit global climate change, carbon sequestration and storage has come to the fore and brought the concept of payments for ecosystem services to the general public.

Because nature has always provided for us, and these goods and services have flown freely and copiously from nature, they have been free for the taking unless someone has found a way to monopolize them and bar others from free access. Thus, our mindset has always been that these benefits are free and we are loath to accept the entry of economics into nature and the pristine world of free water, scenic vistas, and organic soil microorganisms. But with the advent of private land ownership, agriculture, and limited hunting rights, some people have been able to dominate certain resources and exclude others from free access, and in some cases to start to charge for things that used to be freely available. Charging a fee for the use of water discourages waste, if the fee is high enough, and in a crowded world helps ensure that in the end it is available to more people—and let us not forget all the other living beings that need that same water.

More often than not, though, paying for water has been fraught with controversy and some times open conflict. Utilities have been forced to mask their fees as charges not for the water itself but for the use of their infrastructure and the service of purifying water artificially, where needed. Access to water and food has been seen as a basic right that should not be available only to those with the means to pay for it; yet our society has made paying for some of these goods and services an integral part of economic life, but not others. Fish from the sea has been free to those with the means of harvesting it, and while in recent times we have become used to paying for fish in the store, that payment could always be seen as payment for the fisherman and the fishmonger's service of making it available to us, and reimbursement for their costs—and not so much for the fish itself. But with increasing scarcity, we have seen the introduction of tradable fishing licenses, worth millions, and the thought that fish no longer come free from the ocean has taken hold. But again, perhaps fishermen are not really paying for the fish themselves, which nature provides, but for the right to exclude others from the resource.

A mangrove forest, for instance, provides a multitude of ecosystem services: erosion control, protection of coast lines from storm surges and tsunamis, land reclamation, carbon capture and storage, recycling of wastes and nutrients; they serve as nurseries and feeding grounds for fish and shrimp; provision of fuel wood, timber, fiber, tannins and dyes, and other materials; sediments trapped by the mangrove roots prevent silting of adjacent marine habitat such as coral reefs; mangroves provide compounds for medicinal use, etc. Some of these values are currently marketable, others are not.

There are a variety of different methods for assessing the value of ecosystem services (e.g. Barbier et al. 1996, Costanza et al. 1997). While never complete, providing a partial

measure of ecosystem values is much better than none at all. One way is to calculate how much it would cost us to supply that service industrially, where that is possible. Clean water, for instance, can be supplied by desalination plants, and the water transported to where it is needed. (The cost of water supplied by this means should include the environmental costs of burning fossil fuels for energy and transportation, although these are usually treated in conventional economics as externalities).

Mangroves are estimated to provide ecosystem services at a per hectare rate of \$9,900 per year—nearly five times higher than the per hectare rate for tropical forests, which are noted for their high biodiversity (Tallis and Kareiva 2005). Forests can easily hold 100 tons of carbon per ha and keep it from being emitted to the atmosphere. 2/3 of this carbon might be stored in the soil. As CO<sub>2</sub> emission permits currently trade at about 30\$/ton in the EU, the service of keeping this carbon out of the atmosphere might be worth \$12,000/ha at current market prices.

### *Why pay for ecosystem services?*

As long as we don't account for the value of ecosystem services, we will set in place all sorts of perverse mechanisms with which our current economic system is plagued. If something is free or too cheap, we tend to waste it. If something is perceived as valuable, and comes with a high price, we tend to look after it, and we have devised a complex economic system and mechanisms of trade to try to derive an income from such assets.

If we do not put a price on nature, the planners, bureaucrats and economists of the world will put an implicit price on it, namely zero. That means that the value of natural assets and services will be disregarded in our planning, accounting, in financial transactions and in the way we organize our lives—until it becomes time to pay the piper.

Perhaps the most compelling argument for payment for ecosystem services is that with the way things are going, there will never be enough large protected areas to adequately protect the riches of nature inside protected areas, and we have to find ways to ensure that also modified habitats outside reserves will support wildlife and vegetation. Ascribing economic values to ecosystem services is an important way of making clear to people the magnitude of the benefits they derive from ecosystem services as a motivation to preserve natural systems, and creating incentives for managing for the maintenance of these ecosystem service also outside of protected areas.

Most of the biodiversity in the world is to be found in developing countries. These cannot be expected to bear all of the cost of protecting the world's diversity or the ecosystem services that benefit the whole world. So it is necessary to find means of providing an income from wildlands without destroying them, in financially poor countries as well as in rich countries.

Payments for ecosystem services (PES) can of course complement income from compatible economic activity, such as community forestry, small scale, rotational agriculture, hunting, honey gathering, tourism and other activities that fit within the patch structure of a healthy ecosystem. As such they may be a necessary and sufficient means of tipping the balance in favor of ecologically friendly land use patterns.

*Some examples, with caveats*

Costa Rica is famous for having instituted payments for ecosystem services on a large scale, in its efforts to protect their forests and local livelihoods, and the country now derives a large portion its revenue from tourists that come to experience the natural splendor of the forests, the wildlife, and the beaches. Based on this success, payments for ecosystem services have become relatively commonplace throughout Central America, and examples are springing up elsewhere in Latin America in particular.

When New York City needed to make investments to secure its water supply, it found that they could build new water treatment plants to the tune of \$10 billion, or combine land purchases and payments to watershed landowners to maintain forests and other landscape features that provided clean water from nature, for about \$1 billion. However, the very fact that this case is so widely cited, suggests a paucity of good cases for writers to draw on.

On the other hand, if we take a broader definition of PES we find a multitude of examples, from conservation banking and biodiversity offsets in the United States and Australia, conservation easements, payments to small scale landholders for water provided to downstream farmers, etc. In Indonesia's community forestry program, farmers are allowed to use degraded state forest for coffee-based agro-forestry systems provided they protect the rest of the forest, resulting in tenure benefits (Richards and Jenkins, 2007, citing Kerr et al 2006). Broadly defined PES mechanisms include eco-labelling or certified forest products, conservation concessions, biodiversity offsets, bioprospecting, ecotourism (including sport hunting and fishing), and entrance fees to national parks.

It has been suggested that the examples of PES from Meso-America have had little impact on national deforestation rates, because payments have accrued to land that would not have been cleared in any case (Kaimowitz 2008)). Parts of Meso-America are already undergoing the forest transition where deforestation ceases due to changing socio-economic factors and the fact that the forest frontier is already gone. While lowland forests are typically gone, most remaining forest cover tend to be on steep slopes and in areas that are inaccessible in the absence of new infrastructure. This is a serious global problem, as the species that make their living in productive lowland ecosystems have been severely depleted almost everywhere.

The performance of PES efforts have been hampered by the absence of supporting legal frameworks, limited funding, reduced implementation capacity, poor cross-sector collaboration and incompatibility with existing development policies (Hall 2007). Common equity constraints are insecure land tenure, weak local institutions, and inequitable public enforcement capacity. Beneficiaries are often poor and/or unwilling to pay for a "free good" or their basic right to a good such as water, and it is difficult to exclude beneficiaries who won't pay (Richards and Jenkins 2007). Most of all, however, the benefits of PES have been slow to emerge due to a lack of knowledge about the benefits provided by natural ecosystems and the possibility of deriving an income from the delivery of such benefits.

It has further been suggested that the likely recipients of PES are not primarily poor farmers, but companies and large individual land owners. Meanwhile, rapid deforestation continues in many agricultural frontier areas, particularly in the humid tropics. Demand for participation in PES schemes have surpassed available funds, for instance in Costa Rica. To the extent that PES actually displaces activities that contribute to deforestation, an influx of additional funds would ensure greater results.

While there is a paucity of successful examples of PES, there is no shortage of stories demonstrating the costs associated with ignoring ecosystem services. One of the reasons Australia, for one, is a front-runner in pushing for systems of PES is the devastating effects on agriculture following the ill-advised policy to grant titles to cleared forest land, which resulted in the predictable forest loss and billions of dollars in costs associated with raising of the water table and salination of soils when the forests were no longer there to suck up ground water as it had in the past.

### *Some complexities*

The broad application of PES is hampered by some simple, practical constraints. Three big ones are:

1. It's often difficult to quantify many ecosystem services, and especially difficult to attribute the contribution of particular "sellers" to their provisioning;
2. The transaction costs of setting up payment systems can be greater than the value of the goods themselves;
3. Ecosystem services, by definition, need human consumers. That limits the natural areas that can sell services provided to those that are within range of significant human settlements (e.g. forested watersheds in the periphery of cities is a good example).

Bottom line: there are some limited cases where payments for ecosystem services will be a critical tool in achieving desired goals (e.g specific watershed services), but it may be a long time before natural services are so scarce that this is worth considering for broad application. PES still has potential as one conservation tool among many.

In general, though, many of these concerns do not apply to the same extent when it comes to a global market for carbon capture and storage. There have been concerns over demand-side limitations and a lack of supply-side know-how as barriers to effective PES (Wunder 2005), but there should be no shortage of demand now that funding appears likely to flow in for carbon storage. Experiences from other types of PES may not be all that relevant to payments for carbon capture and storage. Carbon capture and storage is uniquely simple relative to other ecosystem services.

One key difficulty remains in the variation in opportunity costs between different land areas: average prices will not provide the desired results. Opportunity costs will be very variable spatially, and to some degree also temporally. Land with higher opportunity costs than the payment will largely be cleared anyway, land with lower opportunity cost probably wouldn't have been cleared regardless of the payments.

The effects of PES depend on what actors do with the extra spare time on their hands; when for instance they no longer need to practice slash and burn agriculture. If they go out hunting, this could have very detrimental effects on biodiversity. As one takes a sufficiently integrated approach to ecosystem services at appropriate spatial and temporal scales, however, incompatible activities would be discouraged.

For PES to be an efficient means of attaining REDD objectives (Reduced Emissions from Deforestation and Degradation) you would seek to pay only for forests that would otherwise be cleared or degraded. Furthermore, you would seek to pay only as much as you had to in order to influence decision makers in the intended direction.

In principle, however, it would seem correct and equitable to pay for ecological services whether or not they were threatened at all. In that case you are not really achieving environmental or climate benefits at all, and perhaps one could seek agreements to pay for these over aid budgets or local budgets instead, perhaps as required co-financing.

Financially, it is a completely different matter to pay for the avoidance of deforestation (through compensation for opportunity costs) than it is to pay for ecosystem services wherever they occur. For instance, it is one thing to pay compensation to halt the clearing of 20,000 km<sup>2</sup> per year in Brazil, but a completely different matter to pay for ecosystem services derived from 5 million km<sup>2</sup> of Brazilian forest.

For one thing, in order to displace harmful activities, payments must be concentrated enough to give actors a viable alternative to the harmful activity. If payments are spread over too large an area you would need very large flows of capital indeed to displace the harmful activities where they are a looming threat. At \$5/ton of CO<sub>2</sub> and 100 ton CO<sub>2</sub>/ha forest, 5 million km<sup>2</sup> of Brazilian forest would represent a value just for the carbon of \$250 billion. Spacing payments over 100 years you would still get a cost of \$2.5 billion per year if you were to pay for the storage of CO<sub>2</sub>, just in Brazil. In a sensible world that amount would perhaps not be out of the question—it corresponds approximately to the advertising budget of the American sporting goods company Nike. One estimate puts the overall global advertising market at \$484 billion in 2008 (Times Online, Zenithmedia), of which \$3 billion will be spent on the Olympics in Beijing.

In the age of carbon credits even the sums for PES may not be prohibitive, however. The market for carbon credits is currently at about 100 billion dollars, and growing rapidly. There is talk of a trillion (10<sup>12</sup>) dollar market in carbon credits. Payments for compensated reductions should be sufficient even to displace high value crops such as soybean (e.g. Silva-Chavéz 2005).

For another, our economic system has been founded on the availability of many services that the environment provides for free or for an extremely low price. If we had to suddenly find a way to pay for all these services it would be a severe shock to the system. Many past and present economic activities are at best a zero-sum game, just shifting wealth from one form of “capital” to another, and from one set of stakeholders to another. For instance, logging on State land means taking the natural capital represented by standing trees from “owners” and stakeholders—local communities, citizens of the State and the global community, a multitude of species and natural communities that depended on those trees and the ecosystem services they provided, not to mention the trees themselves—and transferring it into money in the pockets of logging companies, “robber barons” and laborers, and workers in secondary industries, and timber products in the hands of buyers. Who is better off from this exchange, and by how much? How do we account for the transfer from one kind of capital to another, and the income streams derived from depleting capital? Has wealth been created or lost?

In either case, proper accounting of such transfers and properly identifying winners and losers would help bring these issues to the fore, help us make better decisions, and make explicit the value judgements we are implicitly making anyway as long as we are not assigning values to various forms of “capital” and keeping track of transfers in this manner—and in clearly delineating the conflicts of interest and the trade-offs inherent to our actions. Money, and sometimes great fortunes, are sometimes only made because

someone has the power to take something that belongs to all of us, or to no one, and keep the proceeds for himself.

Granted, part of the reason this someone was able to dominate a particular resource like this and turn it into a private fortune, is that the “system” assigned little or no value to it in the first place. If we were more diligent about assigning value, and in our accounting, the fact that mostly what has occurred was a transubstantiation of one form of capital into another, and that there were winners and losers in this transaction would not have escaped our notice so easily. But one might reasonably ask whether economic growth and wealth creation is at all possible in a system with complete accounting.

Many, if not most, ecosystem services flow to local and national stakeholders—e.g. soil formation and retention; protection of coastlines; water recycling and purification; flood and erosion control; food, fiber and fuel provisioning; pollination services; recreational and cultural values, and so on. If a system of international compensation for the service of carbon retention and absorption in forests is instituted, one might expect to subtract the value of national benefits of the same forest from international transfers. At the very least, a proper conditionality for such payments might be that a nation wishing to receive payment for avoided deforestation might be required to work towards a system of accounting and assignation of value to reflect national benefits derived from ecosystem services, including carbon storage. Some countries or regions might then choose to institute internal systems of payments for ecosystem services such as provisioning of clean water or flood control.

In general, one should state clearly whether a transfer is a payment for an ecosystem service or a compensation for an opportunity cost due to the fact that the “buyer” values a particular good higher than the “seller” does. The philosophical distinction and ramifications have been discussed above. Compensations for opportunity costs should be only as high as they need to be to displace a competing activity. Payments for ecosystem services would tend more towards fair value for the good provided, irrespective of the threat of a competing economic activity. However, in a “market situation” this distinction might be somewhat blurred, as the price might still be set by supply and demand and negotiations between buyers and sellers. Clearly, funds for PES will go further towards achieving environmental goals if they are applied only to land under threat, on the other hand perverse incentives are less likely to emerge if payments are for the provision of a service regardless of threat level. In either case, transaction costs should be kept as low as possible; systems should be only as complicated as they need to be.

Hostage situations might occur in a PES setting as well as in a compensation for opportunity costs. Someone able to impact the provisioning of a service, such as water from a local forest to the people down hill, might threaten to disrupt that service—whether he is the legitimate resource owner or not. Needless to say, there is still a role for regulation, control and legislation to stave off some of the evils of a free market situation. For international transfers, however, that ability to legislate and control is likely to be weaker.

Scarcity power is a critical element in turning a profit from any activity. Simple supply and demand also dictates that in our current economic system things do not become valuable until they are relatively scarce. Even our most precious resources, water and sunlight, upon which we are utterly dependent in the near term, have little or no price, even if they would be infinitely valuable to us when faced with a shortage. Nature tourism would only make a return if there are few opportunities for it relative to demand, either because there

is very little nature left or because it is limited by investments in infrastructure for access to it. Only then can you get an adequate concentration of tourists to a given location to make a living off them. Vast areas or areas without market access have no economic value unless those values can be accessed remotely, such as in the case of carbon capture and storage.

Given the vast scale of human consumption of fossil fuels, clearing of land for agriculture and live stock grazing, and burning of vegetation, carbon capture and storage may just now be reaching the point where it is a limited resource and some economic value can be ascribed to it. Incidentally, we may also have reached the point where any clearing of remaining ancient and old growth forests should be forbidden.

Because we have already lost so much forest, there is a huge opportunity in addressing our climate problems by restoring forests, letting them re-grow to healthy ecosystems on previously cleared land while sucking up carbon from the air. This would be an ecosystem service of great value, that is relatively simple compared to avoided deforestation, albeit one that would tend to reward people for past sins if implemented in any kind of quid pro quo system. For example, Turner et al. (2007) estimate that ecosystem carbon absorption in Oregon offsets 51% of the state's fossil fuel emissions, even in the absence of any particular incentive structures for boosting carbon capture and storage.

Replanting and afforestation is already included in the climate protocol and need not concern us further here, except to say that reforestation must be conducted in an ecologically sound way to ensure the provision of other ecosystem services besides carbon capture and storage. Again, having embarked on a path of paying for carbon capture, it is reasonable that this might encourage an expansion of other (internal) mechanisms for valuing other ecosystem services.

Comparative advantage is also a central concept in our economic system. In essence, simple theory would indicate that each actor should concentrate on his comparative advantage, the thing he or she is best at, to the exclusion of all other options and trade for other goods. Some areas are good for growing cotton and bringing it to market, other areas have an advantage in spinning the cotton and turning it into end products, some areas, particularly those lacking infrastructure and access to markets have their comparative advantage in "growing" or "maintaining" biodiversity, forest cover, and other ecosystem services. If there was a way to make a competitive living by providing these "ecosystem services" then such areas should specialize on that.

The question arises, however, whether we are willing to sacrifice all those areas (and the species and people that depend upon them) for which provisioning "ecosystem services" is *not* the comparative advantage? Clearly a market system should not be our only tool, and hopefully no one is still arguing that it should be. Even if the value of ecosystem services were completely integrated into our accounting and trading systems there would be winners and losers and serious repercussions, even if only because just humans participate in human economic transactions. We should also be open for the idea that there *are* absolute values, and in some cases command and control mechanisms are the only way. A mixture of regulatory mechanisms with a better valuation and accounting of ecosystem services would nonetheless be a marked improvement over the current state of affairs.

Most likely many actors will not worry overly about perverse incentives, detrimental ecological side effects, large scale leakage, etc. because they figure PES will bring income

and development to poor people and certain sectors of the economy. It is therefore important that people whose priorities are on the environment and obtaining environmental/climate benefits be vigilant with respect to how the funds are used.

As much as possible, funds for avoided deforestation should be coupled to and take advantage of (redirect) as much as possible other complimentary funds from other (development aid) sources, such as investments towards improved governance, poverty alleviation, anti-corruption measures, monitoring capacity, community outreach and strengthening of civil society, family planning, etc.

PES should be combined with support to population control and reduction, as a) continued population growth will threaten the ecological services on which payments are made, b) local provision of ecological services will be inadequate to meet the population's needs if population growth continues, and c) per capita income from PES will decline with continued growth and increase with population reductions.

Remember, you can subtract the cost of infrastructure development etc. from national plans if a shift to delivery of ecosystem services are prioritized over market access etc. for forestry and agricultural products.

One more insidious repercussion is that one would exacerbate the tendency for people to refuse to do anything unless they get paid for it. Seems these days you have to pay farmers and herders to tend their livestock, parents to stay home with their offspring, school children to do their homework...

Getting the baseline right is not going to be trivial. Some suggested baseline formulations would tend to punish those areas that have made progress before the REDD initiatives begin. Some countries on the verge of transition would benefit unduly because they had high deforestation rates in the past but these would fall in the future even if no REDD measures were taken.

One of the classic dogma in the literature is that "one of the proven and most effective means of preventing deforestation has been to ensure that local people have secure tenure rights and economic incentives to manage and benefit from their local forest resources in perpetuity." (e.g. Simon Counsell) However, secure land tenure might lead to long term deforestation as it could set communities on the path that development has historically taken, by allowing people to borrow for investment against the value of their land etc. Once such access to capital is ensured, there is no telling where you will end up, and most likely the usual development path will result. It would therefore be wise to couple payments for ecosystem services with development aid aimed at showing local communities different routes to prosperity than the one the western world took—so they do not have to make the same mistakes we made.

### *Some conclusions*

The issue of "fairness" is commonly raised in the discussion over payments for ecosystem services—even though instituting a system of payment for ecosystem services in principle would probably be more fair to the currently poor and disenfranchised than the absence of such a system. E.g.: "...would probably need to find a delicate balance between fairness, equity, and efficiency and to find innovative ways to incorporate poor people into PES

initiatives even when they lack land titles or operate illegally. If it goes too far in the direction of fairness and equity it will be difficult to significantly reduce emissions from deforestation and degradation. On the other hand, if it goes too far in the direction of efficiency it will end up rewarding wealthy groups for inappropriate and often illegal behavior, increasing inequality, and undermining the political legitimacy of the entire endeavor.” (D. Kaimowitz ms)

No system is going to be “fair” to everybody. It is a common mistake to try to do everything with a single tool. If you have this mindset, it might seem unfair if wealthy people benefit more from PES than do the poor, and one might be tempted to address issues of social equity with PES. Alternatively, one runs the risk of facing criticism if PES are perceived as unjust. More appropriately, PES should be equity blind, and equity issues should be addressed separately and directly.

Making a large and high profile investment in trying to alter land use patterns you are going to get a lot of criticism, from a variety of sources, no matter what you do, and you should be prepared for that.

PES is a conceptual goal of those economists that want to “internalize” conservation into private markets. The issues of equity and additionality are secondary concerns that have nothing to do with the actual practicability of the concept, which is primary.

A concerted effort to institute payments for ecosystem services needs to be carried out in the context of integrated land use planning.

Payments for ecosystem services, and not least incorporating the value of such services in our accounting systems, would create a desperately needed means of reducing the destruction of natural habitats. They should, however, be used in conjunction with other conservation instruments and consistent aid policies.

## References

Barbier, E. B., Acreman, M. C. and Knowler, D. 1996. Economic valuation of wetlands: a guide for policy makers and planners. Ramsar Convention Bureau, Gland, Switzerland. [http://www.ramsar.org/lib/lib\\_valuation\\_e.htm](http://www.ramsar.org/lib/lib_valuation_e.htm)

Costanza, R. et al. 1997. The value of the world's ecosystem services and natural capital. *Nature* 387: 253-60. <http://www.nature.com/nature/journal/v387/n6630/pdf/387253a0.pdf>

Hall, A. 2007. Better RED than dead: paying the people for environmental services in Amazonia. *Phil. Trans. R. Soc. B.* <http://journals.royalsociety.org/content/v254377860276751/fulltext.pdf>

Kaimowitz, D. 2008. The prospects for reduced emissions from deforestation and degradation (REDD) in Mesoamerica. Unpublished manuscript.

Richards, M. and Jenkins, M. 2007. Potential and challenges of payments for ecosystem services for tropical forests. *Forestry Briefing* 16.

Silva-Chavéz, G. A. 2005. Reducing greenhouse gas emissions from tropical deforestation by applying compensated reduction in Bolivia. pp. 72-86 in Moutinho and Schwartzman, Tropical Deforestation and Climate Change, IPAM/Ecological Defense.

Tallis, H. and Kareiva, P. 2005. Ecosystem Services. *Current Biology* 15(18) R746-748.  
<http://conserveonline.org/workspaces/ecosystem.services/ecoservices.session.strategies.conf/ecoservices.refs/ecosystem.services.published.papers/Tallis%20and%20Kareiva%20Ecosystem%20Services.pdf>

Turner, D. P. et al. 2007. Scaling net ecosystem production and net biome production over a heterogeneous region in the western United States. *Biogeosciences*, 4, 597–612.  
<http://www.biogeosciences.net/4/597/2007/bg-4-597-2007.pdf>

TimesOnline: [http://business.timesonline.co.uk/tol/business/industry\\_sectors/media/article2563206.ece](http://business.timesonline.co.uk/tol/business/industry_sectors/media/article2563206.ece)

Wunder, S. 2005. The efficiency of payments for environmental services in tropical conservation. *Conservation Biology* 21(1): 48-58.

Zenithoptimedia: <http://www.zenithoptimedia.com/gff/pdf/Advertising%20Expenditure%20Forecasts%20July%202007.pdf>