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Potential and Challenges of Payments for Ecosystem Services from Tropical Forests

Michael Richards and Michael Jenkins

This paper summarises current potential and challenges facing the development of payments for ecosystem services (PES) as a means of promoting the sustainable management or conservation of tropical forests, including the challenge of combining equity or poverty reduction objectives with environmental objectives, and the interaction of PES with broader forest sector and 'extra-sectoral' policies.

REDD: last hope for tropical forests?

Policy conclusions

- Payments for ecosystem services (PES) have considerable potential for raising the viability of sustainable forest management (SFM) and conservation and delivering pro-poor benefits, but are not a panacea. PES should form part of a package of instruments, especially those which reduce the opportunity costs of SFM and conservation.
- Avoided deforestation or REDD (Reduced Emissions from Deforestation and Degradation) has most potential, but also faces a complex set of issues. It is hoped that the international commitment to climate change mitigation will prove sufficient to overcome these.
- Early PES experiences reveal some positive equity impacts like improved tenure security, community empowerment, organisational and social capital development. While PES do not inherently favour pro-poor outcomes, experience is showing that trade-offs between environmental and social objectives can be managed with appropriate external support.
- Governments (and donors) have a vital role in promoting equitable governance, secure tenure, an enabling policy, legal and institutional framework, capacity building of national PES providers, collective institutions and transparent PES monitoring arrangements. These would reduce ecosystem service buyer risks and transaction costs, and facilitate participation.

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Introduction

This paper provides a short introduction to the potential and challenges facing attempts to promote payments for ecosystem services (PES) from tropical forestry ecosystems. This includes the challenge of simultaneously meeting environmental and equity goals. The paper also attempts to place PES instruments within a broader context of how to promote sustainable forestry management (SFM) and conservation.

Current attempts to promote SFM and conservation in tropical countries face a range of market, policy and governance failures that encourage alternative land uses and often result in high social and environmental externalities (CIFOR, 2007). Payments or compensation for environmental or ecosystem services mechanisms[1] confront the 'market failure' problem of tropical forestry - weak or absent markets for the forest ecosystem services associated with carbon, water and biodiversity. The growing interest in these services is driven partly by the general failure of 'command and control' approaches (based on fiscal and regulatory measures) and integrated conservation and development projects (ICDPs), and reduced overseas development assistance (ODA) support for forestry.

A working definition of a PES scheme is "a voluntary, conditional agreement between at least one "seller" and at least one "buyer" over a well-defined environmental service" (Wunder, 2007). The condition is that the seller supplies the service. However PES often occur when there is weak evidence of provision and/or the ecosystem services are loosely defined, so that in practice many cases are 'PES-like' mechanisms. These can be broadly classified into four main types:

- Public payment schemes to forest owners or managers in which the government is the main or only buyer (e.g., national PES programmes in Costa Rica, China and Mexico).
- Trading between buyers and sellers of ecosystem services around a regulatory floor on the level of services to be provided or a cap/quota on allowable damage or deterioration, known as 'cap and trade' mechanisms .
- Private market-based deals in which beneficiaries of ecosystem services contract directly with service providers (e.g., downstream beneficiaries with upstream watershed managers).
- Eco-labelling or certification of forest or farm products in which consumers pay a 'green premium' to assure neutral or positive ecosystem impacts.

The following sections focus on the three main forest ecosystem services – carbon sequestration/ storage, watershed protection and conservation of biodiversity and landscape beauty.

Payments for protection of carbon stocks and carbon sequestration

'Forest carbon' has taken centre stage due to the urgency of the climate change mitigation agenda. Forest carbon payments occur either for carbon sequestration deriving from afforestation (including agroforestry) and reforestation (known as A/R in the Kyoto Protocol) or by protecting carbon stocks in natural forests, generally known as Avoided Deforestation (AD) in the voluntary carbon markets and Reduced Emissions from Deforestation and forest Degradation (REDD) in the United Nations Framework Climate Change Convention (UNFCCC) context.

Forest carbon in regulatory markets

The global carbon trading market has a current annual value of over US $30 billion, but forest carbon is marginalised in the main regulatory markets – the EU Emissions Trading Scheme (EU-ETS) and the Clean Development Mechanism (CDM) of the Kyoto Protocol. Conservation of forest carbon stocks is not currently permitted in these markets, and only one A/R project has been registered (approved) in the CDM.

The virtual exclusion of forest carbon from regulatory markets has been due to a combination of methodological and scientific concerns, including:

- 'additionality': this occurs when carbon payments lead to additional carbon benefits compared to the situation without carbon payments; where forestry is already viable, the carbon would be sequestered or conserved without the need for carbon payments.
- 'leakage': this happens when project or national level carbon gains are lost due to increased deforestation or degradation somewhere else.
- 'impermanence': carbon sequestration is subject to risks like fires or diseases, and in the long term woody biomass gradually deteriorates.
- the concern that forest carbon offsets reduce pressures to cut emissions at source[2].
- the fear that the carbon price would plummet with a large increase in forest carbon offsets.
- very high transaction costs in the CDM, especially for communities and smaller projects.

But it is being increasingly recognised that these problems can be tackled; some are just as applicable to other mitigation sectors; and that forest carbon conservation is vital for climate change mitigation. The momentum to include avoided deforestation in the regulatory markets has accelerated rapidly since the Stern Review (Box 1).

Currently the most favoured REDD proposal in the UNFCCC negotiations is 'compensated reduction' in which developing countries could, on a voluntary basis, sell carbon credits gained by reducing their deforestation rates against baseline or 'business as usual' deforestation rates (see Peskett et al, 2007 for a fuller description). A common aspect of REDD

Box 1: The Stern Review and Avoided Deforestation

Stern (2006) observed that deforestation contributes at least 18% of man-made carbon dioxide emissions, and that while forest conservation (or protection of carbon stocks) is allowed for industrialised countries in the Kyoto Protocol, it is not permitted for developing countries where most deforestation occurs. Stern therefore proposed avoided deforestation as one of four 'key elements' of a global climate change mitigation strategy, arguing that it would be a "highly cost-effective way of reducing greenhouse gas emissions ... fairly quickly." This cost-effectiveness is derived from research showing that the land use opportunity costs are often low compared to the value of carbon, and especially compared to the cost of cutting industrial emissions. But Stern recognises that "major institutional and policy challenges" have to be overcome for these opportunities to be realised.

proposals is that reduced deforestation is only possible through national programmes due to the 'leakage' problem of project approaches (although project level REDD can and probably should form part of a national REDD programme). As argued by Chomitz et al (2006) and others, a compensated reduction REDD agreement would serve to:

- facilitate more ambitious emission caps
- lower global climate change mitigation costs
- 'buy time' for technology and policies to cut industrial emissions and
- increase tropical country participation in climate change mitigation, since for many developing countries deforestation is easily their main source of greenhouse gas emissions, and therefore encourage US participation.

REDD would also result in significant co-benefits, especially for biodiversity conservation, providing a possible bridging point between multilateral environmental agreements. Also failure to agree on REDD could create a perverse incentive to deforest faster in expectation of a future agreement. As a market incentive for improved forest policies and governance, REDD has major potential for SFM and conservation, but also faces some significant challenges (summarily presented here) including:

- Equity and ethical concerns associated with additionality (see Box 2).
- Government actions may have little effect on deforestation rates, since 'extra-sectoral' factors like agricultural commodity prices tend to be the main drivers of deforestation.
- The highest deforestation rates tend to be in weak governance countries: it will require high levels of political will and sustained donor support to deliver the necessary reforms.
- The definition of baseline deforestation rates determines how much a country will benefit. The approach likely to be favoured under REDD is an average historical deforestation rate which is assumed to continue into the future. But deforestation can slow as forests are depleted or accelerate as countries experience faster economic development. The alternative is to predict future deforestation rates, but this is also difficult due to 'extra-sectoral' drivers, climate change impacts on forest growth, etc.
- Partly related to baseline definitions, any REDD agreement will result in 'winners' and 'losers' among tropical countries, so agreement in the UNFCCC may not be easy. The most likely REDD mechanism will credit countries for reducing their deforestation rates against historical baseline rates; the 'losers' would be countries with low deforestation rates like India and Costa Rica. Another compensation or incentive mechanism is needed for these countries in order to avoid perverse incentives to increase deforestation.
- The marginal cost of reducing carbon emissions due to REDD will rise over time; countries could decide to stop their REDD efforts once the 'low hanging fruit' have been picked and before the main policy and governance failures are tackled.
- REDD will require considerable up-front funding since carbon payments will occur mainly at the end of the second Kyoto commitment period (2017). Significant investments are needed for developing national carbon infrastructure, including specialised institutions, expertise and technology, and for the policy and regulatory reform process. The international community will need to take the lead in pre-financing REDD and/or underwriting risks to forward investors in REDD credits[3].
- Another challenge is translating national level carbon payments into effective land use incentives for forest managers. This will require experimentation to develop workable national approaches. Thus Stern (2006) called for "large scale pilot schemes to explore effective approaches to combining national action and international support"; the World Bank Forest Carbon Partnership Facility has earmarked $250 million for REDD 'readiness' activities and pilots; and DFID recently announced a £50 million fund for the Congo Basin.
- REDD is voluntary for tropical countries - if some forested countries opt out, international leakage is likely due to the continuing demand for wood products.

Box 2: Equity and ethical issues of REDD

As with other PES mechanisms, REDD is not inherently 'pro-poor'. In order to achieve 'additionality', which means that REDD actions must target forests under threat of deforestation. The danger is that the main 'winners' could turn out to be would-be developers or degraders, e.g., large-scale and capital rich plantation crop or cattle farmers, rather than forest conserving communities.

A related ethical issue is that these developers are often politically well-placed individuals who are threatening to break the law, e.g., encroachment on state or community tenure land. Therefore REDD payments could end up compensating them for the opportunity costs of obeying the law. Clearly the 'correct' solution is to implement the law effectively, but governments may decide REDD payments are politically easier. Other NGO concerns are that governments could adopt a 'fences and fines' approach to REDD, possibly involving the eviction of indigenous or other poor groups from protected areas and ignore customary tenure rights or otherwise attenuate community or indigenous property rights. Other factors determining equity outcomes are the level of transaction costs, how project contracts are structured and equitable compliance regimes.

SOURCES: BASED ON WUNDER (2007)

Forest carbon in voluntary markets: more scope for 'win-win' outcomes

By contrast, forest carbon projects are increasing rapidly in the much smaller voluntary carbon markets. While the quality of voluntary forest carbon offsets has been variable, there are some promising pro-poor experiences involving credible measurement, monitoring and verification procedures, e.g., the '*Plan Vivo*' model (Box 3). While the additionality criterion remains a constraint to pro-poor outcomes, there is emerging evidence of the potential for win-win benefits, for example:

- Recent development of a credible set of standards for guiding 'multiple-benefit' carbon credits – the Carbon, Community and Biodiversity Alliance (CCBA) standards (www.climate-standards.org).
- The Tropical America Katoomba Group is developing a portfolio of projects aiming to secure carbon and other PES payments for forest dependent communities, including avoided deforestation credits from certified community forest management.
- The NGO Climate Focus is promoting a new carbon product called the 'Conservation Carbon Unit' to be offered to corporate social responsibility type buyers as a non-offset carbon credit.
- There are increasing reports of institutional and tenure benefits from community engagement with PES markets, for example, involving organisational capacity building, clarification of property rights, stronger community negotiation positions in other resource-based negotiations, etc. (Wunder, *personal communication*).
- In Indonesia's community forestry programme, farmers are allowed to use degraded state forest for coffee-based agroforestry systems provided they protect the rest of the forest, resulting in tenure benefits (Kerr et al, 2006).
- Various international NGOs are exploring the potential carbon benefits of sustainable charcoal production in Africa in situations where current systems are unsustainable.

Box 3: The *Plan Vivo* model

The Plan Vivo model stems from the Scolel Té project in Chiapas, Mexico, developed since 1994 and supported by the Edinburgh Centre for Carbon Management (ECCM). Scolel Té involves over 700 farmers from 40 communities working with a range of agroforestry systems and small timber plantations. A trust fund provides farmers with financial and technical assistance based on the expected carbon revenues. Recent research on social impacts in this project indicates some trade-off between poverty and environmental objectives.

ECCM has now developed the Plan Vivo model as a management system and certification standard which incorporates sustainable livelihoods. The Plan Vivo model is now being tested in the buffer zone of a protected area in Mozambique, and one in Southwest Uganda. These projects involve agroforestry activities and small-scale plantations, diversification of income generation activities and re-investment of profits in community infrastructure. In Mozambique, it is estimated that farmers will receive an average of $35 per hectare per year for seven years for carbon sequestered by various land use activities. Although forest carbon is not profitable *per se*, positive net incomes are expected when it is combined with tree/crop product sales. Other reported benefits in Mozambique include fruit, fodder, fuelwood, better soil structure and improved organisational capacity.

SOURCES: ECOSYSTEMS MARKETPLACE, 2006, WWW.PLANVIVO.ORG

Table 1: Strengths and Weaknesses of Watershed PES Mechanisms

Strengths/benefits	Weaknesses/constraints
Beneficiaries or users are easy to identify and are often willing to pay for forestry interventions – even though there may be weak scientific evidence.	Hydrological impacts of forest interventions are largely site-specific and additionality is hard to prove. If buyers are unsure they are getting what they are paying for, sustainability is doubtful.
Investments in watershed management are cheaper than treatment or new water supplies, e.g., in the US, it is estimated that each $ spent on watershed protection saves $7-200 in new filtration and water treatment facilities.	In state managed programs, additionality or cost-effectiveness is problematic, e.g., in Mexico's programme, the forests most at risk have received only 10% of payments; tendering schemes are needed to reduce over-payments.
There is high win-win potential in developing countries since upper watershed farmers are usually poor, e.g., the Rewards for Upland Providers of Environmental Services (RUPES) programme in Asia has built up collective action institutions and consolidated tenure.	Common equity constraints are insecure tenure, weak local institutions and inequitable public enforcement capacity; strong donor/NGO support has therefore been key to positive or neutral equity impacts.
Watershed PES work best when there is a scarcity of clean water, and water users have capacity to pay, e.g., urban citizens, companies.	Beneficiaries are often poor and/or unwilling to pay for a 'free good' or their basic right to water, and it is difficult to exclude beneficiaries who won't pay.
For private or market-based mechanisms, there is good potential for leverage of federal or municipal finance.	'Cap and trade' mechanisms are demanding of administration and compliance, and tend to rely on high external support.

SOURCES: SCHERR ET AL (2006), BISHOP ET AL (2006), CHOMITZ ET AL (2006)

Payments for watershed protection services

While 'forest carbon' is the forest ecosystem service with most potential, demand for hydrological services of forests is also rising fast. Water use has increased at twice the population rate for the last hundred years, while erosion has increased the scarcity of clean water. Watershed PES can be for water quality, flood prevention and (dry season) water quantity, although propositions about the role of forests in these services often lack a proven scientific basis[4].

There are a range of public and private mechanisms for watershed PES involving a diversity of institutional arrangements. Public or state-mediated schemes are currently much more important (over $2 billion globally) than voluntary market-based schemes (less than $5 million). The growth of watershed based PES has been mainly in Latin America, although China has a major programme. There are some 'cap and trade' water quality trading systems in the US, Ecuador and Australia[5], but these are demanding in terms of administrative and enforcement capacity. Table 1 summarises some strengths and weaknesses of watershed PES.

A recent study (Asquith et al, 2007) reveals considerable optimism for pro-poor watershed PES. Based on a review of watershed PES in six countries, they observe that the poverty/environment trade-offs can be minimised with appropriate design and implementation, and that these projects tend to involve transfers of wealth (from wealthier urban areas to poorer rural areas) and can empower the poor by explicitly recognising them as valued service providers. On the other hand, an earlier review (Landell-Mills and Porras, 2002) identifies some demanding preconditions for effective and equitable watershed PES projects, including:

- Secure property rights of local stakeholders, including over the ecosystem service.
- Collective institutions for both sellers and buyers are normally needed to defray transaction costs and ensure equitable negotiations.
- A range of support services, including: legal, financial, insurance and business management support and advisory services; credit provision; independent verification; and inter-sectoral knowledge sharing and coordination.
- Effective and equitable public enforcement regimes.
- Reliable measurement and monitoring of the hydrological impacts of land use change.

Biodiversity, landscape beauty and 'bundled' ecosystem services

Carbon and water benefits from forest management or conservation are fairly tangible or measurable

Table 2: Strengths and Weaknesses of Selected Biodiversity PES Mechanisms

PES mechanism	Strengths/benefits	Weaknesses/constraints
Eco-labelling or certified forest products	Fast-growing demand driven by concerns about illegal imports; potential to move to landscape level certification.	The 'green premium' is rarely paid by consumers resulting in weak incentives for certified SFM.
Regulatory and voluntary biodiversity offset	Self-financing and relocates development to lower biodiversity areas without constraining national development objectives.	Can give 'licence to destroy' unique habitats – offsetting biodiversity and livelihood impacts is complex and 'second best' to avoidance.
Conservation easements and land trusts	International NGOs are able to target biodiversity hotspots through management contracts for habitat/species preservation.	Not market based or self-financing; opportunity cost compensation may be high; unsuitable for state and community tenure.
Conservation concessions	Similar to logging concessions – compensates foregone timber profits; suitable for state and community tenure.	Not market based or self-financing; too expensive for primary forest – more viable for 'logged over' forest.
Bioprospecting	Over 50% of drugs are derived from natural products; the Costa Rica INBio model shows potential of raising pharmaceutical funds, but little replication to date.	Unrealistic expectations: there are substantial business risks; 'biopiracy' risk; transparency and public accountability concerns.
Ecotourism, including sport hunting and fishing	Huge market – up to 20% of all tourism; potential for participatory approaches; new ecotourism certification standard proposed by Rainforest Alliance; participatory CAMPFIRE model being adapted in Luangwa National Park, Zambia.	Most benefits go to urban-based companies; forests have shy and elusive wildlife; faces a fickle market – tourism fashions can change; sport hunting requires game animals and strong regulation.
Entrance fees to national parks	Emerging cooperative revenue sharing agreements with local communities.	Previous free entry makes people reluctant to pay; few benefits to local stewards to date.

SOURCES: SCHERR ET AL (2006), BISHOP ET AL (2006), CHOMITZ ET AL (2006), KARSENTY (2007).

benefits in comparison with biodiversity and aesthetic or landscape beauty benefits. The measurement difficulties have not however prevented the emergence of a range of potential PES mechanisms for compensating biodiversity and aesthetic benefits. Some of these are listed in Table 2 with their perceived strengths and weaknesses.

Regulatory biodiversity offsets are one of the higher potential mechanism, since they offer a market-based alternative to the 'command and control' approach. It involves a 'cap and trade' system, the 'cap' being in terms of a number/size of tradable emission permits or in the form of legislation restricting biodiversity degradation. The main examples are in Brazil (Box 4) and the USA. But a drawback is that it is problematic for state or common pool tenure since communities and/or the state cannot easily trade land use rights for financial compensation (Karsenty, 2007).

Some biodiversity PES mechanisms, like eco-labelling and conservation easements, as well as the state-mediated PES programs, effectively capture the value of a 'bundle' of ecosystem services, even though biodiversity or water may be the lead service. The importance of bundled PES is that a single compensated ecosystem service can be less than the opportunity cost of forest retention. Bundled PES approaches are particularly relevant for the landscape level; for example, Ecoagriculture Partners are developing methods to assess PES opportunities for ecosystem services in agricultural landscapes, including payments for wild products, eco-labelling and market infrastructure (Scherr et al, 2006). But a limitation is the difficulty of establishing 'additionality': buyers are often reluctant to pay for more than one ecosystem service.

Conclusions

While PES for hydrological and biodiversity services are rapidly evolving, carbon PES have most potential due to the international commitment to climate change mitigation. REDD is particularly important for SFM in that it provides a unique opportunity as a market incentive for tackling some

Box 4: Tradable Forest Conservation Obligations in Brazil

Brazil has a long standing law that landowners in forest areas retain a minimum forested area varying from 20% to 80%, known as the *reserva legal*. But this law has hardly been enforced or respected. A system of tradable development rights introduced in 2000 obliges landowners with less than the reserva legal to offset their footprint by compensating landowners conserving more than the legal minimum. In practice this means that landowners in areas with high agricultural values and opportunity costs pay landowners in areas with lower farming values. This lowers the overall opportunity cost of conservation, and provides an incentive to low opportunity cost farmers to keep more than the minimum.

This approach also reduces legal compliance costs – by two thirds, according to one study, while protecting a third more 'high conservation value forest' than the traditional regulatory approach. On the other hand, it does not target high biodiversity areas or safeguard high risk forests - most 'trades' have been between degraded forest areas. Also its effectiveness is dependent on sound regulatory and administrative capacity in the first place.

SOURCES: CHOMITZ ET AL (2006), KARSENTY (2007)

of the underlying policy and governance failures. It brings together the demand and supply sides of the problem by making SFM and conservation more attractive (tackling the market failure problem) and reducing its opportunity costs (driven by policy and governance failures). It is different to other PES mechanisms in that it is a more national and holistic response to deforestation, and is extra-sectoral in its scope; other PES mechanisms could be included as part of a national REDD programme, for example, regulatory biodiversity offsets. REDD should also deliver significant biodiversity and hydrological benefits. At the same time there are concerns about its equity impacts, and external support will be necessary to ensure community conservation is adequately protected and compensated.

Paradoxically one of the 'solutions' to fossil fuel dependency, and for industrialised countries to meet their emissions targets, is also a threat to forests. Unregulated biofuel production is rapidly increasing in response to markets and subsidies, and there are signs of a land rush in some countries. Apart from observing that it appears to be on a collision course with REDD, discussion of the likely social and environmental externalities of a biofuels boom is left to other papers.

PES mechanisms clearly have both potential and risks as regards poverty outcomes. Small but regular payments for ecosystem services can provide vital supplementary income and make marginal forest production systems viable (as in the *Plan Vivo* model); they can help formalise tenure and clarify property rights; and since PES agreements explicitly recognise their role as environmental stewards, they strengthen communities in other resource-based negotiations. Over the longer term they should increase ecosystem resilience or adaptation capacity to climate change. At the same time there are several challenges to win-win PES outcomes, including:

- Additionality: this criterion means that the poor may often be 'losers' in PES arrangements (see Box 2).
- Transaction costs: together with other diseconomies of scale, they represent a major market entry barrier to PES markets; collective action institutions and aggregation mechanisms are essential for community or small farmer engagement with PES markets.
- Rent-seeking strategies by non-resident stakeholders facilitated by weak governance and tenure regimes.
- Livelihood or welfare concerns can be secondary or add-on considerations framed from the buyer's perspective.

The main benefits to the poor could prove to be more indirect than direct. It is clear that PES will be ineffective unless the legal, policy and institutional framework is improved, since insecure tenure, weak compliance, corruption, etc., increase the risks and transaction costs. Therefore if countries want to engage with PES markets, they need to tackle the governance and policy failures which perpetuate anti-poor outcomes. Most observers argue that effective governance and secure tenure are more important drivers of sustainability than PES *per se*. Governments and donors also need to invest in capacity-building of national PES providers. All this would reduce the transaction costs and risks of buyers, and thus increase the demand and willingness to pay for ecosystem services.

Therefore PES mechanisms, while not a panacea, respond to the market failure problem of forestry and are essential to an integrated approach to SFM and conservation. In the final outcome it is difficult to conceive of an effective and equitable solution to a public goods problem (ecosystem protection) without appropriate compensation for the public good providers ***and*** effective regulation of the environmental and social externalities. Therefore governments and the international community must play a much more effective role than they have done to date.

Michael Richards is a Senior Consultant with FRR, a division of the IDLGroup Ltd., and Michael Jenkins is President of Forest Trends. This paper is based partly on inputs provided by Forest Trends to the United Nations Forum for Forests and a presentation on PES at the ITTO West and Central Africa Forest Investment Forum, Accra, 28-30 August 2007. Correspondence: m.richards@frr.co.uk

Footnotes

1 Various terms are found in the PES literature including compensation for ecosystem services (CES) and compensation and rewards for environmental services (CRES), each with their pros and cons. These are not discussed here due to space; PES is used as the term most commonly found.

2 NGO campaigns have caused an uncertain future for forest carbon offsets, and it will require considerable public education, as well as meaningful emission caps, to revive their credibility.

3 'Ex-ante financing' by buyers of AD credits is a possibility, but would involve heavily discounted prices (due to the risks) or expensive insurance. Other possibilities include the issue of carbon bonds backed by international capital, and low interest loans.

4 Payments often seem to depend on the willingness to pay of the buyers based on the "useful myth" that trees have positive hydrological impacts; but the science shows that apart from cleaner water, the impacts are largely site specific and depend particularly on geological formation.

5 For example, the market for groundwater salinity credits in Australia has led to an irrigators' association paying landowners to plant trees to combat rising water salinity (Bishop et al, 2006).

References

Asquith et al. (2007), 'Global Experiences with Payments for Watershed Services: Major Challenges and Solutions', Natura Bolivia/IIED/CIFOR. www.naturabolivia.org.

Bishop, J. et al. (2006), 'Building Biodiversity Business: Report of a Scoping Study. Shell International Limited and the World Conservation Union: London, UK and Gland, Switzerland', (Discussion Draft – September)

Chomitz et al. (2006), 'At Loggerheads? Agricultural expansion, poverty reduction and environment in the tropical forests', a World Bank Policy Research Report. Washington, D.C.

Ecosystem Marketplace (2006), 'A Tale of Two Continents. Ecosystem Services in Latin America and East and Southern Africa', Katoomba Group, Washington, DC

Karsenty, A. (2007), *Questioning rent for development swaps: new market-based instruments for biodiversity acquisition and the land use issue in tropical countries*, International Forestry Review 9 (1): 503-513

Kerr J. et al. (2006), 'Property Rights and Environmental Services in Lampung Province, Indonesia', presented at "Survival of the Commons: Mounting Challenges and New Realities." 11th Conference of International Association for the Study of Common Property, Bali, Indonesia, June 19-23, 2006

Landell-Mills, N. and Porras, I. (2002), 'Silver Bullet or Fools' Gold? A global review of markets for forest environmental services and their impact on the poor', International Institute for Environment and Development. London

Peskett, L. et al. (2007), *Can payments for avoided deforestation to tackle climate change also benefit the poor?*, ODI Forestry Briefing Paper 12

Scherr, S. et al. (2006), 'Developing Future Ecosystem Service Payments in China: Lessons Learned from International Experience', Washington: Forest Trends/Ecoagriculture Partners/Peking University

Stern, N. (2006), 'Stern Review: The Economics of Climate Change', Cambridge University Press. Cambridge, UK

Wunder, S. (2007), *The Efficiency of Payments for Environmental Services in Tropical Conservation*,w Conservation Biology 21 (1): 48-58

Overseas Devlopment Institute

111 Westminster Bridge Road, London SE1 7JD

Tel +44 (0)20 7922 0300

Fax +44 (0)20 7922 0399

Email forestry@odi.org.uk

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