UNEP

CBD

Convention on Biological Diversity

CAMRE League of Arab States

Distr.
GENERAL

UNEP/CBD/RW-BF/1/5/Add.1
10 November 2010
Unedited

ORIGINAL: ENGLISH

REGIONAL WORKSHOP ON BIODIVERSITY AND FINANCE IN SUPPORT OF THE NAGOYA OUTCOME
First meeting
Cairo, 29-30 November 2010

Agenda item 4

INNOVATIVE FINANCIAL MECHANISMS: PAYMENT FOR ECOSYSTEM SERVICES

A submission by Organization for Economic Cooperation and Development

(Also available as UNEP/CBD/COP/10/INF/31)

Paying for Biodiversity

Enhancing the cost-effectiveness of payments for ecosystem services

In 2008, the 9th Conference of the Parties to the Convention on Biological Diversity (CBD) invited, inter alia, the Organization for Economic Co-operation and Development (OECD) to undertake *further studies on payments for ecosystem services and other positive incentive measures at local, national, regional and international levels, their advantages as well as their potential limitations and risks, their cost-effectiveness, potential implications for biodiversity and indigenous and local communities, and their consistency with other international obligations* (COP 9 Decision IX/6 Article 11).

In response, the OECD has published a book in time for CBD COP-10 titled "Paying for Biodiversity: Enhancing the Cost-Effectiveness of Payments for Ecosystem Services". The book seeks to identify good practice in the design and implementation of Payments for Ecosystem Services (PES) and to understand how best to enhance their cost-effectiveness. It draws on PES literature and analysis of more than 30 case studies worldwide.

The publication builds on an OECD expert workshop on "Enhancing the Cost-effectiveness of Payments for Ecosystem Services" held on March 25, 2010. Further information on the workshop is available at www.oecd.org/env/biodiversity. This document highlights key messages of the book. Further information on the publication can be found at www.oecd.org/env/biodiversity/pes.

Executive summary

Biodiversity and ecosystems provide invaluable services to society. These include food, clean water, genetic resources, recreational services, flood protection, nutrient cycling and climate regulation, amongst many others. Ecosystem services provide critical life support functions and benefits, contributing to human health, security,

well-being and economic growth. Despite the significant economic, social and cultural values of biodiversity and associated ecosystem services, biodiversity worldwide is being lost, and in some areas at an accelerating rate. Without renewed efforts to address this environmental challenge, OECD projections to 2030 indicate continued biodiversity loss.

Given these trends in biodiversity loss, there is an urgent need for both (i) greater application of policies and incentives to promote the conservation and sustainable use of biodiversity and ecosystem services, and (ii) more efficient use of available finance in existing biodiversity programmes. Payments for Ecosystem Services (PES) are a flexible, incentive-based mechanism that has potential to deliver in both of these areas.

What are Payments for Ecosystem Services and what is their role in biodiversity conservation and sustainable use?

PES are agreements whereby a user or beneficiary of an ecosystem service provides payments to individuals or communities whose management decisions influence the provision of ecosystem services. More specifically, PES are defined as "a voluntary, conditional agreement between at least one „seller" and one „buyer" over a well defined environmental service – or a land use presumed to produce that service" (Wunder, 2005). Ecosystem service beneficiaries include downstream hydroelectric utilities that use clean water as an input for production, and companies that benefit from value added when they sell organic products. The payments compensate individuals, such as farmers, foresters, or fishermen, for the additional costs of biodiversity and ecosystem service conservation and sustainable use, over and above that which is required by any existing regulations. As PES are voluntary, incentive-based instruments, seeking out sites with higher value and lower costs, they can provide potentially large gains in cost effectiveness compared to indirect payments or other regulatory approaches used for environmental objectives (Alix-Garcia et al., 2003; Engel et al., 2008).

Interest in PES has been increasing rapidly over the past decade. There are today more than 300 programmes implemented worldwide (Blackman and Woodward, 2010), predominantly used to address biodiversity, watershed services, carbon sequestration and landscape beauty (Wunder, 2006). PES are estimated to channel over USD 6.53 billion annually by national programmes in China, Costa Rica, Mexico, the United Kingdom and the United States alone. There are many more PES programmes that have a more limited geographic scope, with numerous local scale programmes operating in the developed and developing world.

Despite the proliferation of PES programmes, a common-cited criticism is that they fail to realise their potential cost-effectiveness gains (Ferraro, 2008; Wunder, 2007). This is because PES programmes often make fixed uniform payments on a per hectare basis. Such payments would be cost-effective if the costs and benefits of biodiversity and ecosystem service provision were constant across geographic space. This is not typically the case however. Instead, biodiversity and ecosystem benefits tend to vary from one location to another. Moreover, individual landholders are likely to have different opportunity costs of ecosystem service provision. The greater the spatial variation in costs and benefits, the larger the potential cost-effectiveness gains are when PES programmes are designed to take these differences into account.

How can PES best be designed to channel limited finance in the most cost-effective manner?

There are three elements that vary spatially in the context of PES (Wunscher *et al.*, 2006):

- the benefits of ecosystem service provision;
- the risk of ecosystem service loss, and the potential to enhance its provision; and
- the opportunity costs associated with ecosystem service provision.

Appropriate PES design, whereby ecosystem service buyers target and differentiate payments to account for this spatial variability can significantly enhance cost effectiveness. Metrics and indicators, including environmental

or biodiversity benefit indices, can be developed to identify areas where benefits are highest. Scoring or weighting methods can help to prioritise payments, in particular when multiple ecosystem services are being targeted and when there are inherent trade-offs in their provision. To ensure that any ecosystem services paid for are indeed additional to those that would have occurred under a business-as-usual (*i.e.* baseline) scenario, payments should only be made to ecosystem services that are at risk of loss, or to enhance their provision. To estimate the opportunity costs of ecosystem service provision, and differentiate payments accordingly, administrators can obtain information on variables that affect opportunity costs (called costly-to-fake signals) such as agricultural prices, or they can use inverse auctions. Inverse auctions require potential ecosystem service sellers to submit bids indicating the minimum payment they are willing to accept for the provision of an ecosystem service.

How can the use of inverse auctions contribute to enhanced cost-effectiveness of PES?

Inverse auctions are suitable when there are a large number of bidders, thus inducing competition for payments. They are an innovative way to reflect sellers‟ opportunity costs in PES programmes, and can help maximise the ecosystem service benefits purchasable for the finance available. Auctions are being increasingly used in both developed and developing countries. For example, they have been applied in PES programmes to protect old growth forests in Australia, conserve waterfowl in Canada, reduce soil erosion in Indonesia, and improve agri-environment practices and enhance wildlife habitat in the United States.

Inverse auctions can effectively deliver large cost-effectiveness gains. In Australia for example, the inverse auction mechanism applied in the Tasmanian Forest Conservation Fund programme resulted in a 52% cost-effectiveness gain (compared to a first-come-first-served approach to allocating PES contracts). Likewise in the United States, a local PES programme in the Conestoga watershed found that the use of inverse auctions resulted in a seven-fold increase in the reduction of phosphorus runoff per dollar spent compared to a fixed price approach (Selman *et al.,* 2008).

What are the potential sources of PES finance and how can finance for PES best be mobilised?

Finance for PES can be mobilised directly from the ecosystem service users themselves, or from third-parties acting on behalf of the beneficiaries, such as governments or institutions. Since biodiversity provides benefits at the local, regional and global scale, how finance for PES can best be mobilised may depend on the geographic scale of the ecosystem service benefits. For example, if the objective is to address the local public good benefits of ecosystem services (such as watershed services), sources of finance can be mobilised at the local level from the users directly. If the objective is to address regional and global public good benefits, the most appropriate source of finance may be via governments or institutions at the national and international level, respectively.

What are the key criteria that must be addressed in PES programme design to enhance environmental and cost effectiveness?

The environmental and cost-effectiveness of PES depend crucially on programme design and implementation. Twelve key criteria that are essential to enhance PES effectiveness are:

1. *Remove perverse incentives*: For a PES programme to produce clear and effective incentives any conflicting market distortions, such as environmentally-harmful subsidies, should be removed.

2. *Clearly define property rights*: The individual or community whose land use decisions affect the provision of ecosystem services must have clearly defined and enforceable property rights over the land in question. Otherwise, risks associated with, for example, illegal logging or land appropriation will undermine the ability of a landholder to provide the ecosystem service, rendering the PES ineffective.

3. *Clearly define PES goals and objectives*: Clear PES goals help to guide the design of the programme, enhance transparency and avoid *ad-hoc* political influence.

4. *Develop a robust monitoring and reporting framework*: Monitoring and reporting of biodiversity and ecosystem services is fundamental, enabling the assessment of PES programme performance, and allowing for improvements over time.

5. *Identify buyers and ensure sufficient and long-term sources of financing*: Whether the buyers of services are the beneficiaries themselves, or third-parties acting on behalf of the beneficiaries, the finance must be sufficient and sustainable to ensure that the objective of the PES programme can be achieved.

6. *Identify sellers and target ecosystem service benefits*: Accounting for spatial variation in ecosystem service benefits via economic valuation, benefit scoring, and mapping tools allows payments to be prioritised to those areas that provide the highest benefits. If the total PES budget available is limited, this can substantially increase the cost-effectiveness of the programme, in comparison to say, allocating payments on a first-come first-served basis.

7. *Establish baselines and target payments to ecosystem services that are at risk of loss, or to enhance their provision*: A PES programme should only make payments for ecosystem services that are additional to the business-as-usual baseline (*i.e.* in the absence of the programme).

8. *Differentiate payments based on the opportunity costs of ecosystem service provision*: PES programmes that reflect ecosystem providers‟ opportunity costs via differentiated payments are able to achieve greater aggregate ecosystem service provision per unit cost.

9. *Consider bundling or layering multiple ecosystem services*: Joint provision of multiple services can provide opportunities to increase the benefits of the programme, while reducing transaction costs, especially if finance for multiple benefits is available. The potential synergies and trade-offs involved in joint ecosystem service provision need to be identified.

10. *Address leakage*: Leakage occurs when the provision of ecosystem services in one location increases pressures for conversion in another. If leakage risk is expected to be high, the scope of the monitoring and accounting framework may need to be expanded to enable assessment of the potential leakage so that appropriate measures can be introduced to address it.

11. *Ensure permanence*: Events such as forest fires or illegal logging may undermine the ability of a landholder to provide an ecosystem service as stipulated in a PES agreement. If these risks are high, this will impede the effective functioning of a PES market. Insurance mechanisms can be introduced to address this.

12. *Deliver performance-based payments and ensure adequate enforcement*: Ideally, payments should be ex-post, conditional on ecosystem service performance. When this is not feasible, effort-based payments (such as changes in management practices) are a second best alternative, provided that changes in ecosystem management practices will bring about the desired change in service provision. Sufficient disincentives to breaching the PES agreement must also be provided and enforced, especially if payments are based on efforts rather than on actual ecosystem service delivery.

What lessons can existing PES programmes offer for international PES?

The criteria and insights derived for designing and implementing effective local and national PES programmes are also relevant for the establishment of international PES (IPES). Examples of existing IPES-like activities include afforestation and reforestation projects under the Clean Development Mechanism, and more broadly, bio-prospecting agreements. A new international mechanism, Reducing Emissions from Deforestation and forest Degradation (REDD-plus), is also currently being proposed to help address the global climate change challenge. Successful agreement on a future REDD-plus mechanism would represent a substantial and unprecedented development in the creation of an international mechanism to help internalise the carbon-related

ecosystem services provided by forests, and offers the potential to capture large biodiversity co-benefits (Karousakis, 2009).

IPES are likely to involve the need for greater institutional capacity including at the international level, for example for verification and review. The key building blocks for cost-effective PES, such as appropriate methods for targeting ecosystem services, remain the same. For biodiversity, which provides local, regional and global public good benefits, there is a need to consider how international finance for biodiversity can be mobilised to complement existing local and national PES programmes that target biodiversity benefits. Similarly, further work is needed on how emerging international voluntary initiatives that target both carbon and biodiversity can be improved and scaled-up.

PES Case Study Overview

Country	Programme	Objective	Targeting Ecosystem Service payments		
			Ecosystem Service Benefits	Risk of Loss (or method to address additionality)	Opportunity Costs
Australia	Tasmanian Forest Conservation Fund	Forest conservation	Yes. Conservation Value Index	To some extent. Risks of non-additionality included in CVI	Yes. CVI per unit cost, via auction
Australia	Environmental Stewardship Programme	Environmental quality	Yes. Conservation Value Index	Change in management practices considered additional to business as usual	Yes. CVI per unit cost, via auction
Australia	Victorian BushTender	Native vegetation conservation	Yes. Biodiversity Benefits Index	Change in management practices considered additional to business as usual	Yes. BBI per unit cost, via auction
Austria	OPUL	Agri-environmental quality	Not explicitly. Payments made for different management practices by area	Change in management practices considered additional to business as usual	No. Uniform payments for given management practices
Brazil	Ecological Value-Added Tax	Hydrological services	Includes numerous different projects	Includes numerous different projects	Includes numerous different projects
Bulgaria and Romania	Danube	Biodiversity, environmental quality	Includes numerous different projects	Includes numerous different projects	Includes numerous different projects
Cambodia	Tmatboey	Avian species protection	To some extent. Two tiers of payments based on species viewings	Not explicitly	No. Uniform payments. Opportunity cost heterogeneity is not considered
Canada	Assiniboine River watershed	Wetlands and waterfowl protection	Yes. Waterfowl productivity potential estimated	Restoration considered additional to business as usual	Yes. Benefits per unit cost, via auction
China	Sloping Land Conversion Program	Erosion control	No. Payments per unit area	Not explicitly	No. Uniform payments. Opportunity cost

Country	Programme	Objective	Targeting Ecosystem Service payments		
			Ecosystem Service Benefits	Risk of Loss (or method to address additionality)	Opportunity Costs
					heterogeneity not considered
Costa Rica	Payments for Environmental Services	Forest conservation, hydrological services	Not explicitly. Eligibility criteria outline priority areas.	Not explicitly	No. Uniform payment for given management practices
Dominican Republic	Upper Sabana Yegua	Hydrological services, biodiversity, carbon	Includes numerous different projects	Includes numerous different projects	Includes numerous different projects
Ecuador	Pimampiro programme	Hydrological services	To some extent. Three tired payments for different forest type	Land use changes are considered to be additional	No. Uniform payments. Opportunity cost heterogeneity is not considered
Ecuador	PROFAFOR, FACE	Carbon sequestration	To some extent. Cost-environmental benefit trade-offs considered in contract selection.	Land use changes are considered to be additional	To some extent. Cost-environmental benefit trade-offs considered in contract selection.
Ecuador	Socio Bosque Project	Forest conservation	Preference is given to high quality areas, poverty also targeted	Land use changes are considered to be additional	To a certain extent. Uniform payments per ha, but additional payment increases as land area increases
EU	Natura 2000	Environmental quality, biodiversity	Includes numerous projects	Change in management practices considered additional to business as usual	No. Uniform payments for given management practices
France	Nestle - Vittel	Water quality	To some extent. Area major consideration	Change in management practices considered additional to business as usual	To some extent, via negotiation
France	Danone-Evian	Water quality, environmental quality	To some extent. Area major consideration	Change in management practices considered additional to business as usual	To some extent, via negotiation

Country	Programme	Objective	Targeting Ecosystem Service payments		
			Ecosystem Service Benefits	Risk of Loss (or method to address additionality)	Opportunity Costs
Germany	North Rhine-Westphalia Pilot Tender	Grassland conservation	No. Payments per unit area	Not explicitly, pilot	Yes. Area per unit cost, via auction
Greece	Amfissa	Landscape quality	No. Payments per unit area	Area protection considered additional to business as usual	No. Uniform payment for given management practices
Guatemala	Sierra de las Minas	Hydrological services	High, medium and low value water supply area identified	Land use changes are considered to be additional	No. Uniform payment for given management practices
India	Oach-Kuhan catchment	Hydrological services	Project area targeted, but benefit heterogeneity amongst landholders not considered	Baseline assessed. Land use changes are considered to be additional	To some extent. Opportunity costs considered to set uniform payment level, heterogeneity not considered
Indonesia	Krakatau Steel	Hydrological services	No. Payments per unit area	Land use changes are considered to be additional	No. Uniform payments. Opportunity cost heterogeneity is not considered
Indonesia	Sumberjaya watershed	Erosion control	No. Principle aim of pilot is to discover service supply curve	Land use changes are considered to be additional	To some extent. Land use changes are considered to be additional
Japan	Kanagawa Prefecture	Biodiversity and hydrological services	Includes numerous different projects	Includes numerous different projects	Includes numerous different projects
Kenya	Arabuko Sokoke Forest	Forest conservation, Biodiversity	Targets areas supplying key ecosystem services	Wood plots and restoration considered additional	Various methods of rewards are used. Opportunity cost heterogeneity is not considered
Kenya	Sasumua	Water quality	(Planning state)	(Planning state)	(Planning state)
Madagascar	Academic study	Hydrological services, biodiversity, carbon	Yes. Environmental benefits spatially	Yes. Additionality gradient estimated	Yes. Opportunity cost heterogeneity considered to rule out high-cost areas

Country	Programme	Objective	Targeting Ecosystem Service payments		
			Ecosystem Service Benefits	Risk of Loss (or method to address additionality)	Opportunity Costs
			mapped		
Mexico	Payments for Environmental Hydrological Services	Forest conservation, hydrological services	To some extent. Two tired payments by forest type	Yes. Risk of deforestation modeled for spatial targeting	To some extent. Opportunity costs considered in payment level, but uniform payments set
Nepal	Kulekhani Watershed,	Forest conservation	Not explicitly	Land use changes are considered to be additional	No. Negotiated payments. Opportunity costs not considered
Panama	ForestRE	Hydrological services	No. Payments per unit area	Land use changes are considered to be additional	No. Uniform payments. Opportunity cost heterogeneity is not considered
Scotland	Scottish Challenge Fund	Forest conservation	Yes. Environmental Benefits Index	Yes. Afforestation considered additional to business as usual	Yes. EBI per unit cost, via auction
Switzerland	Ecological compensation areas	Agri-environmental quality	Not explicitly. Payments made for different management practices by area	Changes in management practices considered additional to business as usual	No. Uniform payments for given management practices
Sweden	Nordic Shell Holdings	Water quality	Yes. Water filtration achieved	Yes. Performance based payments	No. Uniform payments per weight of pollutants filtered
Sweden	Sami villages scheme	Carnivore protection	Yes. Species reproductive success achieved	Yes. Performance based payments	No. Uniform payments irrespective of village herd losses from predation
Tanzania	E astern Arc Mountains	Forest conservation, biodiversity	Targets areas supplying key ecosystem services	Land use changes are considered to be additional	Various methods of rewards are used. Opportunity cost heterogeneity is not considered

Country	Programme	Objective	Targeting Ecosystem Service payments		
			Ecosystem Service Benefits	Risk of Loss (or method to address additionality)	Opportunity Costs
UK	Rural Development Programme	Agri-environmental quality	Not explicitly. Payments made for different management practices by area	Changes in management practices considered additional to business as usual	No. Uniform payments for given management practices
US	Conservation Reserve Program	Agri-environmental quality, biodiversity, carbon, water quality	Yes. Environmental Benefits Index	To some extent. Changes in management practices considered additional to business as usual	Yes. Cost factor included in EBI, via auction
US	Wetlands Reserve Program	Hydrological services	To some extent, eligibility criteria, enrolment on case by case basis	Wetland restoration considered additional to business as usual	To some extent, enrolment on case by case basis
US	Environmental Quality Incentives Program	Agri-environmental quality	To some extent, eligibility criteria, enrolment on case by case basis	Changes in management practices considered additional to business as usual	To some extent, enrolment on case by case basis
US	Conservation Stewardship Program	Agri-environmental quality	To some extent, eligibility criteria, enrolment on case by case basis	Changes in management practices considered additional to business as usual	To some extent, enrolment on case by case basis
Wales	Tir Gofal	Agri-environmental quality	Not explicitly. Payments made for different management practices by area	Changes in management practices considered additional to business as usual	No. Uniform payments for given management practices

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Other OECD work on biodiversity includes:

Harmonisation and collection of a range of environmental data and the development of indicators www.oecd.org/env/countryreviews

Regular Environmental Performance Reviews including chapters on Nature www.oecd.org/env/countryreviews

For a stronger, cleaner, fairer world economy

Green Growth including biodiversity www.oecd.org/greengrowth

DAC statistics on monitoring of biodiversity-related aid to support the objectives of the UNCBD http://www.oecd.org/dac

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