THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY

TEEB for National and International Policy Makers

Chapter 5: Rewarding benefits through payments and markets

Chapter Coordinator: Patrick ten Brink (Institute for European Environmental Policy – IEEP)

Lead authors:

5.1 Patrick ten Brink, Samuela Bassi, Joshua Bishop, Celia A. Harvey, Alice Ruhweza, Madhu Varma and Sheila Wertz-Kanounnikoff

5.2 Katia Karousakis, Stefan van der Esch, Bernd Hansjürgens, Celia Harvey, Patrick ten Brink, Mandar Trivedi and Alexandra Vakrou

5.3 Anil Markandya and Paulo A.L.D. Nunes

5.4 Irene Ring

5.5 Andrew J. McConville, Joshua Bishop, Katherine McCoy, Patrick ten Brink and Alexandra Vakrou

5.6 Stefan van der Esch and Samuela Bassi

Contributing authors*: James Boyd, Ingo Bräuer, Naoya Furuta, Pablo Gutman, Sarah Hodgkinson, Markus Lehmann, Burkhard Schweppe-Kraft, Pavan Sukhdev, Kaavya Varma

Editing and language check: Clare Shine

Acknowledgements*: for comments and help by Barbara Akwagyiram, Arild Angelsen, Viviane André, Jonathan Armstrong, Giles Atkinson, Ivan Bond, Joana Chiavari, Bas Clabbers, Tamsin Cooper, Joana Chiavari, Chris Cox, Florian Eppink, Sonja Gantioler, Pablo Gutman, Sarah Hernandez, David Huberman, Mikkel Kallesoe, Sylvia Kaplan, Marianne Kettunen,Chris Knight, Eimear Nic Lughadha, Alaistair Morrison, Hylton Murray, Valerie Preston, Walter Reid, Ewald Rametsteiner, Carmen Richerzhagen, Mark Schauer, Burkhard Schweppe-Kraft, Bambi Semroc, Monique Simmonds, Benjamin Simmons, Paul Smith, Leila Suvantola, Monique Symmonds, Giuliana Torta, Graham Tucker, Andreas Tveteraas, Jean-Louis Weber, Steve White, Sven Wunder, and many others.

Citation: TEEB – The Economics of Ecosystems and Biodiversity for National and International Policy Makers (2009).

URL: www.teebweb.org

* Contributors above not repeated here

TEEB for Policy Makers Team

Chapter 5

Rewarding benefits through payments and markets

Table of Contents

Key Messages of Chapter 5

As highlighted throughout this report, the value of biodiversity and ecosystem services is not (fully) recognised by markets: degradation and loss result from decision making that ignores or understates the local and global benefits provided by ecosystems. **We urgently need new policy frameworks that reward the provision of ecosystem services and promote the greening of supply chains.**

This chapter focuses on innovative tools to reward ecosystem benefits efficiently and equitably through direct payments and tax incentives or by stimulating markets for products and services that have reduced environmental impact. These tools can be combined with instruments and approaches discussed in other chapters of this report. Effective policy mixes in each country will depend on national context and priorities.

National and international payments for ecosystem services (PES)

PES schemes that compensate those who maintain or enhance the flow of ecosystem services have already demonstrated their potential. In a global context of stagnant funding for biodiversity conservation, PES offer considerable potential to raise new funds for biodiversity or to use existing funding more efficiently. Both the public and private sectors can play a role in establishing PES in different contexts. PES have proven to be a highly flexible tool, providing both direct and indirect rewards for various ecosystem services and biodiversity conservation at a range of different scales.

At an international scale, one of the most significant PES opportunities on the table is **REDD (Reducing Emissions from Deforestation and Forest Degradation** in developing countries), which is being negotiated as part of the post-2012 climate change regime under the United Nations Framework Convention on Climate Change. Recent proposals for 'REDD-Plus' would offer incentives for forest conservation, sustainable forest management and enhancement of existing forest carbon stocks. Deforestation is estimated to account for up to 17% of global greenhouse gas (GHG) emissions: an agreement on such a mechanism could make a significant contribution to addressing global climate change and also provide substantial biodiversity benefits if designed and implemented with due consideration to the wide range of values of nature.

Recommendation: Promote PES demonstration activities and capacity building to develop the knowledge base, reduce transaction costs and scale up successful initiatives. Further efforts are needed to confirm where, in what form, and under what conditions PES work best for biodiversity, and to improve their targeting, monitoring and governance. PES should be designed to ensure additionality (i.e. going beyond 'business as usual') and to minimise leakage (i.e. displacement of damaging activities elsewhere). Spatial analysis – including data on economic costs and benefits – can help to map areas that are most important for providing ecosystem services, as well as the distribution of providers and beneficiaries, in order to identify synergies and priorities for both policy makers and private investors. Due engagement of local populations in the design and implementation of PES can be a critical factor in the success of the instrument.

Recommendation: Support an international agreement on a REDD-Plus mechanism as part of the global climate regime, while ensuring that other ecosystem services besides climate mitigation are taken into account. Depending on how REDD-Plus is designed and implemented, it could not only provide incentives for reducing emissions from deforestation and degradation but also secure biodiversity and other benefits at international, national and local levels. Appropriate safeguards should be formulated to reduce potential adverse impacts on biodiversity and to respect the rights and needs of indigenous and local communities, without making the rules so onerous that investors are unduly discouraged.

Recommendation: Contribute to emerging international initiatives to support direct investment in biodiversity public goods and natural capital across a wider array of ecosystems, such as the proposed Green Development Mechanism.

Access and benefit sharing for genetic resources (ABS)

ABS-related activities straddle payment schemes and market-based rewards. Historically, host countries have benefited little from the development and commercialisation of products based on genetic resources sourced from their territory. A fairer and more efficient regime is needed that can establish clear rights for local people, encourage the conservation of genetic resources in situ and facilitate discoveries and their application across a range of sectors.

Recommendation: Successfully conclude negotiations under the CBD on the international regime for more efficient and equitable sharing of the benefits arising out of the utilisation of genetic resources. A premium is needed for traditional local knowledge that leads to successful commercialisation based on genetic resources, together with better screening, contractual and dispute resolution procedures to minimise transaction costs. Investing in local capacity for documenting and assessing the state and value of biodiversity will be critical to successful initiatives.

Tax-based mechanisms and public compensation mechanism

Private and public efforts at a local level to conserve nature lead to national benefits that merit due incentive and payment schemes. The use of tax breaks and other compensation mechanisms offer an important 'thanks' and incentives for efforts. Similarly, transfers of tax revenues across regions can help give additional support to regions in recognition of biodiversity-rich areas or pro-biodiversity activities that create national public goods.

Recommendation: Make more systematic use of opportunities to provide tax exemptions for activities that integrate ecological concerns and promote conservation. Tax breaks can provide powerful incentives for private actors to donate land or to engage in long-term stewardship agreements. Intergovernmental fiscal transfers can likewise provide positive incentives to public agencies at various levels: ecological (e.g. protected area) criteria can be used when allocating tax revenues to lower government levels and hence address financing gaps and needs on the ground.

Recommendation: Damage caused by protected wildlife to local people needs to be recognised as a significant and legitimate concern. Public compensation programmes that account for such damage are necessary but should also aim to promote a more positive perspective that rewards the presence and protection of wildlife.

Green markets and fiscal incentives

The recent expansion of markets for biodiversity-friendly products and services – including forestry, fisheries and agriculture, tourism and other sectors – reflects a combination of market push (supply-side) initiatives by producers and market pull (demand-side) changes in the preferences of consumers, business and governments, expressed via their purchasing decisions. Markets that take ecosystems into account can stimulate the adoption of new production and processing methods that are cleaner, greener and more equitable, while helping to ensure the continued provision of scarce ecosystem services. Governments play an important role by providing an enabling framework that can incentivise these markets, including innovative tax and fiscal policies.

Recommendation: Help producers prepare for new market opportunities as consumers and public procurement policies stimulate demand for biodiversity-friendly products and services. Policy makers can support the development of robust process and performance standards and verification systems that explicitly include biodiversity conservation, including both mandatory and voluntary schemes. Public business advisory and support programmes should be geared to help companies meet the needs of new markets for green products and services.

Recommendation: Cooperative measures should be put in place to support developing countries' production and export sectors, to enable them to participate effectively in the development and implementation of new market standards. Targeted support of this kind can be an important part of international development aid, offering synergies between biodiversity, development and poverty reduction, particularly if local rights, traditions and livelihoods are taken into account.

5 Rewarding benefits through payments and markets

"We never know the worth of water 'til the well is dry".

English proverb

Biodiversity provides a range of ecosystem services[1] that benefit people locally, nationally and internationally. The provision of these services stems directly from natural processes, although management interventions are often required to maintain, develop or protect them. Many are not priced or are underpriced in the markets which means that existing economic signals may not reflect the true value of natural capital.

Chapter 5 focuses on payment and market-based tools to reward private and public actors who maintain the flow of services that benefit society. **5.1** explains how schemes delivering payments for ecosystem services (PES) actually work, drawing on lessons learnt from existing programmes and setting out indicators for improved design and implementation. **5.2** focuses on international PES, in particular the proposed REDD (Reducing Emissions from Deforestation and Forest Degradation) mechanism being developed under the UN Framework Convention on Climate Change, and also considers emerging initiatives to reward a wider range of biodiversity-related services across all ecosystems.

5.3 assesses the strengths and weaknesses of current reward structures for Access and Benefit Sharing for genetic resources (ABS) that are being addressed through negotiations for an international ABS regime within the Convention on Biological Diversity. **5.4** discusses how land, property and income tax regimes could be used more systematically to encourage private and public actors to commit to long-term conservation and how compensation payments can be shifted towards a more positive focus.

Lastly, the scope to stimulate and better target market supply and demand for goods and services produced with lower environmental impact are discussed in **5.5** (eco-labelling and certification schemes) and **5.6** (Green Public Procurement (GPP) policies).

5.1 PAYMENTS FOR ECOSYSTEM SERVICES (PES)

"Men do not value a good deed unless it brings a reward"

Ovid, B.C. 43 – 18 A.D., Roman Poet

This section describes how governments or private entities can provide payments to resource owners and users to protect natural ecosystems or to adapt production practices that ensure the continued provision of ecosystem services (5.1.1). It explains the basic principles and architecture of PES schemes (5.1.2) and provides concrete examples with lessons learnt to date (5.1.3). Remaining constraints and new opportunities are assessed (5.1.4) before setting out practical steps for improving PES design and implementation (5.1.5).

5.1.1 WHAT DO WE MEAN BY PES?

PES is a **generic name for a variety of arrangements through which the beneficiaries of ecosystem services pay the providers of those services** (Gutman 2006). The term covers payments for sustainable management of water resources and/or agricultural land, biodiversity conservation and storage and/or sequestration of carbon in biomass. This section outlines their role and scope: case examples are explored in more detail in Section 5.1.3.

PES typically involve payments to ensure the provision of a specific service. They are used for managing forest and agricultural land to ensure water quality for nearby cities, such as New York (Catskills-Delaware watershed) and Saltillo city, Mexico (Zapalinamé mountains), to cleanse coastal waters in Sweden (Zanderson et al. 2009) and to protect groundwaters in many European countries and parts of Japan (see Box 5.3 and, for other examples, Porras et al. 2008). Carbon sequestration via farm management is rewarded in New Zealand and via forest management in Costa Rica and Uganda. Farming practices that maintain other ecosystem services are rewarded through agri-environment payments in the EU and the US (Wunder et al. 2009; Baylis et al. 2004; Zanderson et al. 2009; see also Chapter 6). PES are also used to tackle external threats that could undermine service provision e.g. for removal of invasive alien species through South Africa's Working for Water Programme (see Box 5.6).

Other PES schemes focus on the provision of multiple services from a given area. Costa Rica's well-known programme (Pagos por Servicios Ambientales) supports a bundle of four services (see Box 5.2; Pagiola 2008; Wunder and Wertz-Kanounnikoff 2009). PES schemes to combine improved groundwater quality with increased biodiversity are found in e.g. Germany (see Box 5.5) and Bolivia (Los Negros watershed, see Asquith et al. 2008). PES schemes primarily for biodiversity conservation include the Bushtender programme (Victoria, Australia[2]) and the US Conservation Reserve Programme[3].

PES are **highly flexible and can be established by different actors**. Some schemes are managed by

Box 5.1: Definition of PES

PES can be defined as *voluntary* transactions where a *well-defined* ecosystem service (ES) (or land-use likely to secure that service) is 'bought' by at least one ES *buyer* from at least one ES *provider*, if and only if the ES provider secures ES provision (*conditionality*).

Source: adapted from Wunder 2005

national governments, as in Costa Rica, Ecuador, Mexico, China, EU Member States and the US. Others are established by water companies or water-user associations, as in the Catskills where PES is used to meet federal water quality standards for New York City and in Bolivia, Ecuador and Mexico. PES can also be purely private arrangements, whereby companies that rely on specific ecosystem services pay the relevant providers (e.g. payments to farmers by Perrier-Vittel in France: see Box 5.4). NGOs can also play an important role in PES e.g. by collaborating with the municipal water company in Quito (Wunder et al. 2009).

PES can be **applied at different scales**, ranging from the very local (e.g. 496 hectares in an upper watershed in northern Ecuador) to much larger scales (e.g. 4.9 million hectares of sloping farmland reforested in China (Bennett 2008; see also Chapter 9).

5.1.2 PRINCIPLES AND ARCHITECTURE OF PES

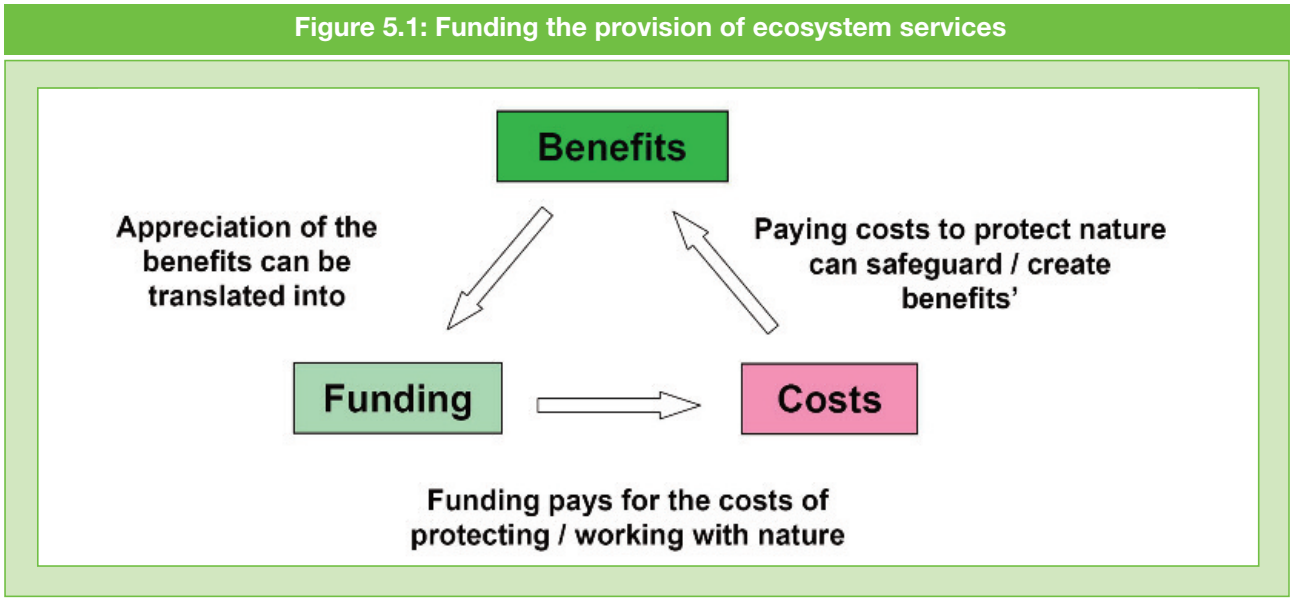
RATIONALE FOR INVESTING IN PES

The overarching principle of PES is to ensure that people who benefit from a particular ecosystem service compensate those who provide the service, giving the latter group an incentive to continue doing so (see Figure 5.1). As noted, policy makers are not the only ones concerned. Other beneficiaries of ecosystem services – such as hydroelectric power companies, irrigation authorities, water companies or aquaculture operations – may also be willing to pay to secure services that underpin their businesses. Private beneficiaries who make PES contracts with providers can thus internalise (some) environmental externalities on a purely voluntary basis.

PES are intended to **change the economics of ecosystem management and can support biodiversity-friendly practices that benefit society as a whole** (see Figure 5.2). In a situation where trade-offs exist between private and societal benefits from land uses, PES can tip the balance and render conservation-focused land uses more privately profitable with benefits for both the private land user and for society. In the absence of PES, the landowner would not choose the social optimum – unless other instruments such as regulation or incentives are in place (e.g. tax concessions, see Section 5.4) or social and cultural norms, customs or considerations lead to a social optimum without the need for payment. Care is needed to ensure that the instrument is socially compatible.

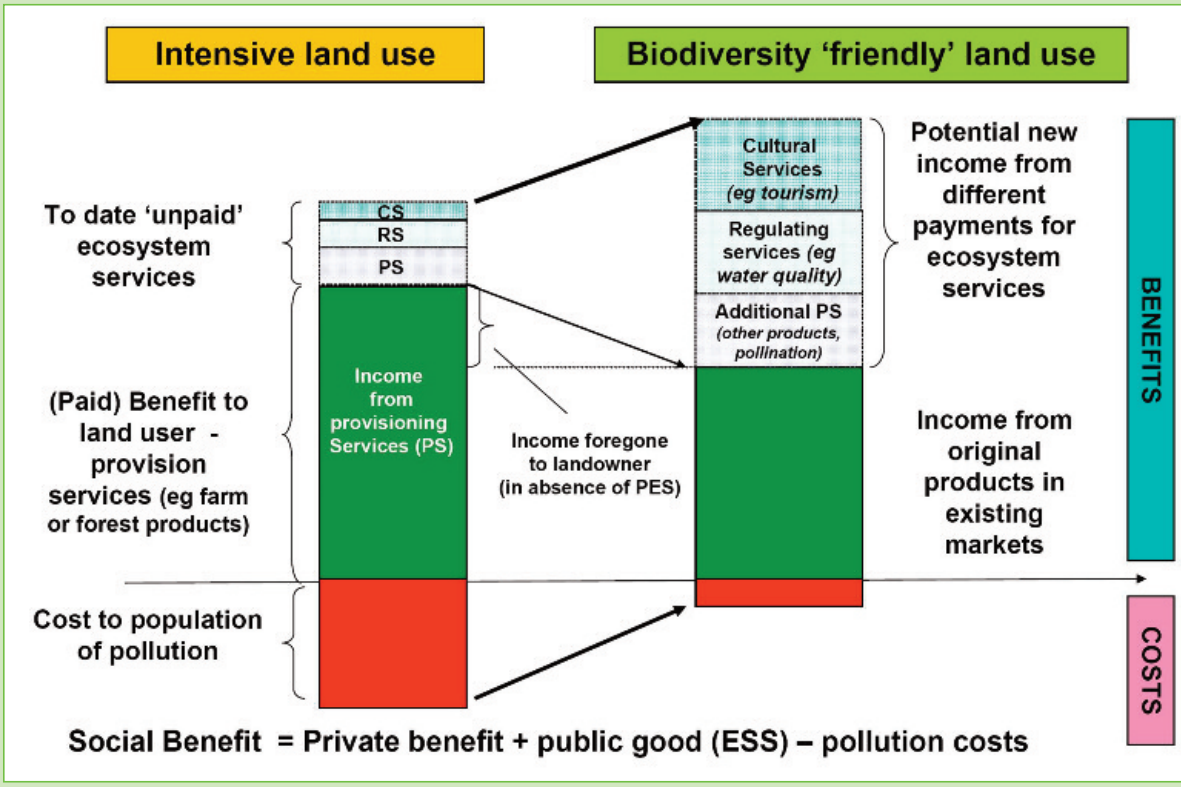
Care is also needed in their design as not all PES protect or conserve biodiversity. A focus on maximising the provision of just one service may have negative impacts on the provision of other ecosystem services if trade-offs are involved e.g. PES that promote exotic species plantations for rapid carbon sequestration at the expense of more diverse natural grasslands, which foster higher biodiversity.

Figure 5.1: Funding the provision of ecosystem services



Source: Patrick ten Brink, own representation

Figure 5.2: Increasing rewards for ecosystem services provision through PES



Source: Bassi and ten Brink, own representation adapted from Bassi et al. 2008

REGULATORY BASELINES AND ADDITIONALITY

Most PES schemes are founded on the idea that a resource owner will select uses and management practices that maximise private net benefits under existing regulations and market incentives. Privately optimal choices of land use will also evolve in line with changes to legal requirements or social norms (e.g. to reduce pollution or meet certain standards), especially where these requirements are properly enforced. The situation may be different in developing countries where systematic enforcement of environmental regulation remains a widespread challenge. There will therefore be different 'baselines' of behaviour or land use with different consequences (e.g. baselines of deforestation are a critical element of REDD discussions, see Section 5.2).

Management practices are generally adapted in response to new regulations or even because of changes in social norms. The practices assumed to be standard under existing regulation and social norms are the point of departure for PES i.e. such payments are intended to reward services that go beyond what is legally compulsory. However, the extent to which regulations are enforced can differ widely between countries, sometimes leading to a situation in which widespread management practices fall well below minimal regulatory levels. In this type of case, a PES system might have an additional effect as it involves a reward instead of an obligation, but at the same time it will undermine enforcement of environmental regulations.

PES should ideally be used to **reward good resource management practices that go beyond legal requirements or customary norms** (i.e. beyond the 'reference level' in Figure 5.3 below: this is equivalent to the above-mentioned baseline where all legal requirements are met). At this stage there may still be scope to gain further environmental benefits at a reasonable cost by paying the resource owner to undertake specified actions. Governments may find that it is less expensive or more consistent with other policy objectives (e.g. poverty reduction) to offer incentives rather than

imposing management obligations. Other beneficiaries of ecosystem services may find that the reference level of service provision does not meet their needs and therefore make voluntary payments to resource owners.

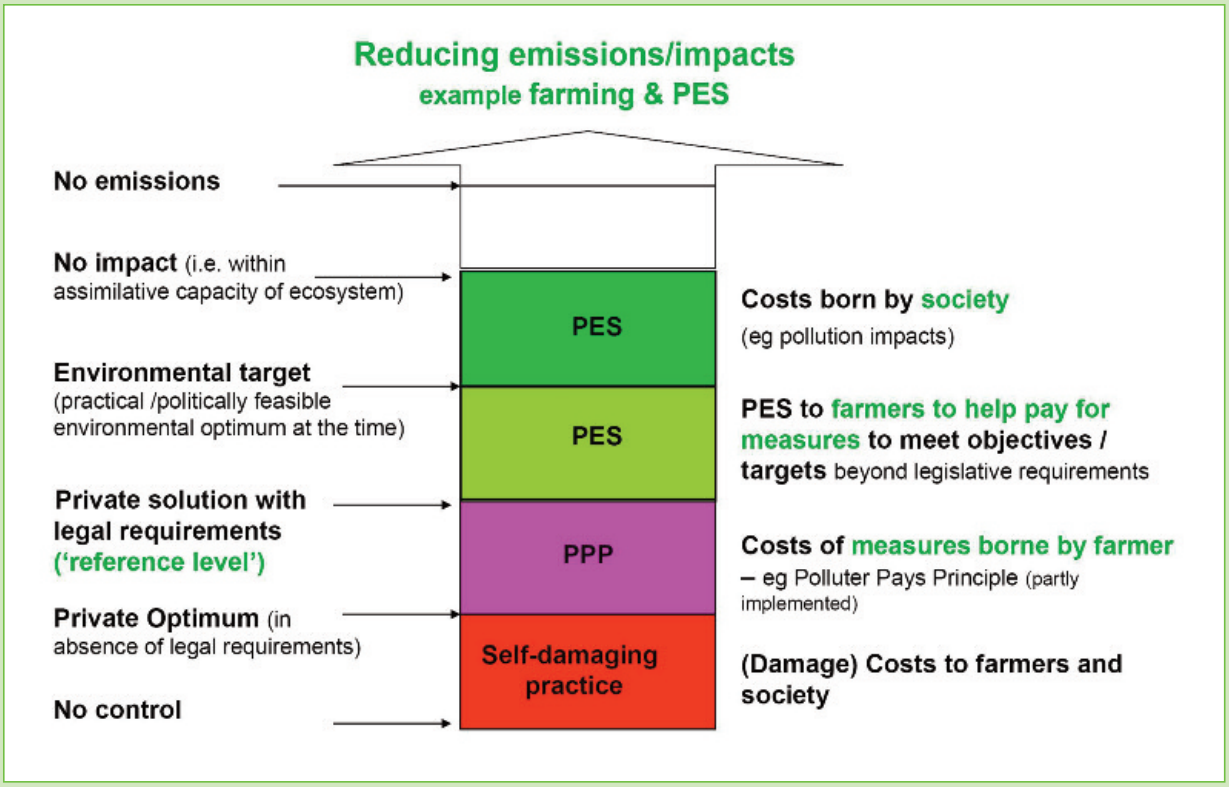
In some cases, governments may chose to use PES pragmatically as an incentive to get practice up to the legal standard – here it operates simply as a subsidy (see also Chapter 6) and runs counter to the 'polluter pays principle' (PPP). This cannot really be seen as a long-term solution, given concerns related to cost, budgets, governance, equity and efficiency. In other cases, governments may find it more appropriate to raise standards, strengthen enforcement and implement the PPP more fully (see Chapter 7).

It should be noted that even with legal standards complemented by positive incentives, there will often be some residual adverse environmental impacts compared with undisturbed ecosystems. These impacts are ultimately borne by society unless or until cost-effective means or technological solutions are found to avoid them. For example, pesticide or fertiliser use may comply with standards and even respond to incentive instruments designed either to discourage their use (e.g. taxes and charges, see Chapter 7) or to reward reductions in use (PES). Despite this, impacts may remain to the extent that relevant legislation and targets do not demand zero impact i.e. where use of fertilisers or pesticides is within the assimilative or regenerative capacity of the ecosystem (see Figure 5.3).

For these reasons, **the effectiveness and feasibility of PES is closely tied to the regulatory baseline and its enforcement** (see Chapter 7). A key challenge is to determine the appropriate reference level i.e. to distinguish between what resource owners/managers can reasonably be expected to do at their own cost and what more they might agree to undertake on the basis of PES.

The answer will depend on how environmental rights and duties are allocated between beneficiaries and

Figure 5.3: PES and the Polluter Pays Principle (PPP)



Source: Patrick ten Brink, own representation building on Scheele 2008

providers, whether formally or through de facto established practices. This varies between different legal systems and social contexts. Where downstream populations assert a right to clean water, it may be considered that upstream landowners should bear the costs of reducing pollution in accordance with the polluter pays principle. Conversely, if those landowners enjoy unencumbered rights to manage their land as they see fit, the burden of persuading them to modify their practices may fall on service beneficiaries (Johnstone and Bishop 2007)[4].

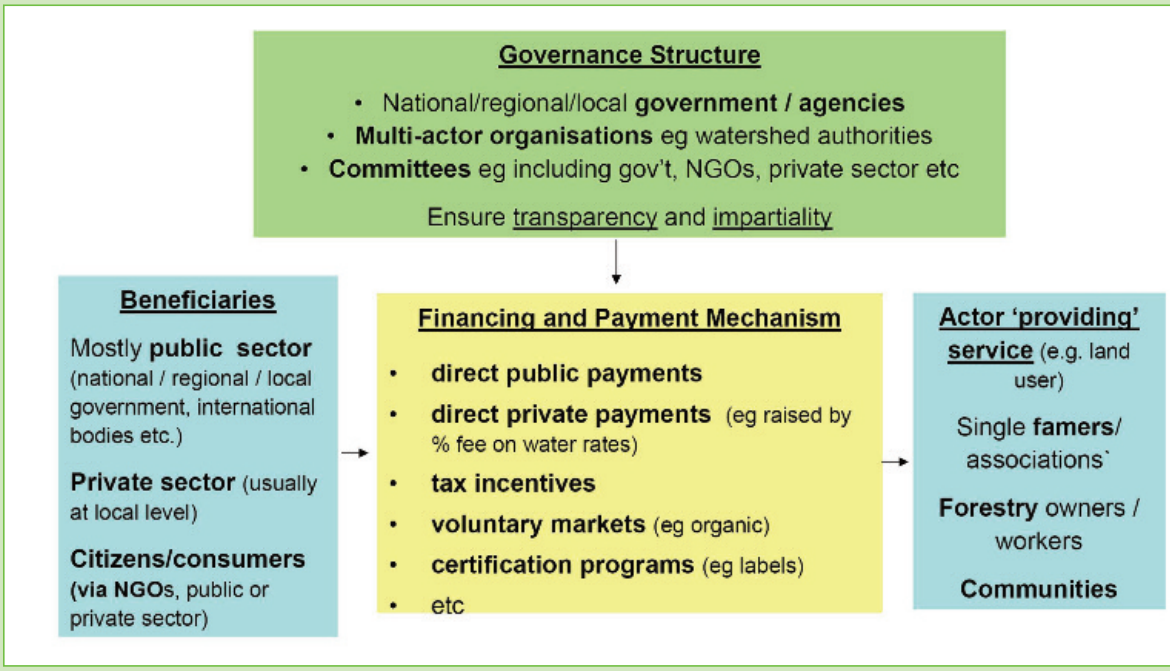
PES are sometimes criticised as a 'second best' solution by those who believe that beneficiaries have a right to enjoy ecosystem services that would have been available in the absence of damaging activities (i.e. free public goods delivered by nature); based on this argument, PES is less ethically satisfactory than strengthening the law to make polluters pay. Others suggest that PES is often just a disguised subsidy to encourage compliance with existing laws and can unfairly burden the public purse (where governments finance PES). In response to such concerns, the justification for PES is that it can be more cost-effective than strict enforcement, more progressive (where providers are relatively poor land users), and/or that it secures additional benefits beyond the minimum legal requirements. PES can also be seen as a temporary measure to motivate the adoption of new management practices and technologies which may eventually become economically justifiable in their own right (Johnstone, N. and Bishop, J. 2007).

Defining reference levels in terms of business-as-usual scenarios (BAU) carries a risk that resource owners exaggerate the level of environmental threat in order to win more payments for conservation[5]. This risk is particularly relevant in the case of REDD (e.g. overstating the rate of deforestation that would occur in a BAU scenario without payments: see Section 5.2 below).

THE STRUCTURE OF PES

As noted in Section 5.1.1, PES are highly flexible and there is no one model or blueprint. There are **many ways to structure schemes, depending on the specific service, scale of application and context for implementation**. Some are based on legal obligations (e.g. PES linked to carbon markets under legally-binding emission targets) whereas private PES schemes are voluntary with little government

Figure 5.4: PES stakeholders and their interactions



Source: adapted from Pagiola 2003

involvement. Sources and mechanisms for payments vary as do the providers (e.g. communities, farmers, forest owners, agribusinesses, timber companies) and the beneficiaries. Figure 5.4 provides a generic outline of the basic structure for most PES.

5.1.3 APPLICATIONS, BENEFITS AND LESSONS LEARNT

APPLICATION OF PES TO DIFFERENT CONTEXTS

PES can be implemented at different geographic scales, depending on the nature of the beneficiaries, the providers and the spatial relationship between them.

If a site provides a service that is mainly useful locally (e.g. pollination of crops), then a local PES makes sense. If it provides national benefits (e.g. pest control), then it is arguably for national government to initiate the appropriate PES or to use legal measures to secure a public good or service. Provision of global benefits (e.g. as in the case of biodiversity and carbon services) may require an internationally coordinated approach (see Section 5.2 below on REDD).

The first national PES schemes in developing countries were pioneered in Costa Rica (see Box 5.2) and Mexico (Programme for Hydrologic-Environmental Services (PSA-H) focused on threatened forests to maintain water flow and quality). The Costa Rican programme is amongst the best-known and studied PES examples and has proved very popular with landowners (requests to participate have outstripped funding). The scheme presents impressive results, at least at first sight. The instrument, its design, sources of funding and engagement are periodically reviewed and adjusted.

Box 5.2: An evolving nationwide scheme: the Pagos por Servicios Ambientales, Costa Rica

Background: Set up in 1997, the national PSA programme remunerates landholders for providing carbon sequestration services, and hydrological services via watershed protection and for preserving biodiversity and landscape beauty. From 1997-2004, Costa Rica invested some US$ 200 million, protecting over 460,000 hectares of forests and forestry plantations and providing additional income to over 8,000 forest owners. By 2005, the programme covered 10% of national forest areas.

Level of payments: US$ 64 per hectare/year were paid for forest conservation in 2006 and US$ 816 per hectare over ten years for forest plantations.

Source of funds: The programme is based on partnerships at national and international level, contributing to long-term financial sustainability. The primary source of revenues is a national fossil fuel tax (US$ 10 million/year) with additional grants from the World Bank, Global Environment Facility and the German aid agency (Kreditanstalt für Wiederaufbau (KFW)). Funds are also provided through individual voluntary agreements with water users (US$ 0.5 million/year) which will increase with the gradual introduction of a new water tariff and potential new opportunities from carbon finance.

Lessons learnt: The PSA programme has helped slow deforestation, added monetary value to forests and biodiversity, increased understanding of the economic and social contribution of natural ecosystems and is generally considered a success. However, recent assessments suggest that many areas covered through the programme would have been conserved even without payments, for three main reasons: deforestation pressures were already much reduced by the time PSA was introduced; the use of uniform payments (fixed prices); and limited spatial targeting of payments in the early stages of implementation. The programme is being adjusted in response to these lessons.

Source: Portela and Rodriguez 2008; Pagiola 2008 in Wunder and Wertz-Kanounnikoff 2009; and personal communication, Carlos Manuel Rodríguez, former Minister of Environment of Costa Rica

PES schemes can also be piloted at local level and subsequently rolled out on a wider scale. In Japan, the combination of serious forest degradation and the findings of a national valuation of forest ecosystem services shifted the policy landscape. The resulting estimates of monetary values helped generate sufficient political support for changing local tax systems in over half of the country's prefectures (see Box 5.3 and also Chapter 4 on the importance of valuation).

The issue of **regulatory baselines and additional ecosystem benefits** comes up in two cases related to improving groundwater quality, involving both private and public beneficiaries. In the Vittel bottled water case (Box 5.4) and agricultural payments in Germany (see Box 5.5) existing regulations were not stringent enough to prevent pollution of groundwaters with nitrates and pesticides or to make the polluters pay for avoidance. In response to product quality and cost concerns (Vittel) and broader health and biodiversity concerns (both cases), a pragmatic approach was adopted. These agreements can be characterised as PES, as regards provision of public goods through increased biodiversity, or as a subsidy for environmental services with regard to the contribution to reduced pollution (see Chapter 6).

Box 5.3: Using valuation to justify payment of local tax revenues for forests in Japan

Background: About two-thirds of land in Japan is forest cover. However, local forest industries have for decades been negatively affected by having to compete with cheaper timber imports. Many forest lands were simply abandoned without proper management after plantation, resulting in serious degradation of forest land and related ecosystem services. In 2001, the Science Council of Japan estimated that the value of ecosystem services under threat amounted to 70 trillion JPY (Yen) per year or US$ 620 billion/year (see table):

Evaluation of Multiple Functions of Forests

Ecosystem service	Value per year of forests for 2001 (JPY)	Billion US$/yr
Absorb carbon dioxide	1.24 trillion/year	10.8
Substitute for fossil fuel	0.23 trillion/year	2.0
Prevent surface erosion	28.26 trillion/year	245.7
Prevent loss of top soil	8.44 trillion/year	73.4
Ameliorate flooding	6.47 trillion/year	56.2
Conserving headwater resources	8.74 trillion/year	84.7
Purify water	14.64 trillion/year	127.3
Health and recreation	2.26 trillion/year	19.6

Note: for the first seven services the replacement cost method was used; for health and recreation, household expenditures (travel costs) were used.

Source of funds: The scheme was introduced in Kochi Prefecture in 2003. By June 2009, 30 out of 47 prefectures had adopted comparable 'forest environmental taxes' or 'water and green forest management taxes'. Each prefecture levies 500-1,000 Yen (approximately US$ 5-10) per inhabitant and 10 000-80 000 Yen (approximately US$ 100-800) per business every year to fund restoration and enhancement of forest ecosystem services (excluding timber production).

Use of the funds: Tax revenues are usually paid into a special fund spent on forest management activities to maintain water resources, prevent natural disasters or enrich biodiversity by altering mono-species forest to mixed species forest etc. To ensure long-term environmental benefits, the Prefecture and forest owners usually conclude an agreement not to harvest the forest in the short term but to maintain it for a certain period of time (e.g. at least 10 years) before getting financial assistance through the scheme.

Source: Science Council of Japan 2001; MAFF Japan 2008

Box 5.4: Private sector contracts for PES: the example of Vittel mineral water, France

Background: Since 1993, Vittel has conducted a PES programme in its 5,100 hectare catchment in the Vosges Mountains to maintain high water quality. 26 farmers ('sellers of ecosystem services') in the watershed are paid to adopt best low-impact practices in dairy farming (no agrochemicals; composting animal waste; reduced stocking rates).

Use of funds: The programme combines cash payments (conditional upon the adoption of new farming practices) with technical assistance, reimbursement of incremental labour costs and arrangements to take over lands and provide usufruct rights to farmers. Average payments are EUR 200 hectare/year over a five year transition period and up to 150,000 EUR per farm to cover costs of new equipment. Contracts are long-term (18-30 years), with payments adjusted according to opportunity costs on a farm-by-farm basis. Land use and water quality are monitored over time which has provided evidence of improvement in relevant ecosystem services compared to an otherwise declining baseline. This high service value clearly makes the investments profitable.

Structure and lessons learnt: The Vittel scheme built on a four-year research programme by the French National Institute for Agricultural Research (INRA) and took 10 years to become operational. It is implemented through Agrivair, a buyer-created intermediary agency that helps to mediate between parties. Total costs in 1993-2000 (excluding intermediary transaction costs) were almost 17 million EUR or US$ 25 million. The tenacity of Vittel in securing an agreement reflects the fact that it was simply significantly cheaper to pay for a solution with farmers than to move the sourcing of water elsewhere (in France, natural mineral waters are not allowed pre-treatment).

Sources: Perrot-Maître 2006; Wunder and Wertz-Kanounnikoff 2009

A well-documented case of PES as value for money comes from the Catskills Mountains, US. A comprehensive PES programme for this 200 km2 watershed costs around US$ 1-1.5 billion over ten years, significantly less than the estimated cost of a water filtration plant (one-off costs of US$ 4-6 billion and operational and maintenance costs of US$ 300-500 million). Nearly all (93%) of the farmers in the region participate and water bills have been raised by 9% instead of doubling in the case of new filtration capacity (Wunder and Wertz-Kanounnikoff 2009; see Chapter 9 for further details on the case).

Using water rates to fund PES can be done in different ways. One study analysed 17 local PES schemes where fees are charged to domestic water users. Seven made the additional costs visible in water bills; percentage premiums are added to final water bills in Pimampiro, Ecuador (20%) and in Cuenca, Quito (5%); a flat rate per cubic metre is used in Heredia, Costa Rica; and in Zapalinamé, Mexico, contributions are voluntary and users can choose the level, helping to address social concerns (Porras et al. 2008). To give an example of scale, charges paid by federal water users in Mexico's national PSA-H scheme generated US$ 18 million in 2003, rising to US$ 30 million in 2004. These monies are disbursed to individual and collective owners of natural forests that serve watershed functions. Payments for preservation of cloud forest (US$ 40 per hectare/year) exceed those for other tree-covered land (US$ 30 per hectare/year) (Muñoz-Piña et al. 2007).

PES WITH MULTIPLE CO-BENEFITS

PES schemes can be designed to **create or support employment related to the provision of ecosystem services**. The type and number of jobs will obviously depend on the scale of the scheme and the nature of the activity involved. A large-scale example is the Working for Water (WfW) public works programme in South Africa which protects water resources by

Box 5.5: Public water quality contracts for PES: the example of farmers in Germany

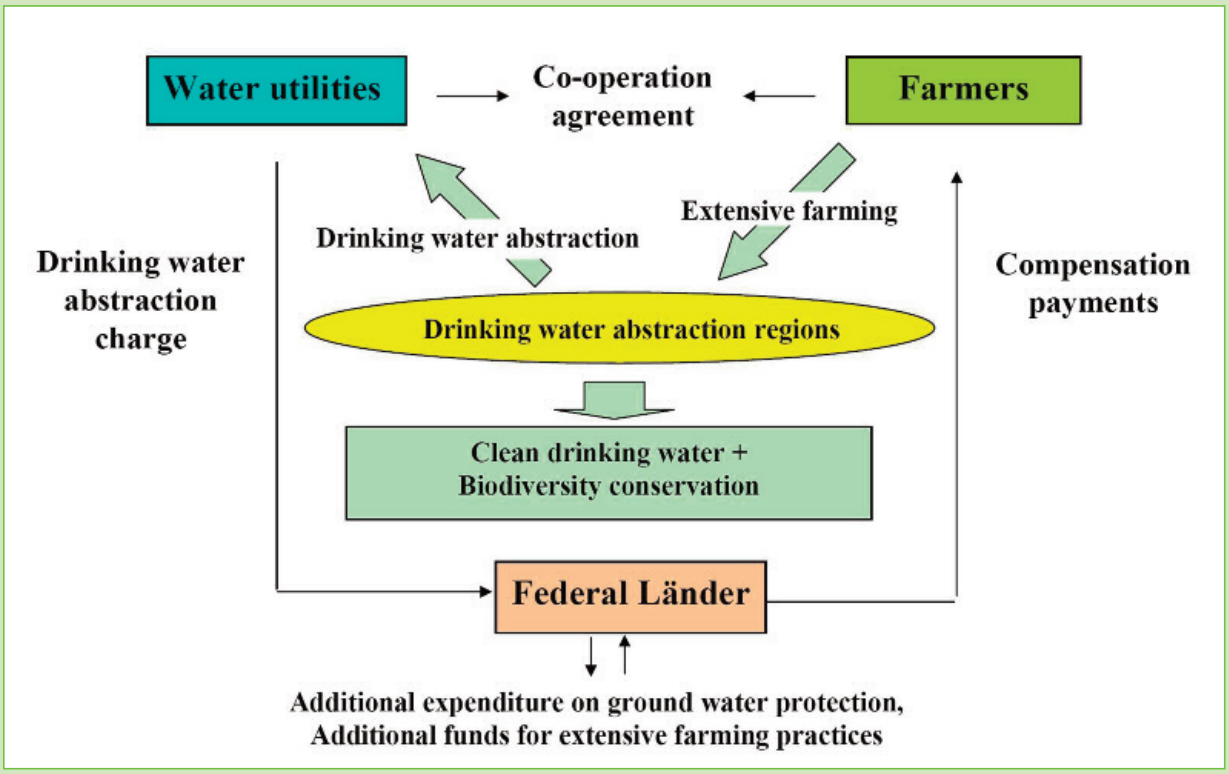
Background: Nitrates in drinking water can be hazardous to health, particularly for children, but their removal – along with other agricultural pollutants – is very costly. It is economically more efficient to prevent these substances from entering drinking water supplies in the first place.

In Germany, the Bundesländer (federal states) achieve this through a combination of mandatory 'groundwater extraction charges' and voluntary measures. Water utility companies have to pay a charge to the relevant 'Bundesland' for every cubic metre of groundwater extracted, part of which is used to pay farmers to reduce use of nitrogen-based fertilisers and pesticides.

Use of funds: Increasingly, the Länder use the money to fund voluntary cooperation projects between local water utilities and farmers, which makes it easier to protect groundwater with little additional effort or loss of agricultural output. An estimated 435 projects took place in 2002, involving 33,000 farmers over 850,000 hectares i.e. 5% of agricultural land in Germany. In Lower Saxony, such projects covered 50% of the areas from which water was extracted.

Lessons learnt: Cooperation between water utilities and farmers not only secures supplies of high quality groundwater at low cost but also helps to protect biodiversity e.g. by preserving grasslands rich in species and creating new grassland areas (about 50% of Germany's biodiversity, including several endangered species, is found on extensively farmed land). Additional payments to achieve other nature conservation objectives can be modelled on this example.

Public water quality contracts for PES – a schematic



Source: Niedersächsisches Umweltministerium, Niedersächsisches Landesamt für Ökologie 2002

eliminating the spread of invasive plants. WfW has more than 300 projects in all nine South African provinces. It has employed around 20,000 people per year, 52% of them women[6], and also provided skills training, health and HIV/AIDS education to participants. WfW is best understood as a PES-like programme as it does not make payments to landowners for continuous service provision but instead consists of 'landowner' (the municipal government) contracting workers to manage public land sustainably (Wunder et al. 2008; see Box 5.6).

Box 5.6: Local environment and employment gains via the Working for Water Programme

In 1999, the South African municipality of Hermanus responded to a water shortage by introducing a block rate tariff system to reduce water demand. A significant percentage of revenues collected were paid to WfW to clear invasive alien plants in the mountain catchment of the reservoir supplying Hermanus with water, in order to restore natural fire regimes, the productive potential of land, biodiversity and hydrological functioning.

The formal agreement between the municipality and WfW continued until 2001, by which time the project had treated 3,387 hectares of land, created 91 person years of employment and prevented losses estimated at between 1.1-1.6 million m^3 of water per year. Contracting costs were R2.7 million and the estimated total cost R4.9 million (including project management costs and other overheads).

Source: Turpie et al. 2008

On the other hand, some PES schemes can reduce rural employment if land is completely taken out of production or dedicated to less labour-intensive management practices to secure environmental benefits. While such a strategy has been applied in EU and US agri-environmental programmes with few negative equity impacts, this could pose problems in developing country contexts e.g. for landless households that rely on selling labour to farmers as a source of cash income (Zilberman et al. 2006).

The Socio Bosque Programme in Ecuador is a recent ambitious PES scheme that aims to combine protection for a wider set of ecosystem services with poverty concerns and addressing climate change (see Box 5.7). This is of interest because payments for carbon storage and sequestration are expected to be a major driver of PES in the coming years. If targeted at areas of high biodiversity value, ecosystem service provision and potential for poverty alleviation, they can offer major win-win opportunities (see also Section 5.2 on REDD).

In some cases PES involve **non-monetary benefits** rather than a monetary reward. For example, protected area managers are increasingly exploring collaborative management models to reduce tension across park boundaries and better integrate protected areas into broader regional development. In Kulekhani, Nepal, local PES-like schemes to regulate water or reduce erosion provide communities with development assistance in the form of medical services and education, rather than cash payments. In east and southern Africa, communities living near protected areas are sometimes granted limited access to the ecosystem in return for supporting conservation action. However, the effectiveness of such indirect approaches may be questioned (Ferraro and Kiss 2002).

5.1.4 OPPORTUNITIES AND CHALLENGES

PES can help make the value of ecosystem services more explicit and thus modify and potentially reverse incentives for resource users to over-exploit or convert them. In some cases, demand for such services is currently low but may become more important in the future in response to increased scarcity of the service being provided (e.g. due to population growth or loss of other areas providing similar services). To determine whether PES could help secure future benefits, we need to assess the level of ecosystem service provision and how this could change in the future and affect demand.

Voluntariness is a key feature of PES (see Box 5.1) although legal/regulatory underpinning is essential if their full potential is to be realised. There is potential to scale up existing PES (from local initiatives to national

Box 5.7: Large-scale PES to alleviate poverty and reduce deforestation in Ecuador

Ecuador has about 10 million hectares of native forest cover but its deforestation rate is one of the highest in South America (around 200,000 hectares lost each year). This leads to emission of about 55 million tons of CO_2 and also entails a huge loss of ecosystem services and subsistence for local people.

In 2008, pursuant to its National Development Plan, the government of Ecuador designed and approved the **Programa Socio Bosque** (Forest Partners Programme) to combine development and conservation objectives and directly benefit poor farmers and indigenous communities. The mechanism consists of a **direct payment per hectare of native forest per year to landowners on condition that they conserve (part of) their forest**. Participation is voluntary and compliance will be monitored on a regular basis through interpretation of satellite images and field visits. Specific programme goals over the first six years are to:

- protect over 4 million hectares of forest to conserve globally important biodiversity, protect soils and water and mitigate natural disasters;
- reduce greenhouse gas emissions from deforestation and forest degradation as an integral part of the national REDD strategy (PES measures will be supported by stronger enforcement of illegal logging and a national reforestation plan); and
- increase income and protect human capital in the poorest rural areas of the country with a total number of beneficiaries of about 1 million people.

Criteria to prioritise areas for implementation are being finalised and may include: high deforestation threat; high value for ecosystem services (carbon storage, water protection and biodiversity); and high levels of poverty.

Progress to date: The first contracts were signed in December 2008, benefiting about 15,000 people and covering 180,000 hectares of forest. In 2009, the scale of implementation increased: by May 2009, another 8000 beneficiaries had been registered, representing an additional 140,000 hectares. A dedicated trust fund has been established to assure long-term financial sustainability and transparent use of resources. The government intends to complement its own resources with support from international cooperation and through national and international PES schemes and carbon markets.

Sources: Marcela Aguiñaga, Manuel Bravo*, Tannya Lozada*, Free de Koning** and Luis Suárez***
** Ministerio del Ambiente del Ecuador*
*** Conservación Internacional Ecuador*
Background information available at: http://www.ambiente.gov.ec/contenido.php?cd=278

coverage), to implement PES in more countries, to make PES more efficient and to address issues of permanence. To date, however, not many PES schemes have been effectively expanded.

PES involving the private sector offer the potential to raise additional finance and thus complement public conservation funding. As public and private PES may operate differently, it is important to **explore the relative benefits of voluntary and regulatory approaches**. While private actors can play a role in PES, the willingness to pay of existing beneficiaries is often not sufficient to cover start-up or operating costs. This may be due to 'free rider' problems or to a lack of knowledge of the full benefits provided by ecosystems. In such cases, governments may need to provide extra incentives or find alternative solutions. One such solution might be to make a scheme obligatory once a certain percentage of beneficiaries agrees to it, mitigating the free-rider problem.

PES schemes face **several constraints**. They require significant investments in information and capacity building. Priorities include mapping the supply and demand of ecosystem services, understanding current and expected future use of resources, engaging relevant stakeholders, supporting certification schemes and training administrators.

High transaction costs create a barrier to developing PES and reduce their cost-effectiveness. Depending on the value of the ecosystems concerned, there may be a justification for states (or international agencies) to subsidise start-up or transaction costs to facilitate progress e.g. by paying for mapping ecosystem services or for stakeholder participation processes.

PES are not appropriate everywhere. They can be particularly difficult to implement where resource tenure or use rights are insufficiently defined or enforced e.g. in the high seas and some mangroves, coral reefs, flood plains and forests without clear ownership. Where institutional capacity and transparency are lacking or where resource access and ownership are in dispute, PES 'buyers' have little incentive to participate because they have few guarantees that the activities paid for will actually be implemented – or even that a legitimate service provider can be identified.

PES design and implementation can also be compromised where there is unequal bargaining power between stakeholders (i.e. imbalance between service providers and beneficiaries). This can affect who is included in the scheme, the way the money is shared, the rate of payment and the conditions set for service provision and access (see Figure 5.5 below).

In some cases, a PES targeting a single service will not be sufficient to halt its degradation or loss as the payment will be less than the opportunity costs of a range of alternative resource uses. However, PES schemes can be part of a broader mix of policy instruments that addresses the full range of ecosystem services from an area.

More generally, the proper **sequencing of measures** is important for achieving effective and coherent policies. Introducing payment schemes without the prior or simultaneous removal or reform of policies with adverse consequences on ecosystems and biodiversity will lead to incoherent and wasteful policy packages. This has been repeatedly underlined by the Organization for Economic Development and Co-operation (OECD), in particular with regard to environmentally harmful subsidies (see Chapter 6).

The ability to **quantify, monetise and communicate the values of ecosystem services to key stakeholders** – from politicians to industry to local communities – can help build support (see Box 5.3 above). However, the lack of a biophysical assessment and economic valuation of an ecosystem service need not preclude PES (Wunder 2007). Some of the most valuable services may be those that are most difficult to measure. In some cases, precise quantification of the service would be prohibitive (e.g. for small watershed schemes). In these cases, arguments based on the precautionary principle may be enough to justify starting PES, although economic valuation should be used as and when new information becomes available to adjust payment levels, targeting or conditions.

5.1.5 MOVING FORWARD ON PES DESIGN AND IMPLEMENTATION

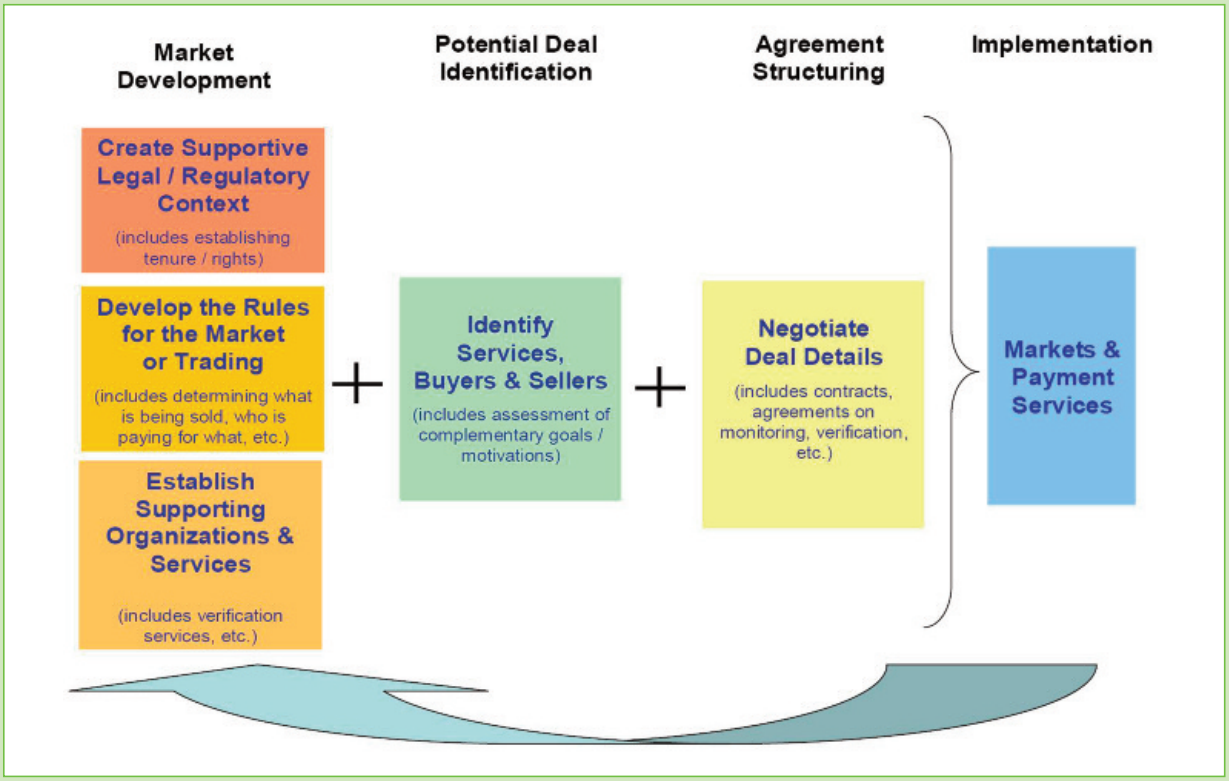
Experience to date has underlined the importance of **careful preparation to ensure that PES schemes are effective and appropriate for local conditions**. Information on the social, economic and ecological context and the legal and institutional context needs to be taken into account. Ideally, PES should be targeted, understandable, fair, cost-effective, accountable, enforceable, coordinated with other instruments and responsive to community needs. In practice, the reality can be very different.

Key steps for PES development include identifying services and stakeholders, setting the baseline, negotiating the deal and implementing the scheme (see Figure 5.5) as well as monitoring and enforcement.

SUPPORTIVE LEGAL AND INSTITUTIONAL CONTEXT

PES schemes require rules and institutions to function effectively, including mechanisms to enforce contracts.

Figure 5.5: The main stages of PES development



Source: adapted from Brand 2002

This can have equity implications as new rules change the distribution of rights and responsibilities over ecosystems and their services. Institutions will be needed to:

- **facilitate transactions and reduce transaction costs.** Most ecosystems provide a range of services, even if only one or a subset of these are recognised by a PES scheme. Payment can be made for a specific 'bundle' of services from large numbers of producers or there may be different instruments or different buyers for different services, evolving over time (see Figure 5.6). In some cases a service will be a free co-benefit;
- set up **insurance or other mechanisms** to manage risks;
- provide **related business services** e.g. for beneficiaries of ecosystem services to be willing to pay for them, better methods of measuring and assessing biodiversity in working landscapes must be developed.

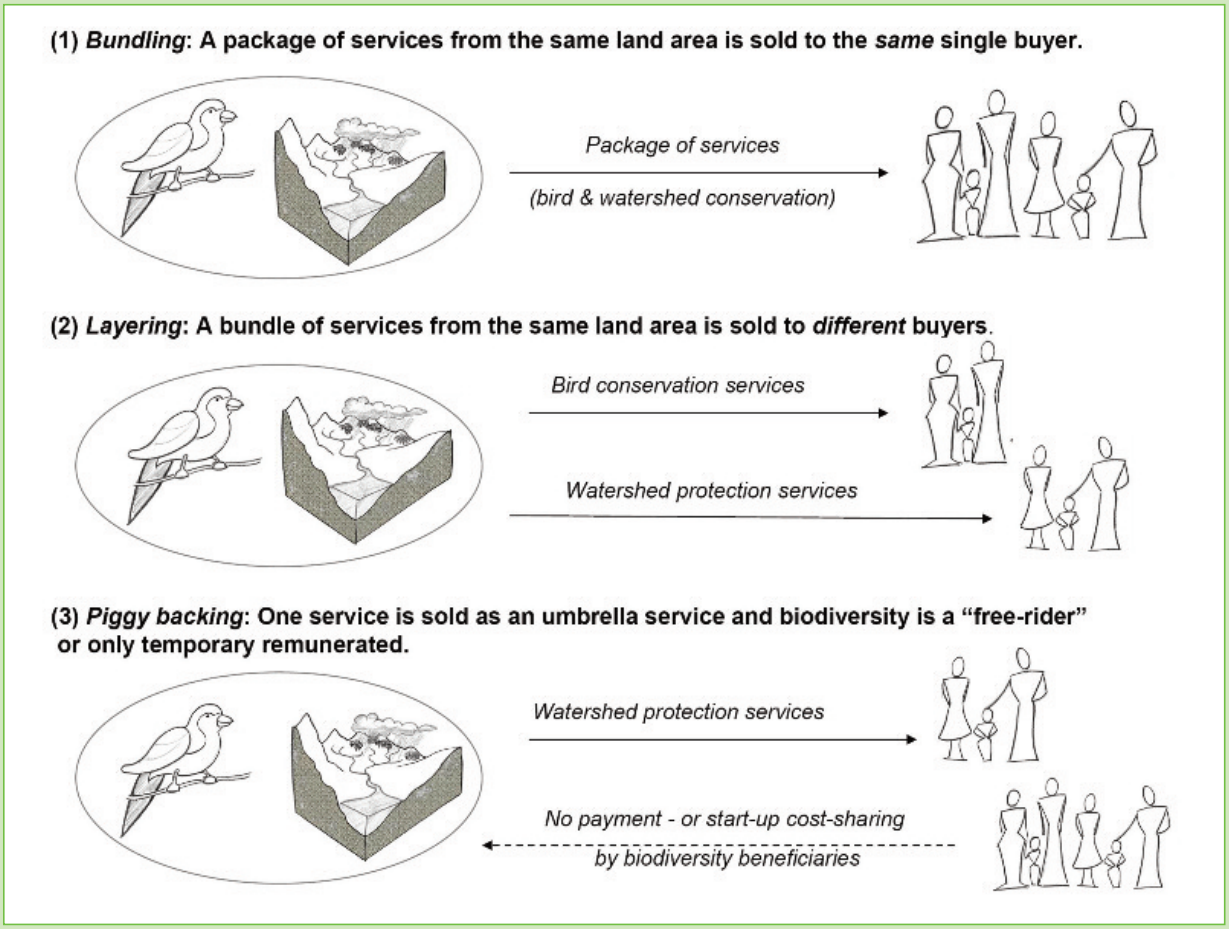
A range of institutional actors are required in a PES deal, including for its establishment and for the maintenance of registers to keep track of payments. Figure 5.7 presents a typical scenario.

IDENTIFICATION OF SERVICES, BUYERS AND SELLERS

Several conditions need to be met to enable PES, including economic, technical, governance and practical factors:

- on the **demand side**, where the supply of a valuable service is threatened, the beneficiary of the service needs to be aware of the threat, willing to pay to maintain the service and able to do so;
- on the **supply side**, the opportunity costs of changing resource management practices must not be too high. It must be possible to improve the supply of the ecosystem service through a change in resource use e.g. land set-aside, adoption of organic production practices, use of water saving irrigation techniques (see also Wunder 2008);

Figure 5.6: Strategies for marketing biodiversity joint service provision



Source: Wunder and Wertz-Kanounnikoff 2009

- with respect to **technical information**, it is important to understand the ecosystem service, who provides it and how, who benefits (using spatial mapping), historical and expected future trends in demand and supply and other contextual factors. Such information is necessary for appropriate targeting of payments to those who can actually deliver the desired service; and
- in terms of **governance**, trust between beneficiaries and suppliers (or the potential to build trust) is essential, along with appropriate legal and institutional support for monitoring and contract enforcement, clarity on resource tenure and mechanisms for redress.

NEGOTIATION OF PES DEALS

In principle, PES initiatives should be **financially self-sustaining** to secure ecosystem services over the long term. However, where continuous payments by beneficiaries are not feasible, it may be possible to convert a one-off payment (e.g. a grant) into long-term flows by setting up trust funds or to pool payments from different beneficiaries (see the 'layering' strategy in Figure 5.6).

PES have distributional consequences so it is critical to address issues of ownership, reward and distribution explicitly to ensure that they do not aggravate existing inequities. **Wide participation in decisions relating to PES design and implementation can help ensure transparency and acceptance and avoid the covert privatisation of common resources.** The distribution of costs and benefits in PES schemes should

be monitored consistently. Participatory resource assessments and valuation can help ensure that PES schemes take account of traditional knowledge and practices and the interests of all stakeholders. Capacity-building and, where needed, adequate institutional measures are important to ensure that weaker stakeholders are able to participate in PES negotiations and share their insights on ecosystem conservation. In Costa Rica and Mexico, 'collective contracting' was introduced to facilitate the participation of poorer small farmers after it was realised that they would otherwise be excluded.

PES schemes are not generally designed to reduce poverty but they can offer new opportunities for the rural poor to earn additional income (see Box 5.8). Many rural people earn their living from activities such as forestry and farming in which income fluctuates by season and year. PES based on ecosystem restoration or improved land management could provide a stable source of additional income and employment in rural areas.

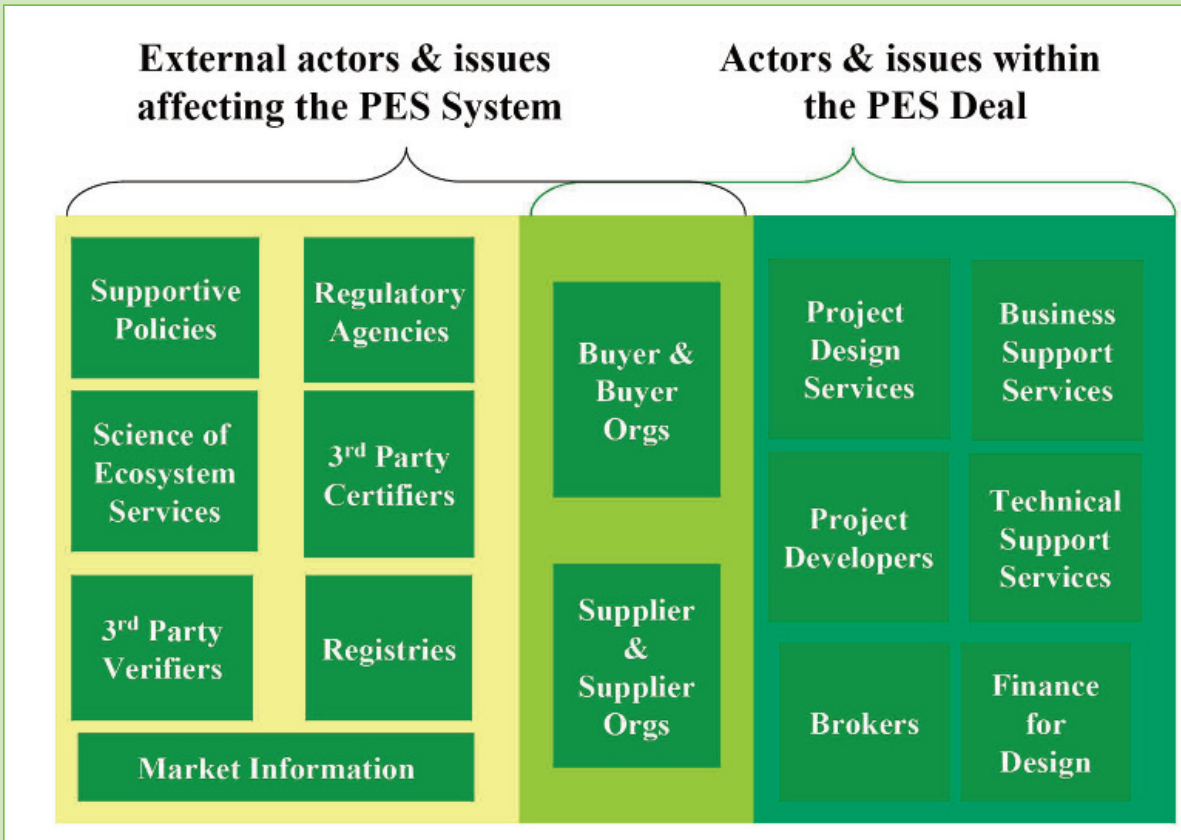
OVERARCHING CONDITIONS FOR SUCCESS

Effective PES requires – and can help to strengthen – certain 'enabling conditions' such as:

- reliable scientific information (e.g. sources of ecosystem services, their spatial distribution and beneficiaries);
- economic data (start-up and implementation costs, including opportunity costs of managing resources for ecosystem services, non-market values and incentive effects of alternative PES arrangements);
- identification and participation of key stakeholders.

Successful PES schemes typically demonstrate transparency, reliability (of payments etc.), appropriate cultural conditions (e.g. acceptance of differential payments for environmental stewardship, trust) and strong commitment by all parties. Effective monitoring

Figure 5.7: Institutional actors involved in PES deals



Source: adapted from Bracer et al. 2007

and enforcement is critical to ensure delivery of the intended services and their measurement. Payments must be clearly linked to service provision and may be withdrawn if resource users abandon management practices associated with the service. Monitoring data on the quality and quantity of site services can help improve the targeting of payments or make other refinements (see also Chapter 3).

As noted, PES will not work everywhere. It may be difficult to secure sufficient support for PES in situations where competing (destructive) resource uses are highly lucrative. Weak governance, unclear resource tenure and high transaction costs can also be major barriers.

Box 5.8: Phased performance payments under PES schemes in Tanzania

On Mafia Island, Tanzania, a two-part payment scheme was set up to encourage the mainly poor local population to conserve sea turtles. It consists of 1) a fixed payment for finding and reporting a nest and 2) a variable payment that is a function of the nest's hatching success. The initial payment provides immediate recompense for not harvesting nests (important as poor residents apply high discount rates to future payments) and also makes the overall payment scheme less risky for poor residents than if all payment were solely dependent upon successful hatchings. The post-hatching variable payment then provides an incentive not to poach eggs once the nest has been reported.

There are around 150 turtle nests on the island and 41,000 residents. Participation in the scheme is agreed directly between volunteers and villagers and based on oral agreements. About half a dozen individuals actively searching for nests account for the majority of payments. The scheme reduced poaching rates of turtle nests dramatically, from 100% at the year of its introduction in 2001 to less than 1% in 2004. Moreover, from 2001 to 2004, the number of hatchlings increased in both absolute terms (from about 1200 to a little over 10,000) and relative terms (from 55% to 71% of the eggs remaining at hatching time).

Source: Ferraro 2007

As with any innovation, a critical step is to secure support from leaders at various levels who can communicate the importance of ecosystem services and the potential of PES to both providers and beneficiaries. There is also a need for careful analysis and effective communication of experiences, both positive and negative, to replicate and scale up successful initiatives.

5.2 INTERNATIONAL PES: REDD AND BEYOND

This section outlines the economic, social and environmental arguments in favour of international cooperation on payments for ecosystem services of global benefit (5.2.1). It focuses on the content and design options for the proposed mechanism under the United Nations Framework Convention on Climate Change (UNFCCC) for Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries, giving particular consideration to the scope for biodiversity co-benefits alongside carbon benefits (5.2.2). Ways to market additional biodiversity benefits alongside REDD are considered in 5.2.3. Finally, 5.2.4 outlines emerging initiatives for International Payments for Ecosystem Services (IPES) specifically focused on biodiversity-related global ecosystem services.

5.2.1 THE RATIONALE FOR INTERNATIONAL ENGAGEMENT

Global biodiversity benefits – including carbon storage, genetic information for bio-industry and pharmaceuticals, international hydrological services, wildlife and landscape beauty - need to be recognised, and costs and benefits fairly shared if we are to halt their degradation. Commitment to **IPES can help secure rewards** for such benefits. Without this, the decision facing many land owners, as well as local and national governments, will remain tilted against conservation and opportunities to contribute to conserving or maintaining their international public good values will be missed.

Several instruments can be broadly classified as a form of IPES (OECD 2009), including bioprospecting, conservation concessions, biodiversity offsets and international grants. International markets for 'greener' products and services are also key mechanisms to conserve natural capital but arguably fall outside IPES (see Sections 5.5 and 5.6).

Regional and continental PES schemes - or equivalent cooperation – can be designed to address ecological functions in large transboundary ecosystems, such as the Nile, Lake Victoria or the Amazon (see Box 5.9). Collaboration to identify interdependencies and recognise service providers and beneficiaries is likely to lead to better solutions than following national interests alone. The latter may deliver short-term gains for a few but long-term losses for all as natural capital erodes.

5.2.2 DESIGNING REDD WITH BIODIVERSITY CO-BENEFITS[7]

"If a post Kyoto climate agreement fails on avoiding tropical deforestation, the achievement of overall climate change goals will become virtually impossible. The lives and livelihoods of millions of people will be put at risk, and the eventual economic cost of combating climate change will be far higher than it needs to be."

Bharrat Jagdeo, President of Guyana

This section looks at a new international financial mechanism that is proposed to help internalise the carbon-related ecosystem services provided by forests. Under the auspices of the UNFCCC, Parties are proposing that a mechanism on Reducing Emissions from Deforestation and Forest Degradation (REDD) in developing countries is integrated into the post-2012 climate change regime. Given the important role that forests play in climate change mitigation and adaptation, as well as in biodiversity provision, the section considers how biodiversity co-benefits in REDD can be maximised and how potentially adverse impacts on biodiversity could be avoided.

Deforestation and forest degradation accounts for about 17% of global greenhouse gas (GHG) emissions (IPCC 2007c). Successful agreement on a REDD mechanism could therefore significantly contribute to meeting the UNFCCC's ultimate objective, namely "to achieve stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (Article 3) (see Box 5.10).

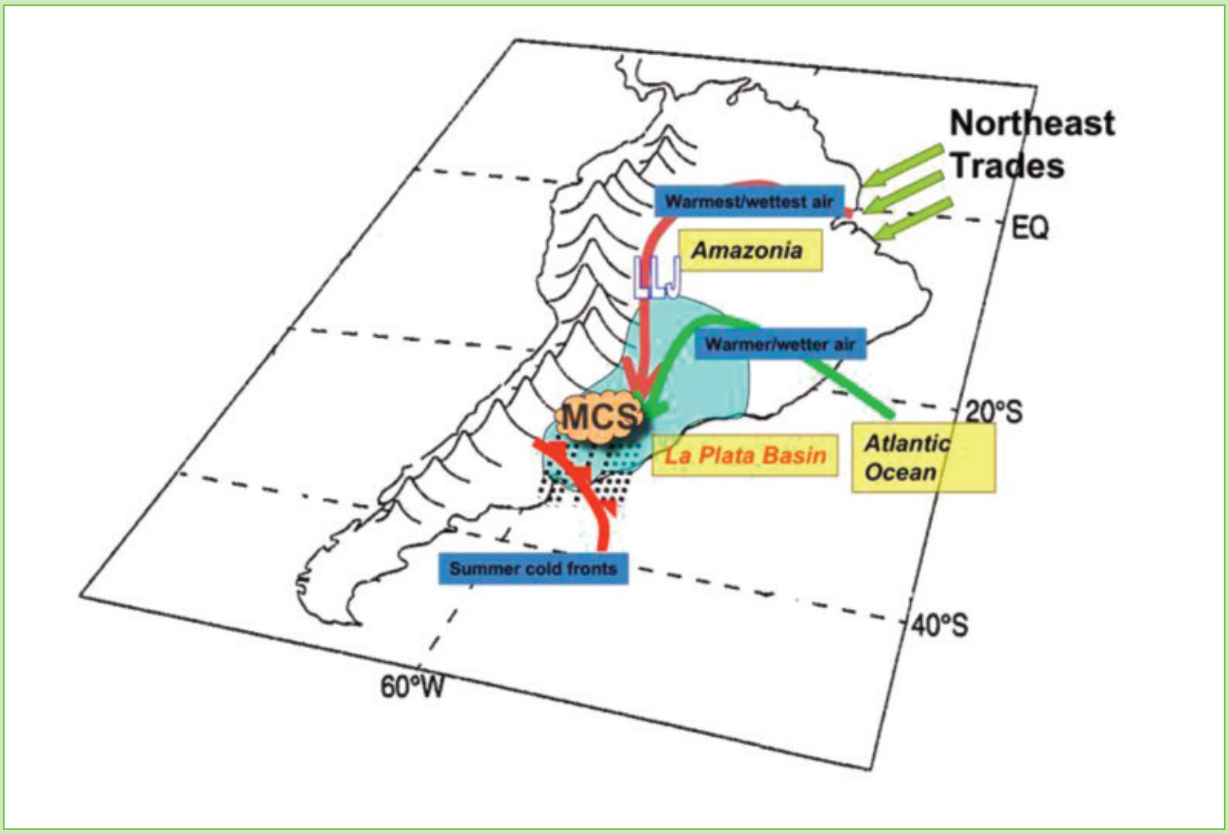
The actual amount of deforestation/degradation that could be avoided – and thus the level of emissions prevented or new sequestration capacity gained – will depend inter alia on:

- the baselines that are set (what area with what carbon store and what carbon sequestration rate is being lost and at what rate?);
- the incentives behind the loss (who benefits and by how much?); and
- financial mechanisms (discussed below).

It is expected that REDD will have a substantial impact on climate change mitigation because it is estimated to be a low-cost GHG mitigation option compared to many other emission abatement options (see Box 5.11). Moreover, sustaining forests and high forest biodiversity improves both the carbon storage capacity of forests and their resilience to future shocks – such as ability to withstand changes in climatic conditions, pollution and invasive alien species.

Box 5.9: Opportunities for multi-country PES: example of the Amazonian 'water pump'

Five countries share the Amazon basin. Amazonia's forests evaporate roughly eight trillion tonnes of water each year (IPCC 2007b) which falls as rain, helps maintain the forests and is transported to the Andes and down to the Plata River Basin, where agriculture, hydropower and industry generate about US$ 1 trillion for these countries (Vera et al. 2006). The region's food, energy and water security are thus underpinned by the Amazonian 'water pump'. National and international PES could help to maintain this critical service.



Source: adapted from Marengo et al. 2004

Box 5.10: The evolution of REDD-Plus under the UNFCCC

At the 11th meeting of the Conference of the Parties to the UNFCCC (COP-11, Montreal, 2005), Papua New Guinea proposed integrating a mechanism to reduce emissions from deforestation into the post-2012 climate change regime. The proposal received widespread support and a formal process was created to examine the possibility of positive incentives and policy approaches for REDD.

The Bali Action Plan (Decision 2/CP.13, adopted in December 2007), mandates UNFCCC Parties to negotiate a post-2012 instrument that includes financial incentives for forest-based climate change mitigation actions in developing countries. Paragraph 1b(iii) of the Plan specifically calls for

"policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries".

At COP-14 (Poznan, 2008), the items on conservation, sustainable management of forests and enhancement of carbon stocks were highlighted as being of equal importance. This gave rise to the latest term within the REDD negotiations, namely REDD-Plus (REDD+).

COP-15 (Copenhagen, December 2009) marks the culmination of the two year process launched in Bali to agree a post-2012 regime, including REDD+. Even if an agreement is reached, the specific design elements and implementation approaches for REDD+ will probably only be addressed after Copenhagen.

The possible scope of activities in a REDD+/forestry mechanism has been significantly enlarged over the last three years and could potentially reward 'enhanced positive changes' through forest restoration/rehabilitation.

Table 5.1: Possible scopeof credible activities in a REDD/forestry mechanism

Changes in:	Reduced negative change	Enhanced positive change
Forest are (hectare)	Avoided deforestation	Afforestation and reforestation (A/R)
Carbon density (carbon per hectare)	Avoided degradation	Forest restoration and rehabilitation (carbon stock enhancement)

Source: Angelsen and Wertz-Kanounnikoff 2008

Although REDD focuses on carbon emissions, the UNFCCC's Bali Action Plan recognises that action to support REDD "can promote co-benefits and may contribute to achieving the aims and objectives of other relevant international conventions and agreements". A notable example of this potential for synergy concerns the Convention on Biological Diversity (CBD) (see Box 5.11).

INTERNATIONAL REDD DESIGN OPTIONS AND THEIR IMPLICATIONS FOR BIODIVERSITY

Several outstanding technical and methodological issues still need to be resolved through the UNFCCC process to ensure that any future REDD mechanism is environmentally effective, cost-efficient and equitable (Karousakis and Corfee-Morlot 2007; Angelsen 2008). Key REDD design elements with implications for biodiversity are outlined below. These relate to scope, baselines/reference levels, different types of financing

Box 5.11: The costs and benefits of reducing GHG emissions from deforestation

Estimated costs of reducing emissions from deforestation vary across studies, depending on models and assumptions used. In comparison to GHG mitigation alternatives in other sectors, REDD is estimated to be a low-cost mitigation option (Stern 2006; IPCC 2007c).

Eliasch (2008) estimated that REDD could lead to a halving of deforestation rates by 2030, cutting emissions by 1.5-2.7 Gt CO_2/year and would require US$ 17.2 billion to US$ 33 billion/year. It estimated the long-term net benefit of this action at US$ 3.7 trillion in present value terms (this accounts only for the benefits of reduced climate change).

A study from the Woods Hole Research Centre estimates that 94% of Amazon deforestation could be avoided at a cost of less than US$ 1 per tonne of carbon dioxide (Nepstad et al. 2007). Olsen and Bishop (2009) find that REDD is competitive with most land uses in the Brazilian Amazon and many land uses in Indonesia at a carbon price of less than US$ 5 per tonne of CO_2 equivalent. Kindermann et al. (2008) estimate that a 50% reduction in deforestation in 2005-2030 could provide 1.5-2.7 Gt CO_2/year in emission reductions and would require US$ 17.2 billion to US$ 28 billion/year (see Wertz-Kanounnikoff 2008 for a review of cost studies).

Sources: Stern 2006; IPCC 2007a; Eliasch 2008; Nepstad et al. 2007; Kindermann et al. 2008; Wertz-Kanounnikoff 2008

mechanism, monitoring and reporting/verification methodologies (see Parker et al. 2009 for a synopsis of REDD proposals).

SCOPE OF REDD AND REDD-PLUS

A well-designed REDD mechanism that delivers real, measurable and long-term emission reductions from deforestation and forest degradation is expected to have significant positive impacts on biodiversity since a decline in deforestation and degradation implies a decline in habitat destruction, landscape fragmentation and biodiversity loss. At the global scale, Turner et al. (2007) examine how ecosystem services (including climate regulation) and biodiversity coincide and conclude that tropical forests offer the greatest synergy. These cover about 7% of the world's dry land (Lindsey 2007) yet the world's forests contain 80 to 90% of terrestrial biodiversity (FAO 2000). Targeting national REDD activities at areas combining high carbon stocks and high biodiversity can potentially maximise co-benefits (see Figure 5.8 on Panama below)[8].

A REDD-Plus mechanism could have additional positive impacts on biodiversity if achieved through appropriate restoration of degraded forest ecosystems and landscapes. Afforestation and reforestation (A/R)[9] activities can provide incentives to regenerate forests in deforested areas and increase connectivity between forest habitats. However, there is a need for safeguards to avoid potential negative effects. A/R activities under a future REDD mechanism that resulted in monoculture plantations could have adverse impacts on biodiversity: firstly, there are lower levels of biodiversity in monoculture plantations compared to most natural forest and secondly, the use of alien species could have additional negative impacts. Conversely, planting mixed native species in appropriate locations could yield multiple benefits for biodiversity. Plantations can also reduce pressures on natural forests for the supply of fuel and fibre.

NATIONAL AND SUB-NATIONAL BASELINES/REFERENCE LEVELS

Baselines provide a reference point against which to assess changes in emissions. Various proposals have been tabled for how these could be established for REDD at national, sub-national[10] and project levels. The accounting level selected has implications for **'carbon leakage'** i.e. displacement of anthropogenic emissions from GHG sources to outside the accounting boundary, with deforestation and/or forest degradation increasing elsewhere as a result. Such leakage

could have adverse consequences for biodiversity if deforestation/degradation were displaced from an area with low biodiversity value to one with higher value. In general, national level emissions accounting is better able to account for international leakage than sub-national and/or project level accounting[11].

Another important question about REDD relates to **'additionality' i.e. achieving emission reductions that are additional to what would have occurred under the business-as-usual scenario** and how protected areas (PAs) are treated within this context. Some high carbon/high biodiversity ecosystems may be located in legally-defined PAs, giving the impression that the carbon they store is safe and that they would not offer additional sequestration benefits. While this is true for well-managed PAs, many sites remain vulnerable to degradation through encroachment, poaching and other illegal activities (Leverington et al. 2008). This reflects inter alia the significant financing gap that exists for many PAs across the world (see Chapter 8).

Ensuring carbon additionality will depend on whether and how REDD finance is extended to PAs. About 312 Gt of terrestrial carbon is currently stored in the existing PA network: if lost to the atmosphere, this would be equivalent to approximately 23 times the total global anthropogenic carbon emissions for 2004 (Kapos et al. 2008). Targeting REDD funding at PAs at risk of degradation/deforestation or which have potential for improved ecological status – rather than at 'safe' PAs – could yield both high carbon and biodiversity benefits.

GROSS VS NET DEFORESTATION RATES

Another issue under negotiation is whether gross or net deforestation rates will be considered when estimating emission reductions[12]. From a climate perspective, the most relevant figure is what the atmosphere actually experiences (the rationale for using net values). However, the use of net rates could hide the loss of mature (i.e. primary and modified natural) forests and their replacement with areas of new forest, either in situ or elsewhere. This could result in significant losses in biodiversity (sCBD 2008).

REDD FINANCING

There are three prevailing positions on how REDD financing could be generated[13]. These have different implications for how biodiversity co-benefits could be promoted and which stakeholders would be involved in decision-making processes.

Market-based approaches: If REDD were financed via the regulated international carbon market, credits would need to be fungible (interchangeable) with existing Assigned Amount Units (AAUs) under the Kyoto market[14]. The unit of exchange would be tonnes of carbon equivalents (tCO_2e). Demand for credits would be generated by the carbon market which would drive investment towards the least-cost mitigation options (subject to any restrictions that governments might place on market access for REDD credits). Given their ability to engage the private sector, market-based approaches to REDD are likely to mobilise higher levels of sustainable and long-term financing, leading to larger areas of conserved forests and larger biodiversity co-benefits.

Fund-based approaches: Another approach is to mobilise REDD finance via inter alia voluntary contributions (ODA), auctioning assigned amount units (AAUs) in the carbon market and earmarking (part of) these revenues or revenues from other fees, fines and taxes. In general, fund-based approaches can be designed to disburse REDD finance based on any objectives and criteria established by donor (and host) countries. Whereas carbon market financing is tied to delivering emission reductions, fund-based approaches could be used not only to finance such reductions but also to support capacity-building needs in developing countries to make REDD operational. They may also target biodiversity co-benefits or be designed to target biodiversity benefits directly. However, the way in which funds are generated may have implications for how they are disbursed (see Karousakis 2009). In general, fund-based approaches are likely to deliver lower volumes of REDD finance over the long-run.

Phased approaches: More recently, a phased approach to REDD finance has been proposed that combines market and fund-based approaches. The

Meridian Institute (2009) suggests three phases entailing:

- voluntary funding for national REDD strategy development and capacity building;
- implementation of policies and measures proposed in national REDD strategies, supported by an internationally-binding financial instrument funded by e.g. auctioning AAUs; and
- payment for performance on the basis of quantified forest emission reductions measured against agreed reference levels. This could be financed on a large scale by the sale of REDD units within global carbon markets or by a non-market mechanism.

Pending agreement on a REDD-Plus mechanism, a growing number of international contributions and funds have already been set up to help address deforestation. Sponsors include the World Bank, Norway, Japan, Germany, the United Kingdom, Australia, the European Commission, Brazil and Guyana (see Box 5.12).

MAXIMISING BIODIVERSITY CO-BENEFITS OF REDD AT NATIONAL AND LOCAL LEVEL

As noted, biodiversity co-benefits can be maximised if REDD activities are implemented in areas of high carbon and high biodiversity benefits. Identifying suitable areas requires tools to assess where these benefits occur geographically and are spatially correlated. By mapping where these benefits overlap, governments and/or private-sector investors can capture two environmental

Box 5.12: Funding initiatives to address deforestation

National donor activities

- the Norway Forest Fund, which has committed US$ 2.8 billion over five years from 2008;
- the Japanese Government's Cool Earth Partnership designed to support adaptation to climate change and access to clean energy, which includes forest measures; US$ 2 billion per year from a US$ 10 billion fund is allocated for adaptation measures;
- the Australian Deforestation Fund, aimed at reducing deforestation in the Southeast Asia region, with funds of AUS$ 200 million; and
- the German commitment of 500 million EUR/year for biodiversity.

Source: adapted from The Prince's Rainforests Project, http://www.rainforestsos.org/ and http://www.mofa.go.jp/policy/economy/wef/2008/mechanism.html

Beneficiaries

- the Congo Basin Fund, supported by Norway and the UK, with funding of US$ 195 million;
- Brazil's Fund for the protection of the Amazon rainforest has received a commitment for an initial US$ 130 million from Norway (drawn from the Norwegian Forest Fund).

Source: adapted from The Prince's Rainforests Project, http://www.rainforestsos.org/

Emergency funding

The Prince's Rainforests Project has proposed an emergency global fund to protect rainforests, financed by a public-private partnership in developed countries which could include issuing Rainforest Bonds. The aim is to raise around £ 10 billion per year. An international working group was formed in April 2009 with G20 support to study a range of proposals.

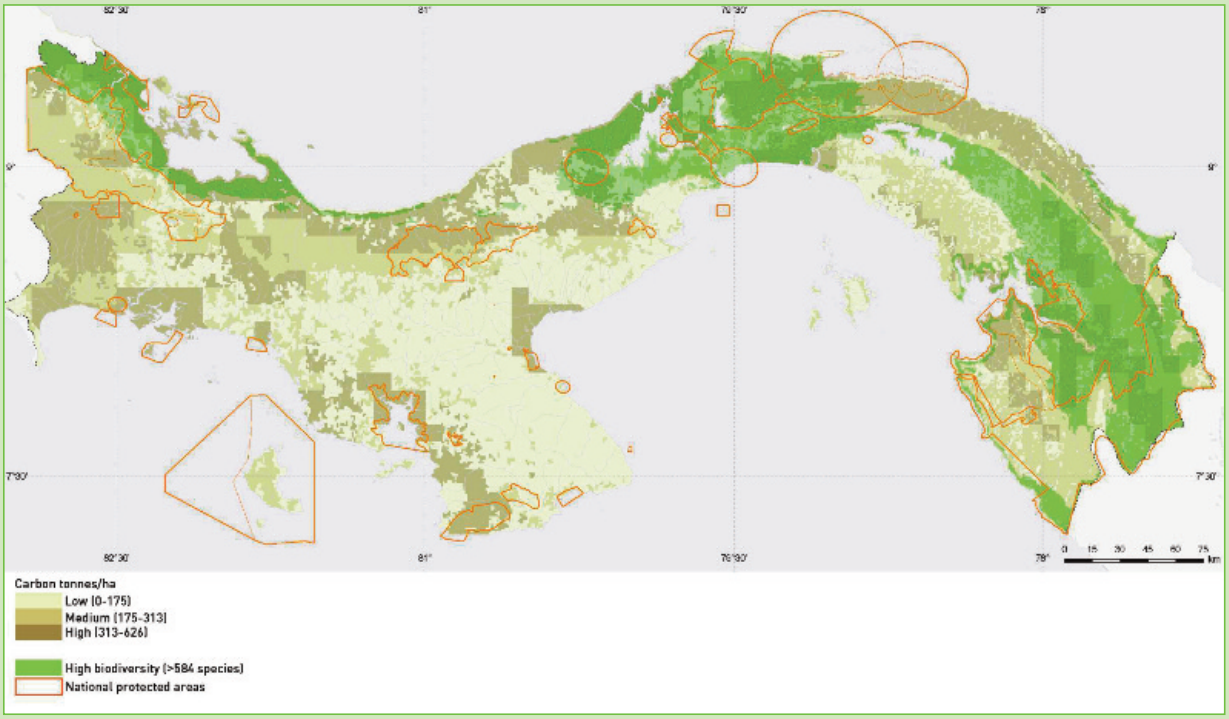
Source: http://www.rainforestsos.org/pages/emergency-package/

Reforestation registered under the UNFCCC Clean Development Mechanism (CDM)

Eight forestry projects have been registered under the CDM. The first African project registered is the Nile Basin Reforestation Project, undertaken by Uganda's National Forestry Authority in association with local community organisations. The project in the Rwoho Central Forest Reserve will generate up to 700 local jobs and receive revenues from the World Bank BioCarbon Fund for planting pine and mixed native tree species on degraded grasslands. It is designed to deliver co-benefits for livelihoods, greater climate resilience and biodiversity (through reduced pressure on the country's remaining native forests).

Source: World Bank Press Release No:2010/093/AFR. http://beta.worldbank.org/climatechange/news/uganda-registers-first-forestry-project-africa-reduce-global-warming-emissions

Figure 5.8: National carbon and biodiversity map for Panama



Source: UNEP-WCMC 2008: 15

services for the price of one. For example, the **Carbon and Biodiversity Demonstration Atlas** (UNEP-WCMC 2008) includes regional as well as national maps for six tropical countries showing where areas of high carbon storage coincide with areas of biodiversity importance (see Figure 5.8).

This example illustrates the variety of different approaches for identifying high biodiversity areas at a regional scale. UNEP-WCMC uses six indicators for biodiversity: biodiversity hotspots, endemic bird areas, amphibian diversity, global 200 terrestrial ecoregions, global 200 freshwater ecoregions and centres of plant diversity. Areas of 'high biodiversity' are those where at least four indicators overlap, with areas in dark green indicating a greater degree of overlap.

Spatial tools of this kind can help governments and potential private sector investors to identify and prioritise REDD activities. Further work is needed to establish similar maps based on national biodiversity data combined with greater spatial understanding of the economic values of biodiversity and ecosystem service benefits. Spatially-explicit cost-benefit analysis involves:

- identifying areas with high carbon storage/sequestration and biodiversity benefits (ideally, also areas with high carbon storage that are important providers of other ecosystem services);
- identifying areas of high risk of deforestation and forest degradation;
- evaluating the opportunity costs of alternative land uses and development pathways.

The more cost-effective the strategy for targeting biodiversity co-benefits, the greater will be the results from available budgets. However, as noted, leakage and additionality issues within and between countries need to be assessed when choosing target areas and measures should be put in place to avoid other problems (e.g. illegal logging, reforestation with non-native species). This calls for a policy mix that integrates REDD-Plus, new Protected Areas (PA) designations/investments, improved regulation and enforcement as well as development of markets for certified forest goods (see Section 5.5 below).

If successful, such approaches could free up existing biodiversity financing (e.g. from ODA and/or developing

country government budgets) currently invested in high carbon/high biodiversity areas. These sums could then be re-directed to target biodiversity conservation in high biodiversity/low carbon areas, delivering additional benefits.

5.2.3 MARKETING BIODIVERSITY BENEFITS ALONGSIDE REDD

It is possible to go beyond capturing biodiversity co-benefits through REDD to create biodiversity-specific incentives. REDD payments could in theory be layered with payments for other forest-related ecosystem services or for biodiversity benefits directly (see Figure 5.6). Measures to address leakage and ensure additionality, discussed above, should also be applied to such initiatives.

The UNFCCC Bali Action Plan called for **REDD demonstration activities** to obtain practical experience and share lessons learnt. Such activities are in the early stages of design and implementation but can eventually contribute to good practice guidance for a future REDD mechanism[15]. They provide policy makers with an important opportunity to promote approaches that maximise biodiversity co-benefits in REDD as well as associated monitoring, reporting and verification processes to assess biodiversity performance over time.

REDD demonstration activities and voluntary agreements that can support REDD are already underway. They provide preliminary insights and emphasise the need to provide alternative livelihoods to communities that depend on forests, improve governance and clarify land tenure (see Box 5.13).

Current initiatives that are considering biodiversity in REDD activities include the World Bank Forest Carbon Partnership Facility (FCPF) which has incorporated biodiversity considerations in its REDD Readiness Fund. REDD country participants are required to submit a Readiness Preparation Proposals (R-PPs, formerly named 'R-Plan') that includes measures to deliver and monitor multiple benefits as part of national REDD strategies, including but not limited to biodiversity, poverty reduction and benefit sharing.

The UN-REDD Programme also supports multiple benefits through e.g. consultations with pilot countries; spatial analyses of the relationship between carbon storage, biodiversity and ecosystem services in forests; and the development of tools to assist decision-makers in promoting synergies, addressing conflicts and managing trade-offs.

Finally, in the **voluntary carbon market**, several initiatives already bundle carbon and biodiversity benefits. These take the form of voluntary premiums for REDD credits that provide additional biodiversity benefits[16] and include the Climate, Community and Biodiversity Alliance (CCBA), Plan Vivo, CarbonFix, Social Carbon and the California Climate Action Registry (see Karousakis 2009 for further information). For example, the CCBA has established voluntary standards for forestry projects, including REDD demonstration activities. The criteria relevant to biodiversity are: 1) net positive biodiversity impacts; 2) offsite biodiversity impacts; and 3) biodiversity impact monitoring. Projects are audited by independent third party certifiers and each project is subject to a 21 day public comment period.

5.2.4 DIRECT INTERNATIONAL PAYMENTS FOR GLOBAL ECOSYSTEM SERVICES

"The conservation of many ecosystems suffers from the fact that the costs of preservation are borne locally, but its benefits are often enjoyed globally"

"A mechanism needs to be devised to compensate societies that preserve the global commons."

UNEP Global Green New Deal policy brief, March 2009

"Cui bono?" (Whose benefit?)

L. Cassius Longinus Ravilla, Roman censor

This section provides an overview of emerging mechanisms that specifically address biodiversity as a global public good and create incentives for the preservation of global ecosystem services.

Box 5.13: Example of a multiple-benefits REDD project in Madagascar

Background: Less than 15% of Madagascar's land area remains forested, having lost about half of its forest cover since 1953 with much regional variation (Hanski et al. 2007); for instance, most of the coastal lowland forests have been cleared. Recently, unprotected natural forest was lost at a rate of 0.65% annually in the period 2000-2005 (MEFT; USAID and CI 2009). The Ankeniheny-Mantadia-Zahamena corridor project in east-central Madagascar is designed to protect some of the last remaining low and mid-elevation primary rainforest.

Project design and goals: The project targets the delivery of multiple benefits for biodiversity, human livelihoods and climate change mitigation. It is structured to take advantage of carbon financing from the emerging voluntary and compliance markets through the sale of emissions reductions from REDD. Endorsed by the government in 2004 and developed with NGO support led by Conservation International (CI), the project provides for the creation of a new protected area. Its objectives combine protection against deforestation with reforestation of targeted sites to restore habitat connectivity, enhancing local resource management capacity (approximately 315,000 people live in 30 surrounding communes) and endemic species conservation.

Project governance and funding: The Environment Ministry acts as project manager, protected area administrator and 'vendor' of the carbon offsets created through REDD and reforestation activities. Communities and NGOs are organised into Local Management Units, federated within sectors, and ultimately report to the Ministry. CI and the World Bank's BioCarbon Fund (BioCF) provide the technical expertise and financial support to access carbon finance mechanisms, including future application of REDD carbon accounting methodology and monitoring emissions reductions.

Because carbon finance is rarely able to cover high start-up and transaction costs in forest carbon projects, the project combined carbon-credit purchase commitments and project support from the BioCF with targeted biodiversity investments from CI and the government and community development funding through USAID and the World Bank.

Source: personal communication Olaf Zerbock and James McKinnon, Conservation International

BIODIVERSITY AS A GLOBAL PUBLIC GOOD

As underlined throughout this report, biodiversity and ecosystem services provide critical inputs to local and national societies in terms of production, cultural values and recreational amenity. However, **biodiversity is also a global public good** which merits international cooperation and support for its conservation, restoration and management in its own right.

The supply of public goods usually falls to government as such goods are by definition non-excludable and non-rival: this makes it hard for business or individuals to profit from producing them. Recognising biodiversity as a global public good implies that governments have a role to ensure its international provision, either by creating conditions for organisations, businesses and individuals to undertake larger-scale and more effective conservation or by taking on this task themselves.

There are good reasons for governments to invest in natural capital and ecosystem services beyond their national borders or to devise international payments for ecosystem services (see also Chapters 9 and 8):

- **global benefits derive from biodiversity** and from local, regional and international ecosystem services, notably non-use values. These need to be made explicit and reflected in government policies;
- efforts to reduce biodiversity loss will require particular efforts from biodiversity-rich developing

countries, many of which cannot easily afford the investments required. Significant and sustained support from developed countries is needed to **underpin economic development without global environmental impoverishment**;

- importing primary commodities into developed economies without internalising their full environmental costs may be seen as **exporting environmental pressure to other countries**. Alongside continuing efforts to internalise environmental costs, consistent with the polluter pays principle, mechanisms to compensate or avoid negative environmental impacts abroad could decrease pressure and buy time to make the shift to more sustainable production.

In addition to carbon sequestration and capture (see Section 5.2.2 on the REDD mechanism), other global contenders for IPES schemes include **nitrogen deposition, bioprospecting (see Section 5.3 below on Access and Benefit Sharing), water and rainfall regulation and global cultural services provided by species and natural areas**. These are all key examples of locally provided ecosystem services with far-reaching benefits.

Biodiversity provides additional global public benefits in the form of non-use values. These can be divided into option values, bequest value, existence value and intrinsic value (see Chapter 4). Such values are not limited to a specific region or country; many have international values and some also global values. Next to the global direct and indirect use values described above, they are a fundamental reason for international and intergovernmental cooperation to ensure the conservation and sustainable use of biodiversity.

In spatial terms, ecosystem use and provisioning are unevenly distributed throughout the world. This is the case for important use values (e.g. agricultural harvests are more abundant in certain regions), cultural values (e.g. charismatic species are found only in certain locations), carbon storage (see Kapos et al. 2008) and biodiversity-rich areas. This unequal distribution is partly a consequence of past human development paths and population movements and partly due to natural endowments and climatic conditions.

Projected biodiversity loss is particularly high in developing countries, many of which are burdened with other priorities like combating poverty and providing education, jobs and economic development (see Figure 5.9 for comparative maps of biodiversity risk areas and the human development index). Developed economies have a co-responsibility to protect global public goods by assisting developing countries to conserve biodiversity. In the short run, sustainable management and conservation will not take place without significantly more investments in the countries where the brunt of projected biodiversity loss will take place.

Biodiversity's role in the global economy is clearly revealed by the interdependency of countries through regional and international trade. Many countries import a high proportion of their primary consumption products, which ultimately derive from ecosystems. **Ecosystem services important for international production should be managed on a long-term basis and protected by appropriate laws. Environmental costs should be internalised in the prices of products that are traded internationally as well as nationally.** Green purchasing criteria, standards and public procurement (see Sections 5.5 and 5.6) are examples of mechanisms that can encourage exporters to internalise environmental costs.

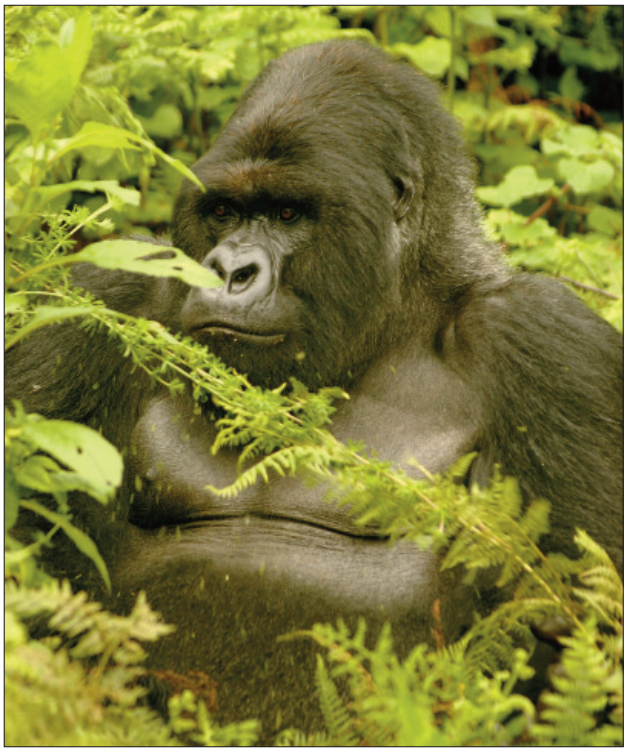
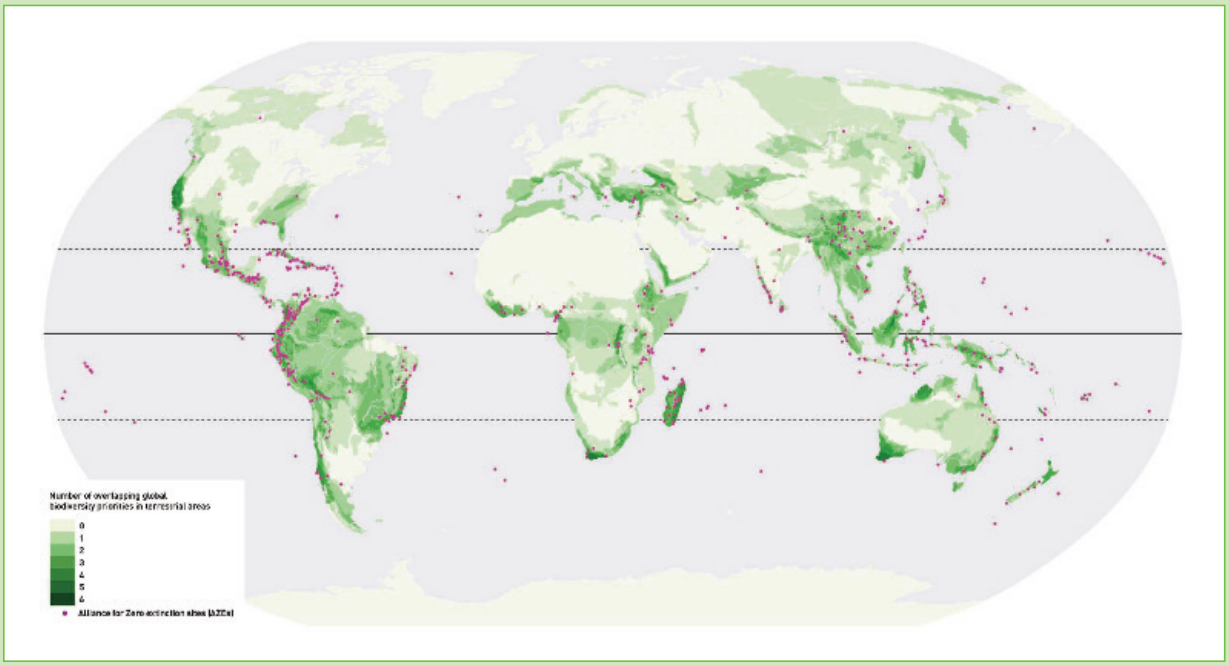


Figure 5.9: Comparative maps of biodiversity hotspots and major wilderness areas and the UN's Human Development Index (HDI)

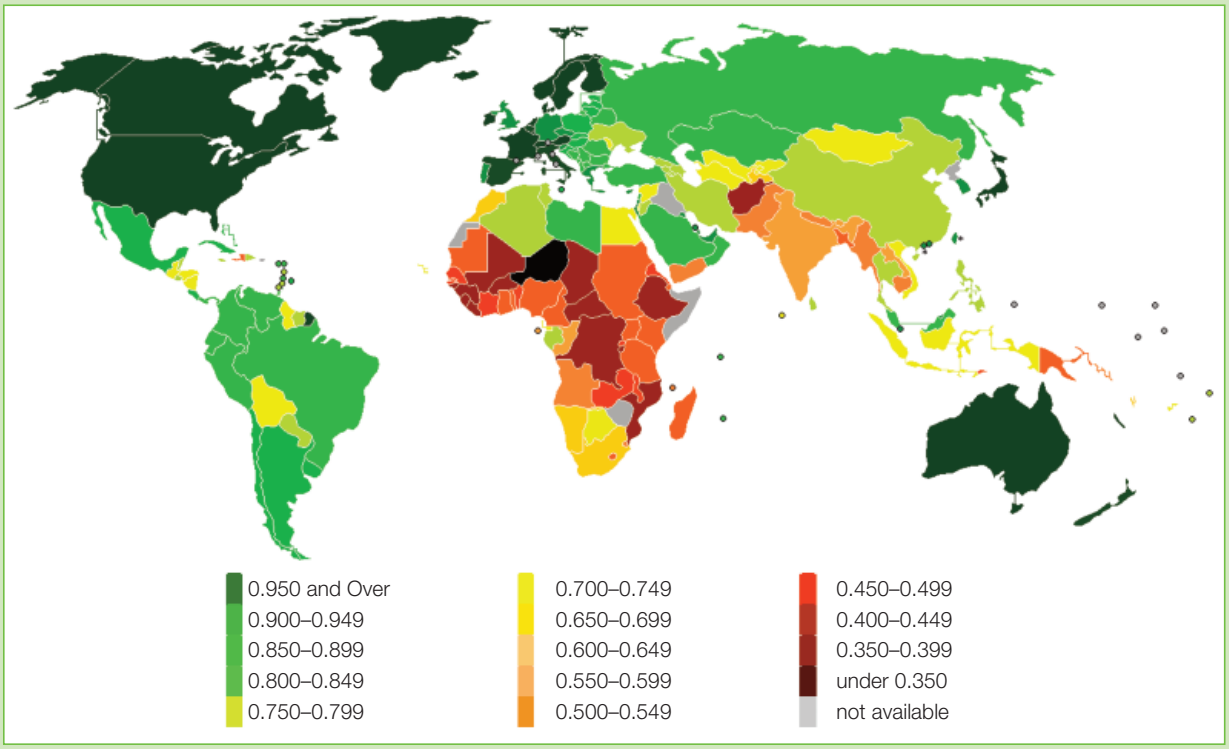
(i) Global Biodiversity 'priority areas' map



Key: this map builds on Conservation International's Hotspots, WWF's Global 200 ecoregions, Birdlife International Endemic Bird Areas (EBAs), WWF/IUCN Centres of Plant Diversity (CPDs) and Amphibian Diversity Areas plus Alliance for Zero Extinction (AZE) sites

Source: Kapos et al. 2008: 7

(ii) Human Development Index (HDI) map

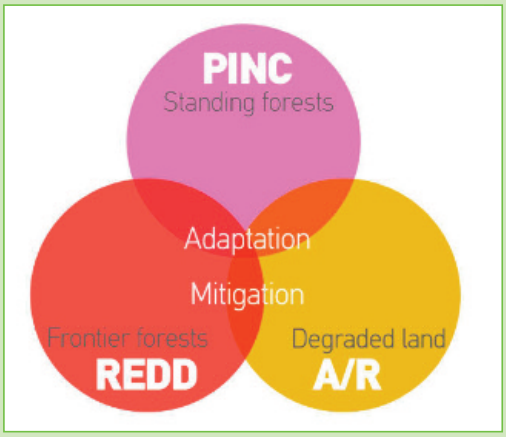


Source: UNDP 2009: 16

Box 5.14: Think PINC – the 'Proactive Investment in Natural Capital' proposal

"We propose that a new mechanism of Proactive Investment in Natural Capital (PINC) is created to promote adaptation in existing protected areas and standing forests that may not benefit directly from REDD funds."

Trivedi et al. (2009)



PINC, proposed by the Global Canopy Programme, seeks to act as a complementary funding stream to a REDD mechanism for large areas of standing forests that are not immediately threatened or may not benefit from REDD (depending on its design and implementation). It recognises the immense value of tropical forests in monetary and non-monetary terms and calls for a mechanism to reward the function of large areas of forests as global providers of multiple ecosystem services beyond carbon storage (e.g. biodiversity protection, rainfall generation, water supply regulation and atmospheric cooling, which are likely to become increasingly important as a result of climate change).

Source: Trivedi et al. 2009

SHAPING IPES AND GLOBAL INVESTMENT IN BIODIVERSITY

Different approaches for international transfers for biodiversity conservation and for mobilising international investment in natural capital have been proposed. Boxes 5.14 and 5.15 describe some recent ideas and initiatives.

Without the means to make a global ecosystem service 'excludable' – i.e. limiting its use by non-paying benefactors – alternative ways must be found to create demand for investment in such services. This argument also applies to international agreements on access and benefit sharing (see Section 5.3 below). Global targets for contributions to biodiversity conservation can be used to determine burden sharing and/or market mechanisms can offer countries the option to deliver certain ecosystem services in a more cost-efficient way (e.g. Tradable Conservation Obligations, see Box 5.15).

Whatever approach is taken, **international agreements supported by national legislation are likely to be needed to ensure sustainable long-term financing for global biodiversity. Governments should seek ways to engage the private sector and to create appropriate incentives for business to reduce adverse impacts and invest in biodiversity and ecosystem services**.

Box 5.15: Stimulating international demand for biodiversity through a Green Development Mechanism

The Dutch Ministry of Housing, Spatial Planning and the Environment (VROM), the International Union for Conservation of Nature (IUCN) and the United Nations Environment Programme (UNEP), in cooperation with the CBD Secretariat, are facilitating expert discussions ahead of CBD COP-10 (Nagoya 2010) on new international incentives for biodiversity. The **Green Development Mechanism (GDM)** initiative seeks to create a global mechanism to stimulate demand for the preservation and sustainable use of biodiversity and to mobilise new and sustained financial support.

A range of different potential instruments are being explored. Tradable Conservation Obligations are one way in which countries could commit to contribute to certain biodiversity conservation targets, within national borders or abroad (hence 'tradable'). Other ideas include footprint compensation measures (e.g. donation levels that use footprint as one of a mix of indicators) and coordination of biodiversity offset obligations (eg 'no net loss' commitments) at the international level.

See also: Swanson 2009; Swanson, Mullan and Kontoleon 2009

5.3 THE ECONOMICS OF ACCESS AND BENEFIT SHARING (ABS)

"My father said: You must never try to make all the money that's in a deal. Let the other fellow make some money too, because if you have a reputation for always making all the money, you won't have many deals."

J. Paul Getty

This section looks at economic factors that influence the value of genetic resources (5.3.1) and considers ways to overcome current constraints on maximising such value (5.3.2). This is a key issue to those who own genetic resources or involved in land use decisions that affect them. Typically such groups are made up of relatively poor rural farming or indigenous communities. Benefits from genetic resources could play an important role in improving their livelihoods as well as stimulating better use of stocks of genetic materials. The resulting gains could thus be spread more widely between developing and developed countries.

A key CBD objective is the fair and equitable sharing of benefits arising from the utilisation of genetic resources. Following the call for action by Heads of State at the World Summit for Sustainable Development (Johannesburg, 2002), negotiations are now under way within the CBD to develop a dedicated international regime to implement relevant provisions of the Convention (see 5.3.3 and 5.3.4 below).

5.3.1 THE VALUE OF GENETIC RESOURCES

Genetic resources provide source material for a range of commercial products from mainstream pharmaceutical to botanical medicines, new seed varieties, ornamental horticultural products, new enzymes and microorganisms for biotechnology, crop protection products and personal care and cosmetic products. Table 5.2 presents data on the estimated size of the market for these product categories and the percentage derived from genetic inputs to provide an indication of the economic value of activities dependent on genetic resources.

A key question in the ABS context is **how much of the**

Table 5.2: Market sectors dependent on genetic resources

Sector	Size of Market	Comment
Pharmaceutical	US$ 640 bn. in 2006	25-50% derived from genetic resources
Biotechnology	US$ 70 bn. in 2006 from public companies alone	Many products derived from genetic resources (enzymes, microorganisms)
Crop protection products	US$ 30 bn. in 2006	Some derived from genetic resources
Agricultural seeds	US$ 30 bn. in 2006	All derived from genetic resources
Ornamental horticulture	Global import value US$ 14 bn in 2006	All derived from genetic resources
Personal care, botanical and food & beverage industries	US$ 22 bn. for herbal supplements US$ 12 bn. for personal care US$ 31 bn for food products All in 2006	Some products derived from genetic resources. Represents 'natural' component of the market.

Source: SCBD 2008

value of final products is attributable to genetic material and how much to other factors of production (labour, capital, local knowledge et al.)? To answer this, we need to distinguish between:

- what a producer of drugs or other products has to pay to obtain the genetic material; and
- what the material is worth to the producer (i.e. the maximum that a company would pay).

The **difference between this maximum payment and the cost of obtaining the genetic material is called its 'rent'**. Questions asked in the literature sometimes relate to the cost of exploitation and sometimes to the rent. It is important not to confuse the two. The costs of obtaining genetic material are paid to relevant parties in proportion to their effort whereas the rent can go to either party (i.e. the company that uses the material or the party that provides it). This sharing needs to be carried out in a way that is fair and equitable (see Section 5.3.3).

The economic rent is calculated by taking the value of the final product and subtracting the costs of development, production and collecting and classifying the genetic material. These calculations are complex as research development is an uncertain activity: some return has to be provided to compensate for the riskiness of the venture. Furthermore, since most numbers involved are large and the rent is the difference between them, the calculations are obviously affected by even small errors in the numbers.

Several estimates of economic rent have been made to date. To the dismay of those who believe that genetic resources are a global resource of high value, these estimates come out rather low. A key early study (Simpson et al. 1996) calculated values of genetic resources in 1996 prices at between US$ 0.2/hectare (California), and US$ 20.6/hectare (Western Ecuador) and argued that these estimates could be on the high side. Other studies making the same point include Barbier and Aylward (1996) and Frinn (2003). Reasons identified for values being so low included the **high cost of developing the final goods and bringing them to market, the long time lags involved and inefficiencies in the systems for exploiting genetic resources**.

Subsequent studies have tried to improve on these estimates. Craft and Simpson (2001) argued that if we base calculations not on the price of final drugs but on the willingness to pay of those who benefit from lifesaving drugs, the rent could be two orders of magnitude higher than the above estimates. However, this raises the question of how (and also whether) to capture higher use values. Massive increases in the price of drugs would exclude many poorer users and could hardly be described as a fair division of the benefits of genetic resources.

There are now far more uses of genetic resources than covered in Simpson et al. (1996) which should increase their net value. Finding more effective and cost-efficient ways to collect information about and screen genetic materials can also increase the rent. Rausser and Small (2000) estimated the possible increase as equal to one order of magnitude higher than the estimates in Simpson et al. (1996). Although Rausser and Small's estimate has in turn been criticised (Costello and Ward 2006), there is no doubt that lowering transaction costs should increase the economic rent (see Section 5.3.2).

For developing countries, one constraint on increasing the value of genetic material is the growing importance of micro-organisms for which the tropics are not an especially important source. However, this is not always the case as companies collecting from nature continue to be interested in samples from diverse and extreme environments (sCBD 2008). The need to develop strong partnerships with providers as a way of monitoring development of natural product compounds is as strong as ever.

Current arrangements for sharing whatever rent exists are not particularly favourable to communities living in the area where genetic resources are located. Several agreements made in the 1990s to share the benefits of products derived from such resources attracted considerable attention. Reviews of eight of the most important[17] showed that:

- most contained an element of royalty-sharing;
- their duration varied from two to eleven years;
- some required the bio-prospector to contribute financially to biodiversity protection in the region; and

- some contained an element of technology transfer to develop local preparation and screening capabilities;
- the financial resources involved in these transactions were relatively small (see Box 5.16).

Although a comprehensive assessment of the transfers actually made ex post is not available, it is unlikely to amount to more than a few million dollars over the duration of each contract. Even if we accept the lowest estimates of the value of these resources, the total amount of economic rents paid should be higher than paid to date.

Although more socially responsible companies would no longer consider genetic resources as available for free, it is very likely that a significant amount of bioprospecting still takes place without prior informed consent as required under the CBD. In such cases a fair share of the rent is not passed back to the owners or managers of genetic resources. It would be useful to make an estimate of the total payments actually made for access to such resources and how this figure has evolved over time. To our knowledge, no such estimate yet exists.

5.3.2 ADDING VALUE THROUGH MORE EFFICIENT BIOPROSPECTING

Considerable efforts have been made to understand how agreements for the exploitation of genetic resources could be made more efficient. Contractual and institutional frameworks are evolving and lessons learnt from the first generation of contracts can improve the design of future agreements. This section considers ways to lift or reduce institutional and market constraints that limit the value of such resources, including steps to minimise transaction costs whilst retaining flexibility.

BETTER SCREENING OF GENETIC MATERIALS

Asymmetric and incomplete information about materials of interest is still an obstacle to contract development. On the technical side, positive deve- lopments include more efficient scientific and technological tools for screening and use of specialist intermediaries to carry out these activities, leading to better up-front information and lower costs for product developers. The bioprospecting industry is steadily moving in this direction: most large companies are forming partnerships with smaller companies and universities that generate leads from research into natural products (sCBD 2008). This trend should increase the rent from genetic resources, part of which needs to revert to the communities where the resources are located.

Technological progress should be accompanied by increased resources for collection and classification of materials. In developing countries, this is still mainly

Box 5.16: Examples of benefit sharing and payments under bioprospecting contracts

Costa Rica: The best known and emblematic contract was signed between INBio (National Biodiversity Institute) and Merck Pharmaceutical Ltd. in 1991. INBio received US$ 1 million over two years and equipment for processing samples and scientific training from Merck.

Source: http://www.biodiv.org/doc/case-studies/abs/cs-abs-tbgri-in-en.pdf

Brazil: In 1999, Glaxo Wellcome and Brazilian Extracta jointly signed a contract where Glaxo paid US$ 3.2 million for the right to screen 30,000 compounds of plant, fungus and bacterial origin from several regions in Brazilian forests.

Source: Neto and Dickson 1999

India: Scientists at the Tropical Botanical Garden and Research Institute (TBGRI), a publicly funded research institute based in Trivandrum, worked with the Kani tribals of Kerala to obtain traditional knowledge about medicinal use of the plant Arogyapaacha (Trichopus zeylanicus). TBGRI successfully developed a drug from the plant and sold the technology to a Coimbatore-based pharmaceutical company which agreed to pay Rs. 1 million and a 2% share in the royalty. These proceeds are being shared equally by TBGRI and the tribal community.

Source: http://www.biodiv.org/doc/case-studies/abs/cs-abs-tbgri-in-en.pdf

carried out by relatively inefficient public sector institutions strapped for funds. However, such work does not have to be carried out exclusively by public bodies. It could be made a fee-based service involving the private sector: creation of an intermediary market for such services would improve bioprospecting efficiency and increase the net value of resources.

BETTER USE OF TRADITIONAL KNOWLEDGE

Reliance on traditional knowledge about the properties of local plants and other species is currently small and seems to be growing smaller. This may be partly due to the emphasis in drug development on disease categories that do not feature prominently in traditional medicine and partly to the increasing role of micro-organisms and diminished role of plants in discovery (sCBD 2008: 106). Nevertheless, many researchers believe that such knowledge can help in new product development but that the process is hampered by the lack of appropriate mechanisms to document and transfer it and to reward information providers[18].

It has been argued that recognising intellectual property rights (IPRs) for traditional knowledge would increase incentives to use them to protect genetic resources. However, establishing IPRs requires proof of novelty, discovery and innovation – which rules out their application to genetic resources.

An alternative way to address this issue is through contracts that require product developers to share the benefits in proportion to the information provided and used. Currently we have no mechanism for determining benefit share in the event of a dispute. One proposal, to get round this problem, albeit one with obvious shortcomings, is to offer traditional knowledge owners specific rights recognised by the courts in countries where the development of relevant materials takes place (Sarr and Swanson 2007).

The creation of such rights, if upheld by the competent courts, could lead to a situation where the 'North' offers contracts that the 'South' is likely to accept. However, the design and enforcement of such rights could take many forms – from private international law alone (where the key issue would be the content of the ABS contract) to more forceful mechanisms to prove claims (i.e. the proposed international certification of origin currently under consideration in CBD-led negotiations: see Section 5.3.4). Such certification could be voluntary or mandatory and apply not just to traditional knowledge but to genetic resources more widely. Reaching agreement within this range is still a contentious issue within the negotiations.

IMPROVING CONTRACT DESIGN

Typically, sellers (usually public institutions) supply screened samples, novel compounds and research leads derived from their field collections. They are responsible for obtaining permission to access genetic resources and/or traditional knowledge, which requires them formally or informally to negotiate with source suppliers[19] before conducting field collection. Sellers also collaborate with companies on development and commercialisation of these resources, which may entail separate contracts or other agreements with private companies.

Buyers[20] are usually engaged in industries carrying out research and development (R&D) into commercial applications of genetic resources. Although these span several sectors, the pharmaceutical industry undoubtedly represents the largest market, invests a higher proportion of turnover in R&D than other industries and incurs higher risks in the drug discovery and development process. Pharmaceutical companies thus play a crucial steering role in driving efficiency gains in bioprospecting contracts.

The most important provisions of genetic resource contracts relate to:

- sharing of royalty revenues in cases where the company patents a new discovery (e.g. a medicinal drug) derived from R&D involving the genetic material sold in the contract;
- transfer of R&D technology and screening capabilities to local institutions and/or local capacity-building and training;
- the structure of the financial agreement: in addition to royalties and technology transfer, this includes up-front payments and milestone payments;
- possible financial contribution by the buyer to protect local biodiversity e.g. through partial transfer of the royalty revenues; and

- ancillary provisions e.g. possible common use of the resource and/or whether exploitation rights are exclusive or not.

EXTENDING THE LENGTH OF CONTRACTS

Bioprospecting activities, especially in the pharmaceutical industry, are characterised by high:

- **asset specificity**, in particular site-specificity (particular genetic materials are sited in particular locations) and dedicated assets (companies invest in bioprospecting to exploit the possibility of patenting new discoveries) (Williamson 1979)[21];
- **uncertainty**: firms investing in R&D are unsure about the probability of new discoveries (Williamson 1979); and
- **complexity**: the activity generates several (positive and negative) impacts on biodiversity exploitation, research, innovation, corporate competitiveness and wealth redistribution.

Long-term contracts represent a way to minimise transaction costs[22] linked to the above factors or to bureaucratic and administrative constraints (e.g. generated by procedures such as public tenders or authorisations in countries exercising sovereign rights over biodiversity within their jurisdiction). Minimising such costs is important to provide incentives for companies to invest in R&D and to share benefits in accordance with CBD provisions.

Source: Getty Images.

Specific areas where there may be scope for improvement include:

- building a high level of trust between the parties, given the complexity of the issue and the impossibility of monitoring all aspects related to agreements (as in Section 5.2 above); and
- instituting facilities for tracking benefits and resolving disputes across jurisdictions to make royalty sharing agreements enforceable. As with traditional knowledge, this will need inter-governmental cooperation.

5.3.3 EQUITABLE SHARING OF BENEFITS DERIVED FROM GENETIC RESOURCES

Equitable sharing of benefits is desirable not only on equity grounds, but also because it ensures more effective management of genetic resources.

Traditional economics states that market institutions determine the efficient allocation of resources and the issue of equity can be left to policy makers. If applied to the context of genetic resources, this would mean that it did not matter who received what proportion of the rent from their exploitation: the market structure would ensure that materials were exploited and conserved optimally.

However, recent literature shows that the traditional divide between equity and efficiency does not hold in this field (Gatti et al. 2004; van Soest and Lesink 2000)[23]. Genetic resource contracts negotiated between corporations and institutions in provider countries are very different from atomistic market transactions. A better way to analyse their outcomes is to use empirical results from game theory experiments which strongly suggest that the final outcome depends on the perception of

fairness by the respective parties. People prefer no deal to a deal they think is unfair (based on results from ultimatum games where one party offers a contract on a take-it-or-leave-it basis). They may even opt for 'strategic destruction' when offered a bad deal (for an application to TRIPs and biodiversity, see Gatti et al. 2004).

The benefits of bioprospecting should thus be shared in such a way that rural and indigenous communities in developing countries (where most genetic material of interest is located) receive a fair and equitable proportion of the value derived from its exploitation. This will not only contribute to improved living standards for the poor but also increase incentives to conserve remaining biodiversity.

How can this be done? Suggestions include:

- forming a cartel to negotiate on behalf of all owners of such resources i.e. like the Organization of the Petroleum Exporting Countries (OPEC) on behalf of global oil producers[24]. Like all cartels, this might succeed in obtaining a higher share of the rent from exploitation of genetic materials but also be unstable with strong incentives to undercut the agreed price (e.g. the price of crude oil has fluctuated since 1974, when the cartel started restricting supply);
- giving providers of genetic resources and associated traditional knowledge specific rights in the courts of countries where such material is developed. As noted above, this is a complex area and the appropriate structure is not self-evident. Well-designed benefit-sharing contracts and/or internationally recognised certificates of origin would clearly be crucial; and
- increasing the share of development undertaken in provider countries e.g. by locating some of the emerging partnerships between large corporations and smaller companies and universities in developing countries and working closely with local source providers.

Finally, we need to recognise that greater transparency and knowledge about the value derived from genetic materials will make it easier for all parties to reach an equitable accord. At present the rent derived from such materials is still somewhat obscure, with some researchers claiming that overall rent is small. No-one has really estimated how much goes to each of the parties. **More research on what the rent is – and how it is being shared at present – should help make the case for larger transfers to provider countries.**

5.3.4 TOWARDS AN INTERNATIONAL REGIME ON ABS

Many of the activities identified above will require coordinated international action. From this perspective, the successful conclusion of current negotiations under the CBD for an international ABS regime could make a critical contribution in the following areas:

Short to medium term:

- facilitating capacity building and the transfer of resources where necessary to improve efficiency in genetic resource management e.g. through the establishment of companies that undertake more of the intermediate work related to product development (screening, classification, primary investigation of materials to discover leads);
- strengthening compliance and monitoring frameworks to ensure fair and equitable sharing of the benefits through the implementation of prior informed consent (PIC) and mutually agreed terms (MAT) agreements;
- ensuring that ABS agreements cover all fields of use of genetic resources (i.e. are not focused solely on pharmaceuticals).

Medium to long term:

- improving knowledge generation/exchange and dissemination of pertinent information on e.g. the accurate value of genetic resources; the rent available to be shared between resource providers and developers; analysis of the link between equitable distribution of rents and their efficient management; and so on.

5.4 TAX AND COMPENSATION MECHANISMS TO REWARD STEWARDSHIP

Economic instruments have a central – indeed indispensable – role to play in valuing nature's public services to society (OECD 1999; Bräuer et al. 2006; Emerton et al. 2006; EC 2007). These services can be targeted by a range of policy instruments including levies (5.4.1), intergovernmental fiscal transfers (5.4.2) and government spending (5.4.3) (Ring 2002).

Fiscal instruments to safeguard ecosystem services and biodiversity are part of the agenda for ecological tax reform (Meyer and Schweppe-Kraft 2006; Ring 2008a). Such instruments could be used more widely to provide incentives for conservation and to raise funds for conservation (OECD 1999; Emerton et al. 2006: 39). Such tools are also central to social policy, including the redistribution of wealth and income – making them especially **suitable for combining biodiversity and ecosystem conservation with poverty reduction** (OECD 2005; World Bank 2005).

5.4.1 USING PUBLIC LEVIES TO STIMULATE CONSERVATION

As highlighted in this report, **the value of biodiversity and many ecosystem services cannot always be captured by market mechanisms alone**. Economic instruments such as taxes, charges and fees – as well as targeted exemptions from these instruments – are a crucial element of the policy maker's toolkit and complement regulation (see Chapter 7), direct payments for services (PES, see Section 5.1 above) and voluntary approaches from certification, informal codes of conduct to non-binding agreements[25]. Economic instruments can provide strong incentives for more sustainable behaviour by citizens, businesses and even governments themselves – if they are well-designed and based on relevant indicators.

Although **land, property and income taxes have considerable potential to integrate and reward ecological concerns**, they are rarely used for this purpose. Tax systems can provide a number of options to reduce existing tax burdens, either through credits or exemptions. A tax exemption can function like a PES to reward positive conservation efforts: the difference is that the PES is a direct payment for a service whereas the exemption is effectively a non-payment (of moneys that would otherwise be due as tax). Even if the financial outcome is similar, the instrument design is different and so, often, is public perception. Some see tax breaks as a form of 'thanks for efforts' that are preferable to payments for services rendered, although in economic terms they may be equivalent.

Tax exemptions or credits can be used to reward landowners who undertake biodiversity conservation or agree to forego future development in order to safeguard habitats (Boyd et al. 2000). Such exemptions take many forms and are found in a range of jurisdictions (Shine 2005). Familiar examples include conservation easements and tax incentives for land donation for conservation (see Box 5.17).

Tax incentives are not limited to gifts of property or interests therein. In the Netherlands, for example, savers and investors are exempt from a capital gains tax if they invest in specified green projects or capital funds (Box 5.18).

5.17: Tax incentives for conservation easements and ecological gifts in North America

An easement is a legally binding restriction placed on a piece of property to protect its resources (natural or man-made) by prohibiting specified types of development from taking place on the land. It may be voluntarily sold or donated by the landowner.

United States: The US has long experience of using easements to secure long-term conservation of natural areas. They are currently used by over 1260 local and regional 'land trusts' or conservancies, which act as the easements' trustees. By 2000, land trusts had protected over 1 million hectares (nearly 2.6 million acres) through conservation easements — almost 500% up on 1990. Usage of this type of instrument has continued to grow. By 2005, land trusts held conservation easements on over 2.5 million hectares (6.2 million acres) and government agencies and national non-profit organisations also had sizable holdings under easement (Land Trust Alliance 2006).

The Nature Conservancy is the largest non-profit holder of conservation easements with 1.3 million hectares (3.2 million acres). The Natural Resources Conservation Service (NRCS) funded by the U.S. Department of Agriculture has responsibility for monitoring, managing, and conducting enforcement activities on approximately 11,000 conservation easements covering more than 800,000 hectares (2 million acres) (Risman et al. 2007).

Easements can be purchased or donated. Donations have been a big part of the story, motivated by the ability to reduce taxes and claim charitable deductions. Progressive changes in tax codes and development of appraisal techniques are practical developments that have encouraged their use, whilst easement contracts are fairly routine and straightforward to put together. Such instruments have played a role in helping people understand the public interest in conserving biodiversity values on private property – the whole reason for easements is that there are public goods arising from private lands.

Part of the explanation for the popularity of easements in the US is that environmental land use regulations are relatively weak, governed by municipalities rather than state and federal governments: private property reigns supreme, but landowners may donate or sell the public interests in their land. There may be less need for easements in countries with tighter land use restrictions and highly developed rights of public access e.g. in European countries such as Germany or the UK.

Key questions when designing easement contracts include their duration (perennity), monitoring and enforcement in order to avoid challenges to use/development restrictions arising as properties change hands over generations.

Sources: Boyd et al. 2000; http://www.nature.org/aboutus/howwework/conservationmethods/privatelands/conservationeasements/files/consrvtn_easemnt_sngle72.pdf

Canada: The Ecogift Programme was introduced in 2001. It provides tax benefits to owners of ecologically sensitive land if they donate it – fully or partially – to specified recipients who take responsibility for its sustainable management and conserving natural habitat. The list of possible recipients is strictly defined by legislation and includes the Federal Government, provincial or territorial governments, municipalities, municipal or public bodies performing government functions and charities approved by Environment Canada. The donor of the land (or the interest in the land) receives tax benefits in return:

- the total value of the ecogift from an individual donor may be used to calculate a non-refundable tax credit;
- the value of the gift can be directly deducted from taxable income of a corporate donor;
- capital gains are exempt from taxes.

Source: http://www.qc.ec.gc.ca/faune/pde-egp/avantages_e.asp

5.4.2 GREENING INTERGOVERNMENTAL FISCAL TRANSFERS

Public spending includes fiscal transfers between different levels of government – which are often neglected in conservation strategies. Huge amounts of tax revenues are redistributed from national to sub-national and local governments to provide the latter with monies to build and maintain schools, hospitals and roads and so on. These public finance mechanisms are critically important for local and regional decision-makers (see TEEB D2) but are rarely considered in terms of their ecological impact (Ring 2002).

Government spending at local, national and international levels needs to fully integrate biodiversity conservation and maintenance of ecosystem services. Integrating such concerns into systems for distributing tax revenues to lower levels of government can encourage decision makers to take more care of nature whilst also nurturing their tax base. Currently, however, tax incentives are mainly directed towards attracting more businesses, residents and construction activities which give rise to land uses that destroy or damage natural habitats (see Chapters 6 and 7) instead of setting incentives towards conservation (see Chapter 8).

Changing the economic signals can create win-win situations. By way of example, many federal authorities use the area of a municipality or province as one criterion for determining fiscal transfers – it is only a small step to include 'protected area' as an additional criterion for allocating tax revenues. This could help raise funds to address the local management and conservation objectives of protected areas (see Chapter 8) and reduce their image as a fiscal burden or obstacle to development. Positive effects will be even stronger if people living in and around these sites receive some of the benefits involved in ecological fiscal transfers: this could help to reduce local opposition to protected areas in some cases.

Decisions to establish protected areas are often taken by higher levels of government with local decision-makers having little influence on site selection. Including protected areas as a criterion for intergovernmental fiscal transfers could help to reconcile the local costs of protected areas with their benefits, which often reach far beyond municipal boundaries.

Box 5.18: 'Green Funds Scheme' in the Netherlands (Regeling groenprojecten)

The Scheme was set up to encourage projects that have a positive effect on the environment. The government offers a tax advantage to 'green' savers and investors, while banks can offer loans at lower interest rates for projects such as sustainably built houses, wind farms, developing forests or organic agricultural businesses. In the Dutch tax system, savers and investors normally pay 1.2% capital gains tax over the amount saved or invested. However, green capital is exempt from such tax, up to a maximum of 52,579 EUR per person (2006).

Source: http://www.senternovem.nl/greenfundsscheme/index.asp

A few countries have taken steps to introduce ecological fiscal transfers to compensate municipalities for land-use restrictions imposed by protected areas. Since 1992, several states in Brazil have introduced 'conservation units' (CUs), a protected area-based indicator, for the redistribution of value added tax from state level to municipalities (Grieg-Gran 2000). In January 2007, Portugal amended its municipal finance law to introduce ecological fiscal transfers to reward municipalities for designated EU Natura 2000 sites and other protected areas within their territories (De Melo and Prates 2007).

Using such criteria to redistribute tax revenues between different levels of government can help realign the incentives of public actors, as the Brazilian experience shows (see Box 5.19). However, care should be taken to ensure that such transfers are clearly linked to wider benefits and that higher levels of government do not end up assuming the burden of providing local goods and services (e.g. sewage disposal) that are normally provided by municipalities from their own resources.

As with PES schemes, **spatially explicit modelling and GIS tools can help illustrate the potential consequences of ecological fiscal transfers at the planning stage**. Fiscal transfer schemes are country-specific and politically sensitive, due to the substantial

Box 5.19: Ecological fiscal transfers in Brazil

12 out of 27 Brazilian states have adopted the 'ICMS[26] Ecológico' (see map) and others are preparing relevant legislation. Different states have implemented different ecological indicators for redistribution of state value added tax income to municipalities but all use Conservation Units (CUs) as the ecological indicator related to PA categories for biodiversity conservation.

Paraná was the first state to introduce the ecological ICMS, in 1992. 2.5% of the amount distributed at local level is allocated according to the quantity and quality of CUs; another 2.5% considers water protection areas within a municipality's territory. By the year 2000, CUs had increased by 165% and municipalities with larger shares of protected areas had considerably benefited from increased revenues.

Source: May et al. 2002; Ring 2008b

Box 5.20: Modelling intergovernmental fiscal transfers for conservation in Germany

This model of Saxony's fiscal transfer system from state to local level is based on administrative, social and economic data from 2002. It has been enlarged by the conservation units (CU) indicator to take account of local ecological services whose benefits cross municipal borders. CUs are standardised areas within the borders of a municipality that belong to existing categories of protected areas defined by Saxony's nature conservation law (Figure 5.10). The map in Figure 5.11 shows relative changes in general lump sum transfers if CUs are used in addition to existing indicators (inhabitants and schoolchildren) to calculate the fiscal need of a Saxon municipality.

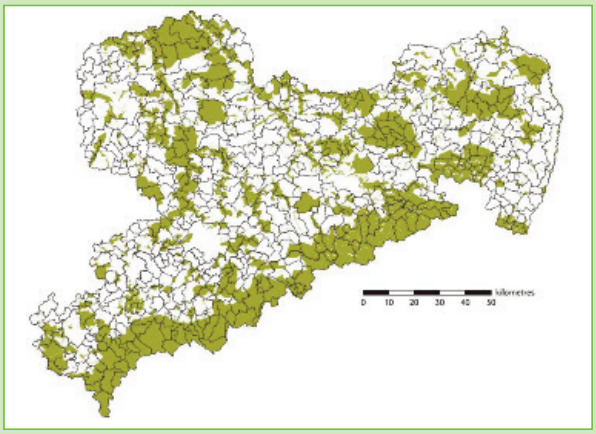


Figure 5.10: Protected areas overlaid over municipal borders in Saxony, Germany

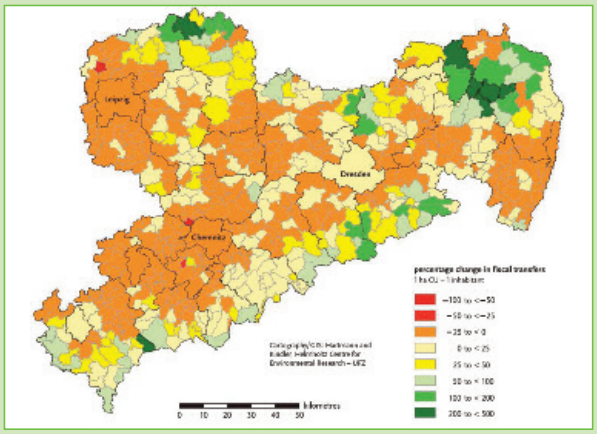


Figure 5.11: Percentage change in general lump-sum transfers when the Saxon fiscal transfer system 2002 was expanded to include designated protected areas.

Source: Ring 2008a

financial flows involved. Building on existing transfer schemes and integrating suitable ecological criteria (e.g. protected area coverage in hectares as a percentage of territory covered) can help decision makers promote innovative solutions to raise funds for conservation.

For Switzerland, Köllner et al. (2002) have developed a model for intergovernmental transfers to the local level, based on biodiversity indicators and cantonal benchmarking. For Germany, Ring (2008a) suggested ways of incorporating protected areas into the intergovernmental fiscal transfer system in Saxony (see Box 5.20).

5.4.3 COMPENSATING LAND USERS FOR WILDLIFE DAMAGE

Compensation payments are designed to indemnify land users, mostly farmers and fishermen, for the damage caused by particular wildlife species e.g. damage to livestock by wolves (Fourli 1999) or to fishing gear by seals (Similä et al. 2006). These kind of payments can be controversial but many have proven to be effective and are accepted by local stakeholders. Compensation schemes have been set up in many developed and developing countries (see example in Box 5.21 and also the India/elephants reward programme case in Chapter 8).

Box 5.21: Goose Management Scheme, Scotland

This scheme aims to promote conservation and a sustainable goose population by compensating farmers for damage to agricultural crops caused by wintering wild geese. It requires a specific area on each farm to be set aside for geese, which may then be scared away from the remaining farm areas.

At the start of this initiative, payments were made on the basis of geese headage which involved high transaction costs. Payments are now made on an area basis. The maximum payment is £ 301.55 (about 338 EUR) per hectare of rotational grass or arable land. The payments are made by the UK government according to the five-year agreement in place.

Source: MacMillan et al. 2004

Although compensation payments for wildlife damage are sometimes essential to prevent hunting or culling of protected and highly endangered species, they are often associated with – or may even create – a negative perception of wildlife. In many countries, **perspective is shifting** away from damage compensation schemes (i.e. seeing wildlife as a cost) towards developing public payments that reward the presence of wild animals on private lands or support measures to provide feeding habitats for protected species (i.e. seeing wildlife as positive and making related payments) (Similä et al. 2006; Suvantola in preparation; see Box 5.22 and the discussion on PES in Section 5.1).

Box 5.22: Rewarding conservation of golden eagles by the Sami in Finland

The scheme provides compensation for losses caused by golden eagles to reindeer husbandry in Northern Finland. As recently amended, it aims to promote the conservation status of the species rather than focusing primarily on damage.

Payments are now based on nesting and reproduction of the species and actively involve the Sami people in monitoring nesting sites. Participants have access to information on nesting sites and also provide information to conservation authorities on newly discovered sites. In this way, the scheme discourages disturbance of the eagles during nesting and encourages creation of nesting sites rather than their destruction. There is also ongoing follow-up to build trust between the authorities and those who are subject to the negative impacts of the species' recovery.

Source: Similä et al. 2006; Suvantola in preparation

5.5 DEVELOPING MARKETS FOR GREEN GOODS AND SERVICES

Market mechanisms that reflect the values of biodiversity are well established for some goods and services and have been growing steadily over the last decade[27]. This trend reflects the increasing awareness of many consumers and producers that conventional production and consumption practices threaten the long-term viability of ecosystems. This section outlines progress on market development in key sectors (5.5.1) and identifies barriers to the success of 'green' products and services (5.5.2) before considering ways to expand the reach of biodiversity-friendly markets (5.5.3).

5.5.1 SUPPORT FOR BIODIVERSITY-FRIENDLY PRODUCTS AND SERVICES

Market niches are available for products and services that can reliably distinguish themselves from their competitors by demonstrating conservation credentials, including:

- products characterised by reduced direct impacts on biodiversity, due to adoption of more efficient or low-impact production and processing methods (e.g. reduced impact forestry or fisheries);
- products with reduced indirect impacts on biodiversity as a result of decreased pollution load (e.g. biodegradable detergents);
- products and services based on the sustainable use of ecosystem services and biodiversity (e.g. ecotourism or biotrade).

While most product markets still do not treat biodiversity as a key concern, there is growing evidence from across the world that **conservation can enhance a company's competitive position and be an opportunity in all sectors**. In some cases, biodiversity-friendly products and services can:

- attract market share or premiums for certain products and their suppliers;
- facilitate access to previously inaccessible markets or create entirely new markets;
- offer enhanced product differentiation in increasingly competitive global markets;
- reinforce and validate positive community relations and improved corporate image;
- improve employee morale, retention and productivity; and
- support the poor where they are directly involved in production (Bishop et al. 2008).

BUSINESS ACTION ON GREENING SUPPLY CHAINS

For most business sectors and companies, biodiversity conservation is still seen as a liability rather than a profit centre. The main drivers of private investment in biodiversity come from legal requirements, charitable impulses and informal pressure from shareholders, local communities and NGOs. The business case for such investment is more often expressed in terms of protecting firms' market share or minimising risk to reputation.

However, there are exceptions. Some retailers committed themselves in the early 1990s to stock only timber products certified as meeting strict environmental performance standards. For example, the B&Q Do-It-Yourself chain in the UK, owned by Kingfisher, was one of the companies responsible for setting up the Forest Stewardship Council (see below) to provide a credible mechanism to demonstrate responsible purchasing of timber products.

Such private voluntary actions can help make markets work better for the environment. When large companies choose to direct their purchasing power in a particular direction, they can have a large impact on trade and production practices around the world. Such initiatives require vision and commitment from the top as well as

considerable patience as such options are not easy or cheap to implement. However, the payback in public relations and corporate social responsibility are often deemed worth the risk.

PUBLIC SUPPORT FOR GREEN MARKETS

In April 2009, the **European Commission issued a Communication signalling its strong support for the Fair Trade movement** (EC 2009). It applauded private sector initiative in this area although stopping short of mandating any action. Fair Trade focuses on social rather than environmental criteria but EU support is a positive development for the certification industry in general. Individual governments can also support biodiversity-friendly products and services through green public procurement policies and practices (see Section 5.6).

Several international institutions recognise the value of encouraging products and services that take biodiversity and ecosystems into account. **The CBD, UNCTAD, CITES and a growing number of countries support BioTrade** activities for the promotion of goods and services derived from native biodiversity under strict sustainable development criteria.

NON-GOVERNMENTAL ORGANISATIONS AND GREEN MARKETS

NGOs have played a significant role in developing voluntary environmental standards for a range of products and services. WWF worked in partnership with Unilever to establish the Marine Stewardship Council (MSC) for the certification of sustainably produced marine products (see Box 5.24) and has helped catalyse demand for certified timber. International NGOs such as Conservation International and WWF are currently involved in various fora addressing biofuel production e.g. the Round Table on Sustainable Palm Oil.

Since the mid-1990s, several non-profit organisations have been established to assess the sustainability of selected commodities and services against emerging standards on biodiversity-friendly production. These programmes are increasingly formalised through independent certification and assurance mechanisms, with both NGOs and private firms competing to offer verification and audit services (see below).

CERTIFICATION OF FORESTRY PRODUCTS

The International Tropical Timber Organisation (ITTO), established under UN auspices to administer a trade agreement between producers and consumers of tropical timber, describes sustainable forest management as forest-related activities that do *"not damage the forest to the extent that its capacity to deliver products and services – such as timber, water and biodiversity conservation – is significantly reduced. Forest management should also aim to balance the needs of different forest users so that its benefits and costs are shared equitably"*[28].

Several certification schemes now exist for forest management, of which two are responsible for the majority of forest certification (see Box 5.23).

Between 2001 and 2005, global coverage of certified forests expanded by about 50 million hectares per year, mainly due to a rapid increase in certified forest area in North America (Figure 5.12). By 2009, 325.2 million hectares worldwide had been certified under various schemes (8.3% of total forest area: UNECE/FAO 2009).

In terms of global roundwood production (i.e. sections of timber in raw unmanufactured state), approximately 26% was harvested from certified forests between May 2008 and May 2009. However, the rate of expansion has decreased over the last three years. Between May 2008 and May 2009, the rate of increase did not exceed four million hectares (Table 5.3).

This **reduction in the rate of expansion of certified forests** may reflect the fact that, in the developed world at least, most of the larger forest areas are already certified. Certifying forests in developing countries presents continuing **challenges linked to lack of capacity, resources and incentives to participate** as a significant proportion of forest areas are owned by smaller non-industrial and communal sectors. The geographical bias of certified forests towards the northern hemisphere inevitably limits the effectiveness of certification as an instrument for protecting biodiversity (see Table 5.3 and Section 5.5.2 below).

Box 5.23: Market penetration to date by major forest certification schemes

The **Programme for the Endorsement of Forest Certification Schemes** (PEFC) is an international umbrella organisation working for the assessment and mutual recognition of national schemes. These must comply with basic PEFC requirements but may adhere to stricter environmental criteria. PEFC certification may cover smaller schemes e.g. the American Tree Farm System (ATFS) for small forest owners. Members include 25 independent national schemes that have undergone rigorous assessment: they cover over 200 million hectares of forest, making it the world's largest scheme.

Source: http://www.pefc.org

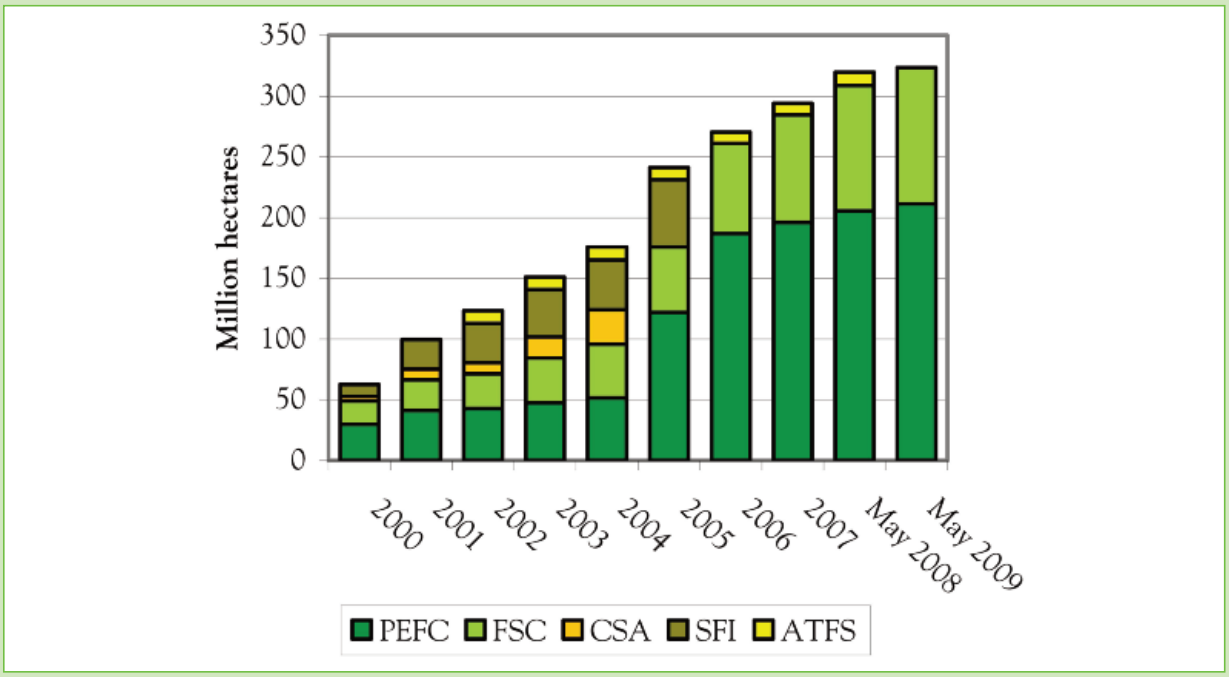
The **Forest Stewardship Council (FSC)** is an independent, non-profit organisation established in 1993. Members include environmental and social groups, representatives of the timber trade, indigenous people's organisations and forest product certification organisations. FSC certification is based on ten principles that encompass principles of sustainable development and equity as well as environment. By 2009, FSC had certified over 113 million hectares in 82 countries. The value of FSC-labelled sales is estimated at over US$ 20 billion, representing four-fold growth since 2005.

Source: www.fsc.org; FSC 2009; UNECE/FAO 2009

Use of certified or controlled wood fibres from sustainably managed forests in drinks carton manufacture is rising sharply. In 2008, usage by Tetrapak, Elopak and SIG Combibloc (which represent 80% of the global market) increased from 47% to 77% according to independent verifier ProForest. The three companies have pledged to purchase 100% of their paperboard from 'legal and acceptable' sources by 2015, using standards developed by FSC, PEFC or equivalent schemes.

Source: ENDS Bulletin 17.11.09 (www.endsreport.com/bulletin)

Figure 5.12: Forest area certified by major certification schemes (2000-2009)



Source: UNECE/FAO 2009

Table 5.3: Global supply of roundwood from certified resources (2007-2009)							
Region	**Total forest area (million ha)**	**Total certified forest area (million ha)**			**Total forest area certified (%)**		
		2007	**2008**	**2009**	**2007**	**2008**	**2009**
North America	470.6	164.2	181.7	180.3	34.9	38.6	38.3
Western Europe	155.5	80.8	84.2	82.2	52.0	54.1	52.8
CIS	907.4	20.6	24.6	25.2	2.3	2.7	2.8
Oceania	197.6	9.9	9.4	10.3	5.0	4.8	5.2
Africa	649.9	2.6	3.0	5.6	0.4	0.5	0.9
Latin America	964.4	12.1	15.0	14.6	1.3	1.6	1.5
Asia	524.1	1.6	2.0	3.0	0.3	0.4	0.6
World total	**3,869.5**	**291.8**	**319.9**	**321.1**	**7.5**	**8.3**	**8.3**

Sources: UNECE/FAO (2009) using individual certification schemes; the Canadian Sustainable Forestry Certification Coalition; FAO and authors' compilations 2009.

CERTIFICATION OF SUSTAINABLE FISHERIES

As demand for fish and other marine and aquatic species continues to increase and the commercial fishing industry goes to ever greater lengths to access new fish resources, a consensus is emerging that the world's fisheries are in peril. The impact of fisheries and aquaculture on the wider marine and coastal environment is also of grave and growing concern. Aquaculture expansion, seen as a means to reduce pressures on wild stocks, has been implicated in the loss of coastal habitat (e.g. mangroves in tropical zones) whilst the farming of higher value species (e.g. salmon and prawns) still requires substantial fishmeal inputs.

The fisheries sector has a substantial direct interest in engaging with the issue of biodiversity and ecosystem protection to:

- **secure long-term supplies of target fish.** Healthy ecosystems have higher productivity, but require management of the ecosystem as a whole;
- **safeguard reputation and access to markets.** Consumers and retailers are increasingly concerned about the impacts of fisheries on target and non-target species and seabed habitats and are demanding assurances that the industry take action to address them.

Several initiatives have been launched to conserve fish stocks more effectively. The FAO Code of Conduct for Responsible Fisheries establishes a voluntary framework on which to base sustainable fishing practices[29]. The Seafood Choices Alliance, a global association of fishers, fish farmers, wholesalers and restaurants, works to promote ocean-friendly seafood[30]. For tuna, the Global Tuna Conservation Initiative launched by WWF and TRAFFIC is working to establish an ecosystem-based management approach for tuna stocks[31].

Of the fisheries market labels, the Marine Stewardship Council (MSC) is the most widely recognised and has the largest geographic coverage (see Box 5.24).

CERTIFICATION OF BIODIVERSITY-FRIENDLY AGRICULTURAL PRACTICES

The impact of agricultural practices (e.g. conversion and degradation of natural habitat, pollution) has been identified as the main reason for the loss of terrestrial biodiversity (sCBD and MNP 2007). By 1990, over two thirds of the area within two of the world's fourteen major terrestrial biomes and over half of the area within four others had been converted, primarily for agriculture (MA 2005b).

Box 5.24: Volume and value of fisheries certified by the Marine Stewardship Council

The MSC is a non-profit organisation which uses eco-labelling and independently-verified fishery certification programmes to recognise sustainable fishing practices and contribute to the health of the world's oceans. A fishery has to demonstrate that it meets three principles (sustainable fish stocks; minimising environmental impact; effective management) to be certified.

Between 1 April and 30 September 2008, the number of fisheries involved in the MSC programme rose by 41%[32]. By 2009, over 2,300 MSC-labelled products were available in 42 countries, derived from annual catches of nearly 4 million tonnes[33]. The quantity and value of such products continues to grow rapidly. Their retail value was expected to reach US$ 1.4 billion, an increase of US$ 400 million over 2008 sales.

Source: www.msc.org

At the same time, the agricultural sector can provide important biodiversity benefits through modified management systems and alternative technologies and practices (e.g. organic farming, agro-forestry systems, soil conservation techniques, conservation of riparian forests). Agro-forestry (combining trees and shrubs with crops and/or livestock) has been part of traditional agriculture for years (see Tetetay and Tegineh 1991). Trees on farms can have multiple benefits e.g. soil regeneration, producing high-level fruits, fibre and medicines, and maintaining ecosystem services such as water, carbon sequestration and biodiversity[34].

Farmers in many countries are increasingly addressing environmental concerns through changes in their production practices. Various labels and certification standards – such as 'sustainable', 'organic', 'free-range' and 'fair trade' – are now used to distinguish farms using environmentally favourable practices from those using conventional methods. Depending on how such standards are implemented, they could enable agri-businesses of all sizes to promote conservation and sustainable use of biological resources (Bishop et al. 2008).

Organic agriculture is by far the largest type of certified agriculture, generating 30.8 billion EUR in 2006. By the end of that year, nearly 31 million hectares of land were certified organic (constituting around 0.7% of the agricultural land analysed in a comprehensive review by Willer and Yussefi 2007). By the end of 2007, a further 1.5 million hectares had been certified[35]. Global sales of organic food and drink have been increasing by over US$ 5 billion a year, reaching US$ 46 billion in 2007[36]. The vast majority of organic products are consumed in Europe or North America (Bishop et al. 2008).

There is much debate about the contribution of organic farming to biodiversity conservation (Bengtsson et al. 2005; Gibson et al. 2007). Different certification schemes require different biodiversity measures, leading the International Federation of Organic Agricultural Movements (IFOAM) to develop a guide for farmers on biodiversity management and landscape quality in organic agriculture (Bosshard et al. 2009).

Other biodiversity-friendly agriculture initiatives include:

- the **Rainforest Alliance programme on sustainable agriculture** whose standard, certified by the Sustainable Farm Certification[37], aims to protect wildlife, wildland, workers' rights and local communities[38];
- **GlobalGAP** (Good Agricultural Practice), a private sector body that sets voluntary standards for agricultural product certification around the globe that cover biodiversity issues. This is a business-to-business label not directly visible to consumers[39];
- **Ecoagriculture Partners**. This partnership of organisations from NGOs in developing countries (e.g. African Conservation Tillage Network) through to international bodies like WWF and UNEP was established at the World Summit on Sustainable Development in 2002 to *"enhance rural livelihoods; conserve biodiversity; and sustainably produce crops, livestock, fish, and forest products"*[40].

TOWARDS ECOTOURISM LABELLING

The tourism industry is responsible for some 220 million jobs (or 7% of total employment) and over 9% of global GDP[41]. **Tourism is a key export for 83% of developing countries: for the world's 40 poorest countries, it is the second most important source of foreign exchange after oil**[42]. Several biodiversity

hotspots are experiencing rapid tourism growth: 23 hotspots have seen over 100% growth in tourist visits in the last decade (Christ et al. 2003).

Well-managed tourism can offer a vital source of funding to projects supporting biodiversity and local communities and provide an alternative to more damaging forms of development, such as agriculture, logging, mining or consumptive use of wildlife. **Ecotourism – "responsible travel to natural areas that conserves the environment and improves the welfare of local people"**[43]– stipulates that the net impact of travel on the environment and on local people must be positive. This goes further than nature-based tourism (i.e. travel to unspoilt places to experience and enjoy nature) which focuses more on what the tourist can gain and less on ensuring that natural areas are protected (see Box 5.25).

The ecotourism sector grew between 20-34% annually during the 1990s (Mastny 2001[44]). **In 2004, the nature and ecotourism market grew three times faster than the tourism industry as a whole**[45]. In the USA in 2006, private spending on wildlife-related recreational activities (e.g. hunting, fishing and observing wildlife) amounted to US$ 122 billion or just under 1% of GDP (US Fish and Wildlife Service 2007). The key to continued growth of this form of tourism is maintenance of natural areas in good condition. This requires reinvestment of some tourism revenues in the protection of ecosystems.

Although the tourism industry has experienced growth in biodiversity-friendly niches and products, it lags other sectors in establishing formal certification processes. However, there are now a growing number of certification and labelling initiatives worldwide which provide an opportunity to achieve higher industry standards. In 2002, the Final Report of the World Ecotourism Summit set out guidelines for certification of ecotourism schemes, recommending that they should be global in concept but local in application and accessible to very small ecotourism enterprises.

The new Tourism Sustainability Council (formed by a merger between the Partnership for Global Sustainable Tourism Criteria and the Sustainable Tourism Stewardship Council in September 2009) has the potential to provide a global accreditation body for ecotourism programmes that meet agreed standards. One criterion for assessing the impact of this initiative will be how well it meets the needs of small tourism operators, especially in the developing world.

Box 5.25: Biodiversity benefits from nature-based tourism in the Philippines

In Olango Island reef in Cebu, most revenues received by the area (an estimated US$ 2.5 million annually) come from on- and off-site expenditures of diving tourists. It has been estimated that if reef quality and wetland stewardship were improved, the area could see a 60% increase in annual net revenues not only from reef and mangrove fisheries but also from tourist expenditures.

Source: de Groot et al. 2006

THE NATURAL COSMETICS SECTOR

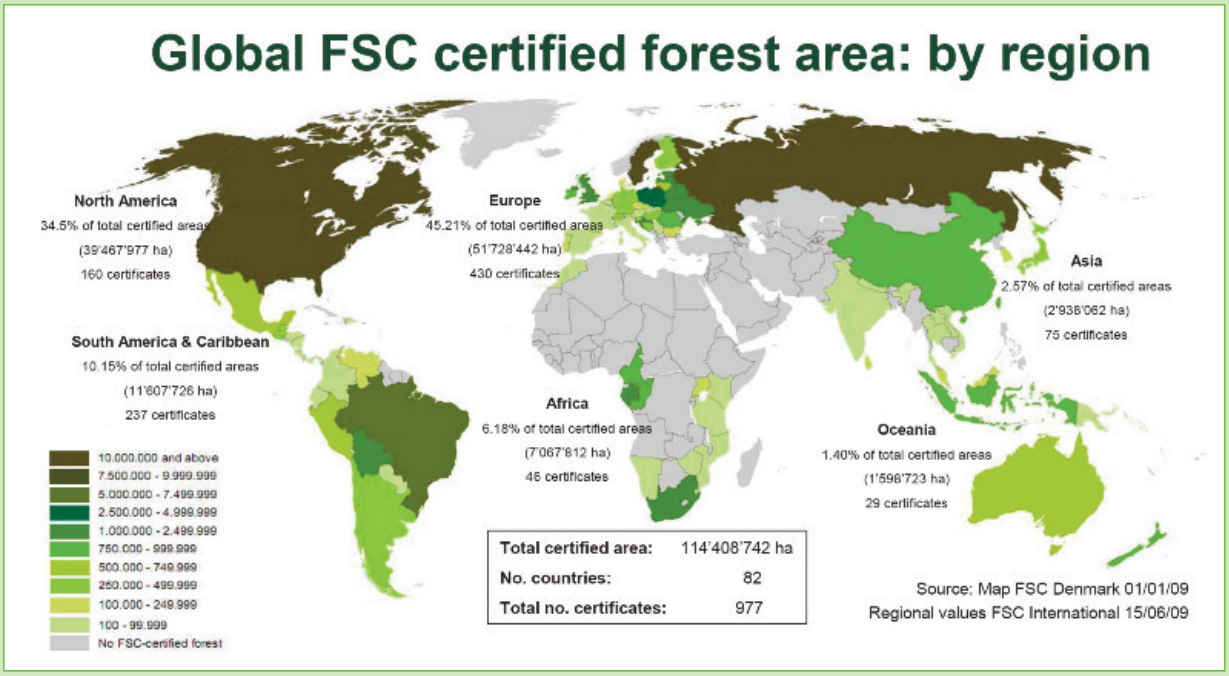
Cosmetics, care products and remedies based on natural ingredients form part of the expanding trade in biodiversity products, although no formal certification schemes are in place. A study by Organic Monitor put the global market in natural cosmetics at US$ 7 billion in 2008, driven by the EU and US markets[46]. A report for the European Commission found that demand for natural cosmetics is being mainstreamed, driven by growing awareness of human environmental impacts and a desire to eliminate the use of products containing harsh chemicals. The natural cosmetics sector is growing at roughly 20% per year in the EU and has already achieved a 10% market share in the US (Global Insight 2007).

5.5.2 BARRIERS TO THE SUCCESS OF CERTIFIED PRODUCTS

Uneven coverage, linked to the cost and complexity of certification

Despite impressive recent growth, the overall market share of certified products remains low. For example, MSC-certified seafood products have grown steadily over the past decade but still account for just 7% of the FAO's total recorded global capture fisheries production (MSC, pers. comm.).

Figure 5.13 FSC certified forest per region, as of 1 January 2008



Source: FSC 2008a

Forest certification, in place since 1993, still only covers 8.3% of the world's production forests. Developing nations in Africa, Latin America and Asia have vast and biodiverse forests but only 0.9%, 1.5% and 0.6% of certified forest respectively (UNECE/FAO 2009: see Table 5.3 above and Figure 5.13 below). FSC, the main certifier in tropical and sub-tropical regions, increased its coverage in Africa by 88% in the year to May 2009 and now has a certified area of approximately 5.6 million hectares (UNECE/FAO 2009). However, in Indonesia, the FSC has certified just over 1% of the total forest estate.

The expansion of certified biodiversity-friendly products and services is hampered by the cost and complexity of implementation, reflected in relatively low levels of certified production in developing countries. The direct costs of certification may be insignificant for large operators but can be a challenge for many small-scale producers and community enterprises[47]. MSC does allow a small part of a fishery to be assessed and certified but this depends on the whole stock being sustainable, i.e. individual operators who adopt improved practices may incur higher costs than their competitors without any credible marketing advantage.

DIFFICULTIES IN COMMUNICATING BIODIVERSITY VALUES

A more fundamental barrier to the expansion of voluntary green markets is limited consumer willingness to pay (WTP). A study focusing on eight EU Member States found a low level of awareness and WTP for certified products amongst end-users (Forest Industries Intelligence Limited 2009; cited in UNECE/FAO 2009). There are indications that end-user reluctance to pay the higher cost of certified products has steered importers and manufacturers away from FSC certification when sourcing from countries in the tropics, towards cheaper products verified as legal but not necessarily sustainable. This also seems to be the case in countries that were traditionally strong FSC supporters e.g. the Netherlands (UNECE/FAO 2009).

A large proportion of certified wood is often not labelled on the market as it is destined for business to business transactions, rather than retail outlets. In countries such as Finland, where most forest area is certified, domestic timber markets have no incentive to differentiate between certified and non-certified wood (ITTO 2008).

While certification systems can signal values important to some groups of people, they do not always capture aspects important to other groups e.g. the cultural values of biodiversity. Although nature tourism depends on a healthy environment, there is no guarantee that the tourism industry will take steps to protect it. There is often a time lag between profit-generating activities and the appearance of environmental degradation, which can make it difficult to develop a coordinated approach involving all relevant stakeholders (Bishop et al. 2008). For example, in 90 of the 109 countries where coral reefs occur, they are damaged by cruise ship anchors and sewage, by tourists breaking off chunks and by commercial harvesting for sale to tourists[48].

LACK OF BIODIVERSITY FOCUS BY CERTIFIED PRODUCTS AND SERVICES

Many certification systems do not make their relationship to biodiversity explicit. Organic farming labels, for example, have been reported to be generally beneficial but the certification does not set out to ensure biodiversity and, depending on local circumstances, could actually reduce species richness (Bengtsson et al. 2005). To further confuse matters, there are substantial differences between standards in terms of how they treat biodiversity.

Certification systems are based on the assumption that adopting certain specified production and processing practices will have positive biodiversity and ecosystem benefits, regardless of the producer's location in the landscape/watershed. In practice, as mentioned above, most certified forests are not very biodiverse[49] and an organic farm located in the midst of a large agro-industrial landscape may not provide much biodiversity benefit for reasons beyond its control. Greater attention to landscape/watershed criteria in certification systems could help ensure better biodiversity outcomes although, as seen in the case of MSC, a broad ecosystem-based approach can weaken incentives for individual producers.

UNINTENDED CONSEQUENCES OF NEW LEGISLATION

New regulations can sometimes limit market opportunities for natural products. For example, a potential barrier

to growth in natural cosmetics comes from tighter legislation in the US and the EU (REACH) on the safety of chemicals in cosmetics. This could reduce research investment into potential new ingredients, making it harder for new products to meet the new criteria. The end result could be continued reliance on existing species/products already approved under the legislation, at the expense of lesser-known biodiversity-friendly options.

5.5.3 EXPANDING THE REACH OF BIODIVERSITY-FRIENDLY PRODUCTS

Practical steps to expand the reach of biodiversity-friendly products could be taken to:

- **review and strengthen the biodiversity element of existing and new certification systems** to ensure they monitor biodiversity use and impacts. Implementation methods currently in place require streamlining as customers (and sometimes user industries) are often unclear what a particular label means;

Box 5.26: Social stock exchange for public serving companies

The Social Stock Exchange is a way for investors to invest in businesses established with the aim of delivering particular social objectives, such as alleviating poverty or preventing environmental destruction[51]. Allowing 'social investors' to make educated choices about the impacts organisations have on society could act as a powerful support for companies that provide a social good. Encouraging investment and trade can act as an incentive to keep biodiversity intact in the face of competition from less biodiverse alternatives.

Source: Yunus 2007

Box 5.27: MSC risk-based support framework for smaller fisheries

The MSC's programme on Guidelines for Assessment of Small-Scale and Data-Deficient fisheries aims to provide small-scale and data-deficient fisheries with guidance on the assessment process. This methodology, known as the MSC Risk Based Framework, provides a risk assessment approach to help evaluate key environmental indicators of the MSC environmental standard for sustainable fishing. Although not limited to developing countries, it is likely to have the greatest uptake amongst them.

Source: http://www.msc.org/about-us/credibility/all-fisheries

- **include broader landscape considerations in certification processes** to ensure that business works to improve overall regional biodiversity e.g. to ensure landscape connectivity across agricultural regions, prioritise efforts in high biodiversity areas etc.;
- **create more supply push and market pull for certified products and services** through increased consumer awareness and supply-chain management by large commercial buyers (see also Section 5.6 on green public procurement). This could be done through e.g. networks setting targets[50] or the creation of eco-investment funds to support companies that are certified and/or have shown innovative ways of creating sustainable business models. For example, a Swiss company HotelPlan raised US$ 750,000 in 2002 through a US$ 3 charge on bookings which was used to support sustainable tourism, environmental efforts and emergency one-off projects (cited in Bishop et al. 2008);
- **invest directly or indirectly** in companies that market certified products, particularly from High Conservation Value areas. This could include technical assistance to help develop more profitable businesses and ensure sustainable management practices and access to markets. There is also an opportunity to create incentive programmes for companies committed to purchasing biodiversity-friendly products or that make biodiversity protection their key output (see Box 5.26);
- **make better use of traditional knowledge** of plant (and animal) species to develop new products that could reduce the costs of complying with chemical safety legislation and **make global markets work better for the poor** by helping provide non-timber forest products and other products suitable for bioTrade;
- **support the adoption of certification standards in developing countries**, particularly in regions where they are currently non-existent or embryonic and help small to medium businesses for whom the initial investment becomes prohibitive (see Box 5.27).

Alongside this increasing interest in expanding the reach of biodiversity-friendly products (see also Section 5.6 on green public procurement), **trade concerns need to be borne in mind**. While there are no formal trade implications of private demand for goods (e.g. choice of FSC-labelled goods or organic foods), the position is more complicated when it comes to governments applying instruments like taxes or subsidies to create price incentives for sustainable products (see Box 5.28).

Box: 5.28: Trade and environment

The role of trade in sustainable development policies and ambitions is a complex one. The General Agreement on Tariffs and Trade (GATT) and its successor, the World Trade Organization (WTO), are key components of this relationship. These frameworks to regulate multilateral trade have been established through consensus among their 153 member states and have progressively reduced global trade barriers, thereby contributing to the vast increase in world trade witnessed over the past decades.

Trade and development

According to basic trade theory, increased international trade should lead countries to produce goods for which they have a 'comparative advantage' in their production. This specialisation should, in turn, lead to a more optimal allocation of inputs and production of goods, something desperately needed with the global population predicted to increase to over 9 billion people by 2050. Trade can also act as a force for development, providing opportunities for exports overseas, increasing production and incomes at home and accelerating the global dispersion of technologies – including environmentally important ones.

Trade is often seen as also generating income and contributing to development by freeing up resources for investment in environmental quality and protection of ecosystems and biodiversity (Sampson 2005). However, as UNEP and IISD (2005) note, *"The links between trade and environment are multiple, complex, and important. Trade liberalisation is – of itself – neither necessarily good nor bad for the environment. Its effects on the environment in fact depend on the extent to which environment and trade goals can be made complementary and mutually supportive."*

…and environment

Governments have obligations not only under the WTO, but also various multilateral environmental agreements (MEAs) such as the CBD and the UNFCCC. Debate often arises over a perceived risk of conflict between these different international conventions, rules and disciplines. Although there have been no WTO legal disputes to date regarding a conflict between specific MEA provisions and the WTO, governments may have to balance WTO-related obligations not to discriminate in traded goods with MEA-related obligations to limit or ban the import of goods produced under environmentally harmful conditions or that contribute to environmental degradation.

Both multilateral trade rules and environmental agreements include provisions focused on minimising the risk of such conflict. The GATT includes an article (Article XX) that sets out general exceptions to its rules, including for measures necessary to protect human, animal or plant life and health. Several MEAs specify that their implementation should not adversely affect the rights and obligations derived from other existing international agreements. For example, the CBD (Article 22(1)) contains a provision to this effect but makes an exception for cases where the exercise of such rights and obligations would cause serious harm to biodiversity.

Another potential issue exists for goods and products that have been produced according to criteria that safeguard ecosystems and mitigate environmental pressures. The external costs of their production (i.e. costs that society has to bear) are lower than those of competing goods not produced under such conditions. It has been argued that to ensure a level playing field, the external environmental costs incurred in the production of goods should somehow be reflected e.g. goods produced under environmentally-friendly criteria should be rewarded for the lower costs transferred to society as a whole. This could have implications for international trade, depending on how governments decide to reflect these cost differences (e.g. through standards or labelling schemes).

This report is not the place for an extensive discussion on the future organisation of international governance on trade and environment, but some concerns and observations can be raised:

- It is legitimate to ask whether the WTO is the best venue for an increasing amount of dispute settlement procedures and agenda-setting on sustainability of products and production systems. Given that its primary task is to regulate the provision of a level playing field for world trade, directing the conditions under which products are produced might seem beyond its original intention;

- Whilst the effects of trade liberalisation on economic development have been thoroughly investigated, this is much less true for its impacts on ecosystems and the environment (Verburg et al. 2009). Some studies have found that liberalising trade in agricultural products could lead to large biodiversity losses especially in Latin America and Africa yet would decrease losses in Europe and North America due to transfers in agricultural production (ten Brink B. et al. 2007);

- Trade-offs may exist between the long and short term; between economic development and environmental and living conditions; and between natural capital and GDP. These are especially relevant for developing countries. Restricting trade in products by obliging certain production standards, or by favouring certain products over others, limits the flexibility (also in time) that developing country governments have to set their own priorities, whilst compliance can pose a significant challenge to small and medium-sized businesses in these countries. On the other hand, short-term development by 'mining' natural resources could mean long-term impoverishment.

- Given the ecological footprint of many developed economies and the impacts of producing their imports on climate change and biodiversity loss, there is a powerful argument for them to take action on at least the aspects of production that clearly influence global commons.

- Understanding and defining terms such as 'sustainable production' or 'environmentally-friendly products' is important for ensuring trade and environment policies are mutually supportive. Finding common ground amongst governments on criteria for key terms should be viewed as an important prerequisite before enacting compulsory measures focused on sustainable trade. The broader the support for these criteria, the less resistance there will be to applying them to make trade more sustainable. Another trade-off presents itself here, as front-runner countries have to balance their desire for ambitious criteria with building a coalition based on a minimum level of shared principles.

Sources: Sampson 2005; UNEP and IISD 2005; Verburg et al. 2009 and ten Brink B. et al. 2007

5.6 GREEN PUBLIC PROCUREMENT (GPP)

"By giving a clear signal to all parties involved in the procurement process, public authorities can draw new environmental technologies into the market place that in turn have the potential to strengthen the competitiveness of European industry.

Green Public Procurement will also help EU Member States meet obligations for energy-efficiency in buildings, energy services and reduced CO_2 emissions. The potential of this instrument is enormous and I recommend that public administrations, at all levels, turn policy into practice and demonstrate their willingness to 'green' Europe."

Stavros Dimas, EU Commissioner for Environment

5.6.1 OBJECTIVES AND TAKE-UP OF GPP POLICIES

Green Public Procurement (GPP) means that **public purchasers take account of environmental factors when buying products, services or works. A product or service can only qualify as 'green' if it goes beyond what is required by law and beyond the performance of products commonly sold in the market**. Whereas regulatory standards create a minimum baseline (see Chapter 7), GPP helps to green the markets: ecologically innovative products can increase market share and often get a price premium.

Governments at all levels, public agencies and organisations can quickly make use of GPP to reduce pressures on biodiversity, drive or create markets for green products and green the supply chain. Their vast buying power – from offices and canteens to construction and transportation – can directly expand the market for products and services produced or supplied with less environmental impact (e.g. energy- and water-efficient devices and building techniques, non-hazardous or bio-degradable products, organic or seasonal food, sustainably produced timber and paper).

GPP can facilitate eco-innovation because governments can take more risk when opting for new products, assuming the role of 'launching customer'. This may create economies of scale and help companies to move up the learning curve, put innovative products on the market and create green-collar jobs. Less green products and services are progressively placed at a significant disadvantage when competing for government contracts.

GPP has been rapidly developing since the early 2000s and is now being mainstreamed by environmentally ambitious governments. The EU market for government purchases alone exceeds 1,500 billon EUR/year or 16% of EU Gross National Product. The European Commission has proposed to Member States that by 2010, 50% of their purchasing should be GPP. Some have chosen to set more ambitious targets e.g. in the Netherlands, the national government intends to purchase 100% green by 2010, with levels of 50 to 75% for local and regional governments (see Box 5.29).

Many other large economies – including Japan, China, New Zealand, Korea and the US – also have formal policies in place that stimulate GPP (see Box 5.30).

Box 5.29: The 'Green-7' in the European Union

Seven EU Member States (Austria, Denmark, Finland, Germany, Netherlands, Sweden and UK) consistently have more tenders with green criteria than other Member States, supported by:

- strong political drivers and/or national guidelines;
- national GPP programmes in place for a number of years;
- strong information sources (dedicated GPP websites containing relevant criteria/specifications);
- innovative procurement techniques (most use dedicated tools e.g. life-cycle costs as an award criterion, or functional specifications/requests for environmental variants);
- application of environmental management systems by purchasing organisations.

Source: Bouwer et al. 2006

Box 5.30: Strengthening regulations for GPP implementation in China

China's Government Purchase Law took effect on 1 January 2003. Five years later, official statistics show that about 5.1 billion Yuan (630 million US$) has been saved in government procurement costs.

The Law as enacted established a 'preferential' list which allowed government bodies to shop around for other products if they could justify them on cost and energy-efficiency grounds. Subsequently, the State Council adopted a compulsory list (December 2007) of nine types of products, including air conditioners, fluorescent lamps, televisions, electric water heaters, computers, printers, computer monitors and water nozzles.

A new State Council Order, published on the central government's website, indicates that China will impose tougher compulsory procurement rules for energy-saving products and give priority to eco-friendly products in future public purchases.

Source: China Daily, 14 April 2009

5.6.2 GPP STANDARDS, CRITERIA AND COSTING

Standards and criteria are the backbone of GPP. Producers and suppliers need to know on what basis their products are assessed and how they can improve their chances of winning a contract. Making environmental criteria measurable and transparent is a considerable challenge given the range of products and services purchased by governments. Cooperation with relevant sectors and producers is needed to strike a balance between environmental ambition and product availability. Training of purchasers is important to ensure that policy goals are translated into action.

Through GPP, governments can choose to buy certified or labelled products that are guaranteed to meet purchasing criteria for a given category of products (see Box 5.31 and Section 5.5 above). Such policies may not only have direct environmental benefits but also increase the recognisability and diffusion of market-based labelling schemes.

Greening certain purchases may yield higher environmental benefits than others. Recent studies have focused mainly on CO_2 effects of GPP policies and not yet on direct biodiversity impacts. One found that focusing on construction and electricity products and services is the 'low-hanging fruit' for governments willing to target CO_2 emissions (PWC 2009). GPP's specific benefits for biodiversity could be assessed by analysing procurement criteria with a positive effect on biodiversity and linking this to actual contracts and amounts bought by national/local governments. However, it is already clear that creating demand for products with low environmental impacts is directly or indirectly beneficial for soil and water quality, ecosystem integrity and long-term sustainability of natural capital.

Box 5.31: Tightening criteria for centralised procurement: timber purchasing in UK

The UK established a Central Point of Expertise for Timber (CPET) to advise government on timber purchasing. The CPET advised that the 5 main timber certification schemes (FSC, PEFC, CSA, SFI, MTCC) complied with government criteria on legality, as did certain independent schemes. As purchases not covered by such schemes had to supply 'equivalent evidence' ('Category B' evidence), most suppliers opted to use formal certification as it simplified proof of compliance.

In April 2009, criteria were strengthened. The entry level for GPP consideration was raised from Legal only to 'Legal & Sustainable', effectively ruling out anything but fully certified timber for central government projects. This high-level commitment has boosted demand for and availability of certified timber in the UK market, as measured by rapid growth in certified forest area and in the number of Chain of Custody certificates.

Remaining policy challenges include patchy implementation of detailed compliance specifications through a complex government bureaucracy. However, the mere existence of this policy sends out a clear and powerful message of intent.

Source: www.proforest.net/cpet

Considering the time it can take to develop comprehensive criteria for all products, starting with products with the highest impacts creates the quick-wins. Products whose biodiversity impact can clearly be reduced – and which represent a significant share of public expenditure – include:

- timber (used in construction, water works, furniture and paper: see Box 5.32);
- food (government canteens and restaurants). One estimate suggests that if all public authorities switched from conventionally to organically produced foodstuffs, this would reduce phosphate release in fertiliser by 41,560 tonnes per year (PO4-equivalent), roughly the amount currently used by 3.5 million Europeans[52];
- information and communications technology (ICT). Aside from energy consumption, ICT demand for metals and minerals (e.g. silver, tin, copper, gold, cadmium, lead and mercury) forms a significant part of global trade in these inputs. Governments, as major purchasers, can play a big role in shifting extraction and waste management practices towards lower impact practices.

GPP is not automatically more expensive than conventional procurement procedures: on the contrary, it can be a cost-saving tool for government. Price will depend on the products available, market competition and the way in which costs are assessed. Assessing a purchase over its entire life-cycle (c.f. simply on purchasing cost) shows that energy-saving products are often worth the investment and can reduce costs in the long run (see Box 5.33).

Lastly, benefits of scale are available where criteria and standards can be applied across a range of markets and/or through joint procurement policies (see Box 5.34). Harmonisation of purchasing criteria across countries could further lower costs but may involve lengthy international negotiation.

Box 5.32: Energy and water savings through green procurement in Denmark

Danish public procurement of virgin paper is around 22,500 tonnes per year. For every tonne of recycled paper, 3,200 kWh of energy and 10 m^3 of water can be saved. It has been estimated that if all public authority use of virgin paper in public procurement was replaced by recycled paper, this would save 73,000 MWh in energy and 225,000 m^3 of water, equivalent to the yearly energy consumption of 15,000 Danish households.

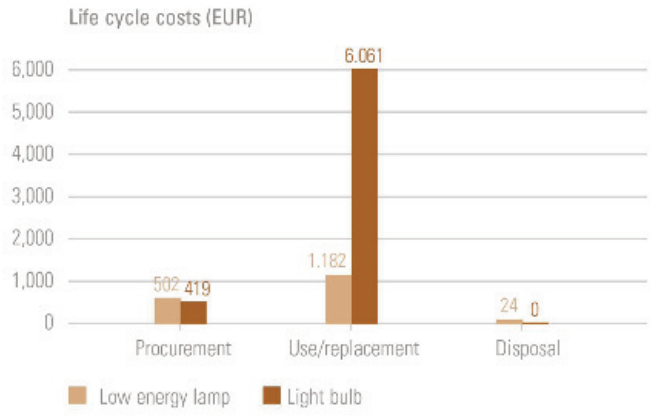
Source: http://www.gronindkobsportal.dk/Default.asp?ID=262

Box 5.33: Cost savings identified through 'whole life costing' in Germany

Whole-life cost analyses for GPP in some German cities reveal that the overall cost of green products and services is often lower than 'normal' products, once their entire life is taken into consideration. The table below provides comparisons between green and other products based on city experiences. Negative values indicate that GPP resulted in cost savings.

Organisation	Product	Non-green Costs (in EUR, incl VAT, incl LCC per year – comparison of bids)	Green Costs (in EUR, incl VAT, incl LCC per year – comparison of bids)	Applied green criteria	Absolute difference (EUR)	Relative difference
Freiburg	All-in-one copier	243,950	291,100	Blue Angel, Star 4.0, RohS-Directive	47,150	19%
	Paper A4	205,980	171,650	Blue Angel	-34,330	-17%
	PC	64,545	65,433	Blue Angel, Energy Star 4.0	888	1%
	TFT displays	9,020	7,177	Energy Star 4.0	-1,843	-20%
Heidelberg	Paper A4	100,000	88,000	Blue Angel	12,000	-12%
	Toilet paper	20,250	15,000	Blue Angel	-5,250	-26%

Source: Öko-Institut and ICLEI 2006



In Hamburg, the Environment Agency replaced all bulbs with energy efficient lamps in 300 buildings. Annual power consumption decreased by 4.5 million kWh, saving 225,000 EUR (at a unit price of 5 centimes). The chart below shows the example of an administrative unit equipped with 50 lamps, taking into account the life cycle of an energy saving bulb (40 months) and interest rate effects for 2004.

Source: Saxon State Ministry for the Environment and Agriculture 2006

5.6.3 TACKLING CONSTRAINTS ON IMPLEMENTING GPP

GPP face a variety of barriers (Bouwer et al. 2006). First, there is often a perception that purchasing green will introduce extra financial costs to the organisation (instead of neutral or reduced costs). As mentioned above, this is not necessarily the case. However, the right balance needs to be struck between ambitious criteria and sufficient supply of goods. Drawing up strict criteria is little use if there are no products available (or too few) that can meet them.

Second, the necessary infrastructure to develop and implement GPP may be lacking. Investment may be required to build capacity for developing and setting

Box 5.34: Joint procurement through the EcoProcurement Service Vorarlberg, Austria

Since 1998, 96 municipalities in Austria's most western province have collaborated on GPP through a environmental association (Umweltverband Vorarlberg). In 2001, the dedicated **EcoProcurement Service Vorarlberg (ÖkoBeschaffungsService – ÖBS)** was launched to:

- organise joint procurement activities on behalf of all member municipalities;
- offer legal and environmental advice on GPP;
- organise workshops on GPP;
- develop GPP guidelines for specific product groups (office equipment and building construction);
- assist municipalities in implementing sustainable construction.

A key driver was the realisation that few municipalities were applying environmental criteria, even when clear guidance was available. Joint procurement was seen as a way to combine financial and environmental benefits and reduce costs. Substantial savings have been made in administrative costs (20-60%) and in prices paid for products (5-25%). In 2005 savings of about 286,500 EUR were achieved.

Source: http://www.iclei-europe.org/index.php?id=3490

criteria, to transfer these into practical tools and assessments and to train purchasing officers. Essential components of GPP policies include third party verification of compliance and supply chain management: the more a product is a combination of inputs, the more complicated it can become to trace the impacts of inputs at their respective points of production.

Third, building support at political and/or managerial level is important for efficient policy implementation. A phased approach can be useful, using demonstrated small-scale success to leverage support for broader roll-out (see Box 5.35).

Box 5.35: Phased implementation of green food procurement policies in Scotland

East Ayrshire, Scotland: Over four years, the local authority transformed the school meal service from a standard public service to a successful model of sustainable food provision supporting local and organic producers and promoting a healthy food culture. The pilot project (one primary school, 20,000 meals in one year) began in August 2004; the second phase from 2005 involved 10 primary schools (220,000 meals); in early 2007, the scheme was expanded to include 26 primary schools and will eventually cover all 44 primary schools and 9 secondary schools in the county.

The scheme was conceived and managed by the East Ayrshire Council and financially supported by the Scottish Executive initiative. It follows the 'Food for Life' model for sustainable food procurement which requires purchases for school canteens to fulfil specific criteria, including:

- at least 75% of food ingredients must be unprocessed;
- at least 50% of food ingredients must be locally sourced;
- at least 30% of food ingredients must be organic.

Positive environmental effects of the initiative include reducing food miles by 70%, reduced packaging waste and saving almost £100,000 in environmental costs.

Source: Sonnino undated

Box 5.36: Compatibility of GPP with free trade rules and disciplines

The General Agreement on Tariffs and Trade (GATT) requires States to treat foreign and domestically produced goods alike (Article III – the 'national treatment obligation') and prohibits discrimination against imported goods that are 'like' domestically produced goods, independent of how or where they have been produced.

However, Article III.8(a) **excludes all products consumed by a government in the course of its normal activity** from the 'national treatment obligation' e.g. furniture, hospital material or social housing. This means that GPP policies have significant scope to explicitly promote biodiversity-friendly purchasing – e.g. by specifying FSC timber based products – without infringing GATT provisions.

Source: FSC 2008b

Fourth, differences in criteria and/or procedures amongst different countries or administrations can create extra costs and uncertainties. Some countries are moving beyond GPP towards 'sustainable public procurement' (SPP) which combines environmental and social criteria in purchasing decisions. Where priorities vary, procurement criteria will obviously also vary between countries or even between regional and local authorities.

In some cases, such differences have raised concerns over international competitiveness. In general terms, there is always the risk that GPP targets and criteria put strain on free trade agreements or, in the case of the EU, the internal market (e.g. criteria that give preference to national producers could distort competition and create suspicions of protectionism). Inclusion of social criteria could also lead to conflicts under trade agreements (see discussion of environmental protection obligations in the context of the GATT/WTO in Box 5.28 and also Box 5.36 below).

GPP can yield broader results when combined with development cooperation efforts and where resources for capacity building and green industry development are available. Supporting greener production in countries of origin, especially developing countries, will open up new markets to providers, improve and expand a reliable supply of green products and lower the price of green procurement.

Looking to the future:

- GPP is a policy instrument with considerable environmental benefits, given the huge markets for government purchases;
- most quantification of benefits has been based on substitution costs (e.g. replacing virgin paper with recycled), reduction in natural resource use (e.g. water) or reduced emissions (e.g. GHG, pollution). Much more work needs to be done to quantify the benefits to biodiversity from certification and labelling programmes;
- the time is right for committed governments to upscale GPP and set national goals as first lessons have been learned and criteria are being devised and revised at an increasing rate;
- harmonisation where feasible could further lower costs and increase GPP's attractiveness;
- transparency and clarity are important for producers at all levels and sizes;
- national GPP policies can be combined with development objectives to support the development of certified markets in other countries.

Chapter 5 has looked at a range of different **instruments to reward providers of benefits from ecosystem services** or to reward products that have less impact on nature. The former included payments for environmental services, mechanisms for access and benefit sharing for genetic resources as well as tax breaks and transfers. The discussion of market-based reward tools has focused on certified products and the use of public procurement to expand and green the markets.

Chapter 6 and 7 discuss closely-related tools. **Chapter 6 considers the need for subsidy reform** to ensure that subsidies reflect the value of biodiversity and respond efficiently to current and future priorities. **Chapter 7 analyses ways in which regulation and pricing can minimise damage to natural capital:** these tools form an essential foundation for the markets analysed in Chapter 5.

Endnotes

[1] The chapter uses the terms (i) environmental services, (ii) ecosystem services, and (iii) ecological services interchangeably. In particular, we usually refer to the Millennium Ecosystem Assessment interpretation of 'ecosystem services' which includes products (provisioning services) as well as intangible services.

[2] Australian Government, Department of the Environment, Water, Heritage and the Arts, URL: http://www.environment.gov.au/biodiversity/incentives/tender.html

[3] United States, Department of Agriculture, http://www.nrcs.usda.gov/programs/CRP/

[4] The approach of remunerating environmental service providers as mean to internalise environmental services is sometimes also referred to as "provider gets" approach to highlight the differing perspective compared to the more widespread application of the "polluter pays" principle. As pointed out by Pagiola et al. (2005), it does not matter -- from a pure efficiency perspective -- whether ''polluter pays'' or ''provider gets'' applies. According to the Coase theorem, either approach will yield the same result provided that markets are competitive, property rights are enforceable, and there are no transaction costs (Coase 1960). In practice, however, few if any of these conditions hold in the case of environmental service (Pagiola et al. 2005). The argumentation is that (i)environmental services have the peculiar characteristic of being the cumulative result of a wide range of spatially dispersed land uses, and (ii) monitoring the impact of many land users scattered over a landscape on the provision of environmental services would be prohibitively costly. The latter is partly reflected by the insufficient compliance with many land use laws (e.g. deforestation bans, fire prohibition), especially in developing countries where equity concerns play an additional role and where adopting a polluter pays approach would impose the cost of environmental protection on often poorer land users rather on better-of service beneficiaries (Pagiola et al. 2005). These elements argue in favor of a "provider gets" approach rather than a "polluter pays" approach when seeking to internalize the generation or conservation of environmental services, especially in the context of developing countries (Wertz-Kanounnikoff 2006)

[5] Auctioning schemes can be designed for this.

[6] See Republic of South Africa, Department: Water and Environmental Affairs, http://www.dwaf.gov.za/wfw/

[7] This section draws on Karousakis (2009) Promoting Biodiversity Co-benefits in REDD. OECD Paris

[8] There might of course be impacts on other ecosystems; perhaps less species rich, but harbouring different species and contributing different services. It will be important to understand knock-on effects of choice of where to fund and hence where not to fund.

[9] Reforestation relates to areas previously covered in forest. Afforestation relates to areas not previously covered in forests.

[10] Sub-national refers to States or provinces, or regions within countries.

[11] Monitoring emission reductions from deforestation/degradation requires two types of data: changes in forest stocks and changes in carbon stocks.

[12] Net deforestation (net loss of forest area) is defined in the FAO Global Forest Resources Assessment (2005) as overall deforestation minus changes in forest area due to forest planting, landscape restoration and natural expansion of forests.

[13] In REDD pilot and demonstration activities, in particular for the 'readiness' phase (i.e. structural and regulatory preparations and capacity building), predominantly fund-based grants are used. These might increasingly be accompanied by loans e.g. when the World Bank Forest Investment Programme becomes operational). Private sector investments might further complement the available funding during the REDD readiness phase, if an agreement on REDD is reached in the UNFCCC.

[14] REDD credits could also be fungible with permits/allowances under existing (domestic) emission trading schemes such as the European Union Allowances (EUAs) under the EU Emissions Trading Scheme (EU ETS).

[15] The UNFCCC REDD web-platform was created to share such information. Due to the early stage, there is currently some information on actions being undertaken but little on the lessons learned. See http://unfccc.int/ methods_science/redd/items/4531.php.

[16] These are in essence 'Green Standard' REDD credits, similar to existing Gold Standard Clean Development Mechanism (CDM) credits which are voluntary premiums for CDM credits meeting additional sustainable development criteria.

[17] More details on the agreements are available from Breibart 1997; ICBG 1997; Mulholland and Wilman 1998; Neto and Dickson 1999; Ten Kate and Laird 1999; Merson 2000; Artuso 2002; Greer and Harvey 2004; and Dedeurwaerdere et al. 2005.

[18] It should be noted that not all indigenous communities are keen on pursuing this line of development as some reject the commercial exploitation of knowledge.

[19] Source suppliers covers source country governments; local management entities; indigenous people/communities, some of whom have the right to grant permission for access to and use of genetic resources and their derivatives; national organisations; and/or stakeholder groups with access to traditional knowledge. This still leaves open, however, the rights and equity issues. Even if we take the suppliers to be national governments that does not infer that all jurisdictions have wholly equitable or indeed well defined rights of sourcing and supply. This is itself a cause of much concern. For more details see Ding et al 2007.

[20] Note that 'buyers' can also be intermediaries, such a local research institutes and universities.

[21] One reviewer of this chapter noted that asset specificity may not apply so forcefully to bioprospecting, arguing that wild and so far undiscovered genetic resources collected for screening purposes usually have no specificity. A provider country can offer their resources to any company interested in the use and companies can approach any provider country.

[22] For a further discussion of how transaction costs economics apply to bioprospecting, see Gehl Sampath 2005,

[23] For further discussion on the constraints on equitable sharing of benefits and related economic issues, see OECD (2003) and Richerhagen and Holm-Mueller (2005).

[24] Suggestion made by Professor Vogel, University of Costa Rica (http://ictsd.net/i/environment/31517).

[25] Voluntary approaches are in place from local to international level. See e.g. for municipalities in Australia http://www.logan.qld.gov.au/LCC/logan/environment/biodiversity/cip/voluntaryconservationagreements.htm and at international level, the FAO Code of Conduct for Responsible Fisheries (http://www.fao.org/docrep/005/v9878e/v9878e00.HTM) and FAO Code of Practice for Forest Harvesting in Asia-Pacific (http://www.fao.org/docrep/004/AC142E/AC142E00.HTM). For further discussion, see Menzies 2002 in ten Brink 2002.

[26] The ICMS is the tax on sale of goods and services which operates at state level in Brazil.

[27] For example, see UNECE 2006 on forests http://www.unece.org/timber/docs/fpama/2006/fpamr2006.pdf and www.msc/org/aboutus/10 for fisheries.

[28] International Tropical Timber Organization: http://www.itto.int/.

[29] http://www.fao.org/docrep/005/v9878e/v9878e00.HTM#2

[30] http://www.seafoodchoices.com/home.php

[31] http://assets.panda.org/downloads/fortuna.pdf

[32] http://www.msc.org/newsroom/msc-news/archive-2009/sustained-growth-of-msc-labelled-products

[33] http://www.msc.org/documents/msc-brochures/ MSC-FisheriesCommitments-Aug09-WEB.pdf

[34] http://www.worldagroforestry.org/af/

[35] Figures from the new World of Organic Agriculture: Statistics and Emerging Trends 2008. cited on their website: http://www.ifoam.org/press/press/2008/Global_Organic_Agriculture_Continued_Growth.php

[36] See Organic Monitor research news http://www.organicmonitor.com/r3001.htm

[37] http://www.sustainablefarmcert.com/

[38] http://www.rainforest-alliance.org/agriculture. cfm?id= main

[39] http://www.globalgap.org/cms/front_content.php?idart=3&idcat=9&lang=1

[40] http://www.ecoagriculture.org/index.php

[41] http://www.wttc.org/

[42] http://www.mekongtourism.org/site/uploads/media/IETS_Ecotourism_Fact_Sheet_-_Global_1__01.pdf

[43] http://www.ecotourism.org/site/c.orLQKXPCLmF/b.4835303/k.BEB9/What_is_Ecotourism__The_International_Ecotourism_Society.htm (source of citation from Mastny 2001).

[44] http://www.mekongtourism.org/site/uploads/media/IETS_Ecotourism_Fact_Sheet_-_Global_1__01.pdf

[45] http://www.wttc.org/

[46] http://www.organicmonitor.com/r1709.htm

[47] See What Do We Know About the Costs and Benefits of Tropical Timber Certification? (2004) Timbmet Group Ltd: Oxford.

[48] Ibid.

[49] Plantations are usually more productive than natural forests, and some argue that the world's timber and fibre needs should be met from plantations, thereby relieving pressure on natural forest to provide the same material.

[50] e.g. through the Global Forest and Trade Network (GFTN), brokered by WWF, consuming and producing companies sign up to the network and report annually to the WWF on progress against individually agreed targets in return for use of its logo for PR purposes (www.gftn.panda.org/about_gftn/)

[51] http://www.socialstockexchange.eu/why/default.html

[52] http://ec.europa.eu/environment/gpp/index_en.htm.

REFERENCES

Angelsen A. (2008) Moving ahead with REDD – Issues, Options and Implications, Center for International Forestry Research. CIFOR, Bogor.

Angelsen, A. and Wertz-Kanounnikoff, S. (2008) What are the key design issues for REDD and the criteria for assessing options? in Angelsen A. (ed), Moving ahead with REDD – Issues, Options and Implications. CIFOR, Bogor.

Artuso, A. (2002) Bioprospecting, benefit sharing, and biotechnological capacity building. World Development 30(8): 1355-1368.

Asquith, N et al. (2008) Selling two environmental services: In-kind payments for bird habitat and watershed protection in Los Negros, Bolivia. Ecological Economics 65(4): 675-684. URL: http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VDY-4RW4S2G-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=da8c60544f71328bcdbf180faa3ad07d (last access Nov 6, 2009).

Barbier, E.B. and Aylward, B. (1996) Capturing the Pharmaceutical Value of Biodiversity in a Developing Country. Environmental and Resource Economics 8: 157-181.

Bassi, S. et al. (2008) Agriculture and Environment: Payments for Environmental Services (PES). Presentation at the conference on Common Agriculture Policy and its Impacts in Malta (Victoria, Gozo, 7-9 November 2008).

Baylis, K.; Rausser, G., and Simon, L. (2004) Agri-environmental programs in the United States and European Union. In. Anania, G.; Bohman, M.E.; Carter, C.A. and McCalla, A.F. (eds.) Agricultural policy reform and WTO: Where are we heading? (pp. 210–233). Cheltenham, UK: Edward Elgar.

Bengtsson, J.; Ahnström, J. and Weibull, A. (2005) The effects of organic agriculture on biodiversity and abundance: a meta-analysis, Journal of Applied Ecology 42: 261-269.

Bennett, M. (2008) China's sloping land conversion programme: Institutional innovation or business as usual? Ecological Economics 65(4): 699-711.

Bishop, J.; Kapila, S.; Hicks, F.; Mitchell, P. and Vorhies, F. (2008) Building Biodiversity Business. Shell International Limited and the International Union for Conservation of Nature: London, UK, and Gland, Switzerland. 159 pp.

Bosshard, A.; Reinhard, B.R. and Taylor S. (eds.) (2009) Guide to Biodiversity and Landscape Quality in Organic Agriculture. IFOAM, Bonn (D), ISBN 978-3-940946-11-9, 185 pp.

Bouwer M; Jonk M.; Berman T.; Bersani R.; Lusser H.; Nappa V.; Nissinen A.; Parikka K.; Szuppinger P. and Viganò C. (2006) Green Public Procurement in Europe 2006 – Conclusions and recommendations. Virage Milieu & Management bv, Korte Spaarne 31, 2011 AJ Haarlem, the Netherlands. URL: http://europa.eu.int/comm/environment/gpp (last access Dec 9, 2009).

Boyd, J.; Caballero, K. and Simpson, R.D. (2000) The Law and Economics of Habitat Conservation: Lessons From an Analysis of Easement Acquisitions. Stanford Environmental Law Journal 19(1): 393-412.

Bracer, C.; Scherr, S.; Molnar, A.; Sekher, M.; Ochieng, B.O. and Sriskanthan, G. (2007) Organization and Governance for Fostering Pro-Poor Compensation for Ecosystem Services. CES Scoping Study Issue Paper No.4, ICRAF Working Paper No. 39, World Agroforestry Center, Nairobi, Kenya.

Brand, D. (2002) Investing in the Environmental Services of Australian Forest. as in Pagiola, S., Bishop, J. and Landell-Mills, N. (eds) Selling Forest Environmental Services: Market-Based Mechanisms for Conservation and Development. London, UK. Earthscan Publications.

Bräuer et al. (2006) The Use of Market Incentives to Preserve Biodiversity. Final Report, Project under Framework contract for economic analysis ENV.G.1/FRA/2004/0081, Berlin.

CBD (1992) Convention on Biological Diversity Convention Text. URL: http://biodiv.org/doc/legal/cbd-en.pdf, (last access Nov 9, 2009)

Christ, C.; Hillel, O.; Matus, S. and Sweeting, J. (2003) Tourism and Biodiversity: Mapping tourism's global footprint. Conservation International, Washington, D.C. 20036.

Coase, R.H. (1960) The Problem of Social Cost. Journal of Law and Economics 3(1): 1–44.

Costello, C. and Ward, M. (2006) Search, bioprospecting and biodiversity conservation. Journal of Environmental Economics and Management 52(3): 615-626.

Craft, A. B. and Simpson, R. D. (2001) The value of biodiversity in pharmaceutical research with differentiated products. Environmental and Resource Economics 18 (1): 1-17.

De Melo, J. J. and Prates, J. (2007) EcoTerra Model – Economic instruments for sustainable land use management in Portugal. Paper presented at the 7th International Conference of the European Society for Ecological Economics. Leipzig, June 5–8.

de Groot, R.; Stuip, M.; Finlayson, M. and Davidson, N. (2006) Valuing wetlands: Guidance for valuing the benefits derived from wetland ecosystem services. Ramsar Technical Report No. 3, CBD Technical Series No. 27, URL: http://www.cbd.int/doc/publications/cbd-ts-27.pdf (last access June 5, 2009).

Dedeurwaerdere, T. (2005) From bioprospecting to reflexive governance. Ecological Economics 53(4): 473-491.

Dedeurwaerdere, T.; Krishna, V. and U. Pascual (2005) Biodiscovery and Intellectual Property Rights: A Dynamic Approach to Economic Efficiency'. Department of Land Economy Environmental Economy and Policy Research Working Papers, 13.2005, University of Cambridge.

Ding, H.; Nunes, P.A.L.D. and L. Onofri (2007) An Economic Model for Bioprospecting Contracts. Fondazioni Eni Enrico Mattei - Note di Lavoro, 102.07, Fondazioni Eni Enrico Mattei, Milan, Italy.

EC (Commission of the European Communities) (2007) Green Paper on market-based instruments for environment and related policy purposes. COM (2007) 140 final, Brussels, 28.3.2007.

EC (Commission of the European Communities) (2009) Contributing to Sustainable Development: The role of Fair Trade and non-governmental trade-related sustainability assurance schemes. Communication COM(2009) 215 final, Brussels.

Eliasch, J. (2008) climate change: financing global forests. The Eliasch review. UK. url: http://www.occ.gov.uk/activities/eliasch/full_report_eliasch_review(1).pdf (last access Nov 6, 2009).

Emerton, L.; Bishop, J. and Thomas, L. (2006) Sustainable Financing of Protected Areas: A global review of challenges and options. IUCN, Gland, Switzerland and Cambridge, UK.

FAO – Food and Agriculture Organisation (2000) Global forest resource Assessment. Food and Agriculture Organization of the United Nations, Rome, available at: ftp://ftp.fao.org/docrep/fao/003/y1997E/frA%202000%20Main%20report.pdf (last access Oct 26, 2009).

Ferraro, P (2007) Performance Payments for Sea Turtle Nest Protection in Low-income Nations: a case study from Tanzania. URL: http://www2.gsu.edu/~wwwcec/docs/doc%20updates/NOAA%20Paper%20TZ%20Final%20Draft%20June%202007.pdf (last access Nov 9, 2009)

Ferraro, P.J. and Kiss, A. (2002) Direct Payments to Conserve Biodiversity. Science. 298: 1718-19.

Forest Industries Intelligence Limited (2009) The EU Market for "Verified Legal" and "Verified Legal and Sustainable" Timber Products. UK Timber Trade Federation and Department for International Development.

Fourli M. (1999) Compensation for damage caused by bears and wolves in the European Union. Office for Official Publications of the European Communities, Luxembourg.

Frinn, R.D. (2003) Bioprospecting – Why Is It So Unrewarding? Biodiversity and Conservation 12: 207–216.

Frost, P and Bond, I (2008) The CAMPFIRE programme in Zimbabwe: Payments for wildlife services. Ecological Economics 65(4): 776-787.

FSC – Forest Stewardship Council (2008a) Facts and figures on FSC growth and markets: Info Pack. FSC Presentation 28 February 2008, URL: http://www.fsc.org/fileadmin/web data/public/document_center/powerpoints_graphs/facts_figures/2008-01-01_FSC_market_info_pack_-_FINAL.pdf (last access May 15, 2009).

FSC – Forest Stewardship Council (2008b) Specifying FSC in Public Procurement – In Line with WTO Rules. FSC Factsheet October 2008. URL: www.fsc.org/fileadmin/web.../Procurement_and_WTO-EN.pdf (last access Dec 6, 2009).

FSC - Forest Stewardship Council (2009) Facts and figures, available at: http://www.fsc.org/facts-figures.html (last access June 15, 2009).

Gatti, J.; Goeschl, T.; Groom, B. and Swanson, T. (2004) The Biodiversity Bargaining Problem. CWPE 0447, University of Cambridge.

–Gibson, R.H.; Pearce, S.; Morris, R.J., Symondson, W.O.C. and Memmott, J. (2007) Plant diversity and land use under organic and conventional agriculture: a whole-farm approach. Journal of Applied Ecology 44: 792–803.

Global Canopy Programme (2008) From REDD to PINC, Briefing note #1. December 2008.

Global Insight (2007) A Study of the European Cosmetics Industry. Prepared for: European Commission, Directorate General for Enterprise and Industry, URL: http://ec.europa.eu/enterprise/newsroom/cf/document.cfm?action=display&doc_id=4561&user_service_id=1 (last access Dec 9, 2009).

Greer, D. and Harvey, B. (2004). Blue Genes: Sharing and Conserving the World's Aquatic Biodiversity. Earthscan/IDRC.

Grieg-Gran, M. (2000) Fiscal Incentives for Biodiversity Conservation: The ICMS Ecológico in Brazil. Discussion Paper 00-01 IIED December 2000. London.

Gutman, P. (2006) PES: A WWF Perspective. Presentation given at the Workshop on: Conservation Finance, Global Biodiversity Forum, Curitiba, Brazil, March 25th 2006, URL: http://assets.panda.org/downloads/peswwfmpo.pdf (last access Nov 11, 2009).

Hanski, I.; Koivulehto, H.; Cameron, A. and Rahagalala, P. (2007) Deforestation and apparent extinctions of endemic forest beetles in Madagascar. Biol. Lett. 22 June 2007 3(3): 344-347, URL: http://rsbl.royalsocietypublishing.org/content/3/3/344.full.pdf+html (last access Dec 4, 2009).

ICBG (1997) Report of a Special Panel of Experts on the International Cooperative Biodiversity Groups (ICBG). URL: http://www.fic.nih.gov/programs/finalreport.html, (last access on Nov 9, 2009).

IPCC – Intergovernmental Panel on Climate Change (2007a) Climate Change 2007: Synthesis report. Intergovernmental Panel on Climate Change Fourth Assessment Report, p. 70, 1-72.

IPCC – Intergovernmental Panel on Climate Change (2007b) Climate Change 2007: the physical science basis. Contribution of working group I to the fourth assessment report of the Intergovernmental Panel on Climate Change. 2007, Cambridge, UK, Cambridge University Press.

IPCC – Intergovernmental Panel on Climate Change (2007c) Climate Change 2007: Mitigation of Climate Change, Contribution of working group III to the fourth assessment report of the Intergovernmental Panel on Climate Change. 2007, Cambridge, UK, Cambridge University Press.

ITTO – International Tropical Timber Organization (2008) Developing forest certification towards increasing the comparability and acceptance of forest certification systems worldwide. Technical Series 29, URL: http://illegal-logging.info/uploads/TS29.pdf (last access Nov 10, 2009).

Johnstone, N. and Bishop, J. (2007) Private Sector Participation in Natural Resource Management: What Relevance in Developing Countries? International Review of Environmental and Resource Economics 1: 67–109.

Kapos, V.; Ravilious, C.; Campbell, A.; Dickson, B.; Gibbs, H. K.; Hansen, M. C.; Lysenko, I.; Miles, L.; Price, J.; Scharlemann, J. P. W. and Trumper K. C. (2008) Carbon and biodiversity: a demonstration atlas. UNEP-WCMC, Cambridge, UK.

Karousakis, K (2009) Promoting Biodiversity Co-benefits in REDD. Organisation for Economic Development and Co-operation – OECD Paris.

Karousakis, K and Corfee-Morlot, J. (2007) Financing Mechanisms to Reduce Emissions from Deforestation: Issues in Design and Implementation. Organisation for Economic Development and Co-operation – OECD Paris.

Kindermann, G.; Obersteiner, M.; Sohngen, B.; Sathaye, J.; Andrasko, K.; Rametsteiner, E.; Schlamadinger, B.; Wunder, S. and Beach, R. (2008) Global cost estimates of reducing carbon emissions through avoided deforestation. PNAS.

Köllner, T.; Schelske, O. and Seidl, I. (2002) Integrating biodiversity into intergovernmental fiscal transfers based on cantonal benchmarking: a Swiss case study. Basic and Applied Ecology 3: 381 391.

Land Trust Alliance (2006) 2005 National land trust census. Land Trust Alliance, Washington, D.C. URL: http://www.sfbayjv.org/tools/ConservationEasementsBiodiversityProtectionandPrivateUse.pdf (last access Dec 6, 2009).

Leverington, F.; Hockings, M. and Lemos Costa, K. (2008) Management Effectiveness Evaluation in Protected Areas: A global study. The University of Queensland, IUCN, WWF, The Nature Conservancy, Gatton, Queensland.

Lindsey, R. (2007) Tropical Deforestation. NASA Earth Observatory, 30 March 2007, URL: http://earthobservatory.nasa.gov/Features/Deforestation/ (last access Nov 12, 2009).

MA – Millennium Ecosystem Assessment (2005a) Ecosystems and human well-being: biodiversity synthesis. World Resources Institute, Washington, D.C.

MA – Millennium Ecosystem Assessment (2005b) Ecosystems and Human Well-being: General Synthesis. World Resources Institute, Washington, D.C.

MacMillan, D.; Hanley N. and Daw M. (2004) Costs and benefits of wild goose conservation in Scotland,. Biological Conservation 119:475–485.

MAFF – Forestry Agency, Ministry of Agriculture, Forestry and Fisheries of Japan (2008) Annual Report on Trends in Forests and Forestry.

Marengo, J. A.; Soares, W. R.; Saulo, C. and Nicolini, M. (2004) Climatology of the low-level jet east of the Andes as derived from the NCEP-NCAR reanalyses: Characteristics and temporal variability. Journal of Climate 17: 2261-2280.

Mastny, L. (2001) Worldwatch Paper #159: Travelling Light: New Paths for International Tourism. ISBN: 1-878071-61-0 88 pages p. 37. cited here http://www.mekongtourism.org/site/uploads/media/IETS_Ecotourism_Fact_Sheet_-_Global_1__01.pdf (last access Dec 13, 2009).

May, P. H.; Veiga Neto, F.; Denardin, V. and Loureiro, W. (2002) Using fiscal instruments to encourage conservation: Municipal responses to the “ecological” value-added tax in Paraná and Minas Gerais, Brazil. In Pagiola, S.; Bishop, J. and Landell-Mills, N (eds) Selling forest environmental services: Market-based mechanisms for conservation and development. London: Earthscan, 173–199.

MEFT – Ministère de l'Environnement des Forêts et du Tourisme ; USAID - United States Agency for International Development and CI - Conservation International (2009) Evolution de la couverture de forêts naturelles à Madagascar, 1990-2000-2005. Conservation International, Antananarivo.

Menzies D (2002) Conflict or Collaboration? The New Zealand Forest Accord. Chapter 5 in ten Brink P (ed) Voluntary Environmental Agreements: Process and Practice, and Future Trends. Greenleaf Publishing, March 2002.

Meridian Institute (2009) Reducing Emissions from Deforestation and Forest Degradation (REDD): An Options Assessment Report. Prepared for the Government of Norway, by Angelsen, A.; Brown, S.; Loisel, C.; Peskett, L.; Streck, C. and Zarin. D, URL: http://www.REDD-OAR.org (last access Nov 10, 2009).

Merson, J. (2000) Bio-prospecting or bio-piracy: intellectual property rights and biodiversity in a colonial and postcolonial context. Osiris 15: 282-296.

Meyer, C. and Schweppe-Kraft, B. (Eds.) (2006) Integration ökologischer Aspekte in die Finanzpolitik. BfN-Skripten, 167, Bonn.

Mulholland D.M. and Wilman E.A. (1998) Bioprospecting and Biodiversity Contracts. Working Papers in Ecological Economics 9806, Australian National University, Centre for Resource and Environmental Studies, Ecological Economics Program.

Muñoz-Piña, C.; Guevara, A.; Torres, J.M. and Braña, J. (2007) Paying for the Hydrological Services of Mexico’s Forests: Analysis, Negotiation, and Results. Ecological Economics 65(4); 725-736.

Nepstad, D.; Soares Filho, B.; Merry, F.; Moutinho, P.; Rodrigues, H.O.; Bowman, M.; Schwartzman, S.; Almeida, O. and Rivero, S. (2007) The Costs and Benefits of Reducing Carbon Emissions from Deforestation and Forest Degradation in the Brazilian Amazon. Woods Hole Research Center, Woods Hole, Massachusetts, USA. URL: http://www.whrc.org/policy/BaliReports/assets/WHRC_Amazon_REDD.pdf (last access Dec 9, 2009).

Neto, R.B. and Dickson, D. (1999) $3m deal launches major hunt for drug leads in Brazil. Nature 400: 302.

Niedersächsisches Umweltministerium, Niedersächsisches Landesamt für Ökologie (2002) 10 Jahre Trinkwasserschutz in Niedersachsen. Modell der Kooperation zwischen Landwirtschaft und Wasserwirtschaft. Hannover (Umweltministerium). URL: http://cdl.niedersachsen.de/blob/images/C1202143_L20.pdf (last access Sept 9, 2009).

OECD – Organisation for Economic Development and Co-operation (1999) Handbook on Incentive Measures for Biodiversity. Organisation for Economic Development and Co-operation, Paris.

OECD – Organisation for Economic Development and Co-operation (2003) Economic Issues in Access and Benefit Sharing of Genetic Resources: A Framework for Analysis. Paris / Working Party on Global and Structural Policies / Working Group on Economic Aspects of Biodiversity.

OECD – Organisation for Economic Development and Co-operation (2005) Environmental Fiscal Reform for Poverty Reduction. Organisation for Economic Development and Co-operation, Paris.

OECD – Organisation for Economic Development and Co-operation (2009) International Financing for Biodiversity Conservation: An Overview of Innovative Approaches and Persistent Challenges. Organisation for Economic Development and Co-operation, Paris.

Öko-Institut and ICLEI (2006) Costs and Benefits of Green Public Procurement in Europe. Final report to DG Environment of the European Commission. Service contract number: DG ENV.G.2/SER/2006/0097r, Freiburg, 26 July 2007.

Olsen, N. and Bishop, J. (2009) The Financial Costs of REDD: Evidence from Brazil and Indonesia. IUCN: Gland.

Pagiola, S.; Landell-Mills, N.; and Bishop, J. (2002) Making Market-based Mechanisms Work for Forests and People in Pagiola, S.; Bishop, J. and Landell-Mills, N. (eds.) Selling Forest Environmental Services: Market-Based Mechanisms for Conservation and Development. Earthscan: London.

Pagiola, S. (2003) Paying for Water Services. World Conservation, No. 1, World Bank, Washington, D.C.

Pagiola, S. (2008) Payments for environmental services in Costa Rica. Ecological Economics 65(4): 712–725.

Parker, C.; Mitchell, A.; Trivedi, M. and Mardas, N. (2009) The Little REDD+ Book. Global Canopy Programme, URL: http://www.globalcanopy.org/themedia/file/PDFs/LRB_lowres/lrb_en.pdf (last access Nov 10, 2009).

Perrot-Maître, D. (2006) The Vittel payments for ecosystem services: A "perfect" PES case? International Institute for Environment and Development, London.

PNAAPD (2007) Plan national d'action pour des achats publics durables. Ministère de l'Ecologie, de l'Energie, du Développement durable et de la Mer, Paris, URL: http://www.ecologie.gouv.fr/IMG/pdf/PNAAPD.pdf (last access Nov 12, 2009).

Porras I.; Grieg-Gran, M. and Neves, N. (2008) All that glitters: A review of payments for watershed services in developing countries. Natural Resource Issues No. 11. International Institute for Environment and Development. London, UK.

Portela, R. and Rodriguez, M.C. (2008) Environmental services payment in Costa Rica. unpublished manuscript. Conservation International.

PWC - Price Waterhouse Coopers (2009) Collection of Statistical Information on Green Public Procurement in the EU. London.

Rausser, G.C. and Small, A.A. (2000) Valuing Research Leads: Bioprospecting and the Conservation of Genetic Resources. UC Berkeley: Berkeley Program in Law and Economics. URL: http://escholarship.org/uc/item/4t56m5b8 (last access Dec 9, 2009).

Richerhagen, C. and Holm-Mueller, K. (2005) The effectiveness of access and benefit sharing in Costa Rica: implications for national and international regimes. Ecological Economics 53: 445-460.

Ring, I. (2002) Ecological public functions and fiscal equalisation at the local level in Germany. Ecological Economics 42: 415-427.

Ring, I. (2008a) Compensating municipalities for protected areas: Fiscal transfers for biodiversity conservation in Saxony, Germany. GAIA 17(S1): 143-151.

Ring, I. (2008b): Integrating local ecological services into intergovernmental fiscal transfers: the case of the ecological ICMS in Brazil. Land use policy 25(4), 485-497.

Rissman, A.R.; Lozier, L.; Comendant, T.; Kareiva, P.; Kiesecker, J.M.; Shaw, M.R. and Merenlender, A.M. (2007) Conservation Easements: Biodiversity Protection and Private Use. Conservation Biology 21(3): 709–718.

Sampson, G.P. (2005) The World Trade Organization and sustainable development. United Nations University.

Sarr, M. and T. Swanson (2007) The Economics of IPR for Genetic Resources and Traditional Knowledge: North-South Cooperation in Sequential R&D. mimeo., University College London.

Saxon State Ministry for the Environment and Agriculture (2006) Green procurement is simpler than you think. Dresden. URL: www.smul.sachsen.de/umwelt/.../SMUL_BR_Beschaffung_engl.pdf (last access Dec 6, 2009).

SCBD – Secretariat of the Convention on Biological Diversity (2008) Access and Benefit-Sharing in Practice: Trends in Partnerships Across Sectors. Technical Series No. 38, 140 pages, Montreal.

SCBD – Secretariat of the Convention on Biological Diversity (2009) Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change. Montreal, Technical Series No. 41, 126 pages. Montreal.

SCBD and MNP – Secretariat of the Convention on Biological Diversity and Netherlands Environmental Assessment Agency (2007) Cross-roads of Life on Earth — Exploring means to meet the 2010 Biodiversity Target. Solution oriented scenarios for Global Biodiversity Outlook 2. Technical Series no. 31, 90 pages, Montreal.

Science Council of Japan, (2001) Evaluation of the multiple functions of agriculture and forests that concern the global environment and the human living environment. Report and Appendices, November 2008.

Scheele M (2008) Common Agricultural Policy: landscapes goods and environmental services for rural areas. Presentation at 12th Congress of the European Association of Agricultural Economists - Brussels Session "Health check and future perspectives of the CAP: Challenges for agriculture - A day of scientific dialogue" Brussels, 28 August 2008. URL: http://ec.europa.eu/agriculture/events/eaae/2008_en.htm (last access Nov 12,2009).

Similä J.; Thum R.; Varjopuro R. and Ring I. (2006) Protected species in conflict with fisheries: The interplay between European and national regulation. Journal of European Environmental Planning and Law 5:432-445.

Simpson, R.D.; Sedjo, R. and Reid, J. (1996) Valuing Biodiversity for Use in Pharmaceutical Research. Journal of Political Economy 104 (1): 163-185.

Shine, C. (2005) Using tax incentives to conserve and enhance biodiversity in Europe. Council of Europe Publishing, Nature and Environment No. 143.

Sonnino, R. (undated) Creative Public procurement: Lessons from Italy and the UK, in Morgan, K. and Soninno, R. (2008) The School Food Revolution: public food and the challenge of sustainable development. Earthscan, London.

Stern, N. (2006) The Stern Review on the Economics of Climate Change. Cambridge University Press, Cambridge.

Suvantola, L. (in press) The Golden Eagle Compensation Scheme in Finland as an Example of Incentive Measures – Potential for Conflict Management? In: Klenke, R.; Ring, I.; Kranz, A.; Jepsen, N.; Rauschmayer, F. and Henle, K. (Eds.) Human-wildlife conflicts in Europe – Fisheries and fish-eating vertebrates as a model case. Springer, Heidelberg.

Swanson, T. (2009) An International Market Based Instrument to Finance Biodiversity Conservation: Towards a Green Development Mechanism. Report from Amsterdam expert workshop, Swanson, T. and Mullan, K., March 2009.

Swanson, T.; Mullan, K. and Kontoleon, A., (2009) Towards an International Market-Based Instrument to Finance Biodiversity Conservation: Green Development Mechanism Technical Background Paper.

ten Brink P. (Ed.) (2002) Voluntary Environmental Agreements: Process and Practice, and Future Trends. Greenleaf Publishing, Sheffield.

ten Brink, B.; Alkemade, R.; Bakkenes, M.; Clement, J.; Eickhout, B.; Fish, L.; de Heer, M.; Kram, T.; Manders, T.; van Meijl, H.; Miles, L.; Nellemann, C.; Lysenko, I.; van Oorschot, M.; Smout, F.; Tabeau, A.; van Vuuren, D. and Westhoek, H. (2007) Cross-roads of Life on Earth – Exploring means to meet the 2010 biodiversity target. CBD Secretariat, Montreal.

ten Kate, K. and Laird, S.A. (1999) The Commercial Use of Biodiversity. London, Earthscan Publications Ltd.

Tetetay, D. and Tegineh, A. (1991) Traditional tree crop base agroforestry in coffee producing areas of Harerge, Eastern Ethiopia. Agroforestry Systems 16(3): 257-267.

Trivedi, M. R.; Mitchell, A. W.; Mardas, N.; Parker, C.; Watson, J.E. and Nobre, A.D. (2009) REDD and PINC: A new policy framework to fund tropical forests as global 'eco-utilities'. IOP Conference Series: Earth and Environmental Science. Vol 8: Beyond Kyoto: Addressing the Challenges of Climate Change: 012005.

Turner, W.R.; Brandon, K.; Brooks, T.M.; Costanza, R.; da Fonseca, G.A.B. and Portela, R. (2007) Global conservation of biodiversity and ecosystem services. BioScience 57: 868-873.

Turpie, J.K.; Marais, C. and Blignaut, J.N. (2008) The working for water programme: Evolution of a payments for ecosystem services mechanism that addresses both poverty and ecosystem service delivery in South Africa. Ecological Economics 65(4): 788-798.

UNECE – United Nations Economic Commission for Europe (2006) Forest Products Annual Market Review: 2005-06. Geneva Timber and Forest Study Paper 21, United Nations Economic Commission for Europe/FAO, New York and Geneva.

UNECE/FAO – United Nations Economic Commission for Europe and Food Agriculture Organization (2009) Forest Products Annual Market Review: 2008-09. Geneva Timber and Forest Study, United Nations Economic Commission for Europe/Food and Agriculture Organisation, New York and Geneva.

UNEP and IISD – United Nations Environment Programme and International Institute for Sustainable Development (2005) Environment and Trade: A Handbook. UNEP Geneva.

UNEP-WCMC – United Nations Environment Programme World Conservation Monitoring Centre (2008) Carbon and biodiversity: a demonstration atlas (eds) Kapos V.; Ravilious C.; Campbell A.; Dickson B.; Gibbs H.; Hansen M.; Lysenko I.; Miles L.; Price J.; Scharlemann J.P.W. and Trumper K. UNEP-WCMC, Cambridge, England.

US Fish & Wildlife Service. (2007) 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation: National Overview. URL: http://wsfrprograms.fws.gov/Subpages/NationalSurvey/nat_survey2006_final.pdf, (last access 10 Nov, 2009).

van Soest, D.P. and Lesink, R. (2000) Foreign Transfers and Tropical Deforestation: What terms of conditionality? American Journal of Agricultural Economics 88: 389-399.

Vera, C.; Baez, J.; Douglas, M.; Emmanuel, C. B.; Marengo, J.; Meitin, J.; Nicolini, M.; Nogues-Paegle, J.; Paegle, J.; Penalba, O.; Salio, P.; Saulo, C.; Dias, M. A. S.; Dias, P. S. and Zipser, E. (2006) The South American low-level jet experiment. Bulletin of the American Meteorological Society 87, 63-77.

Verburg, R.; Stehfest, E.; Woltjer, G. and Eickhout, B. (2009) The effect of agricultural trade liberalization on land-use related greenhouse gas emissions. Global Environmental Change.

Wertz-Kanounnikoff, S. (2006) Payments for Environmental Services – A solution for biodiversity conservation? Idées pour le Débat 12/2006 (Institut du développement durable et des relations internationales, Paris).

Wertz-Kanounnikof, S. (2008) Estimating the costs of reducing forest emissions. A review of methods. CIFOR Working Paper No. 42, Bogor, Indonesia.

Williamson, O. (1979) Transaction Cost Economics: The Governance of Contractual Relations. Journal of Law and Economics 22: 233 261.

Willer, H. and Yussefi, M. (eds.) (2007) The World of Organic Agriculture. Statistics and Emerging Trends 2007. 9th edition, totally revised and updated. International Federation of Organic Agriculture Movements IFOAM, Bonn, Germany.

World Bank (2005) Environmental Fiscal Reform: What Should Be Done and How to Achieve it. Washington, D.C.

Wunder, S. (2005) Payments for Environmental Services: Some Nuts and Bolts. CIFOR Occasional Paper no. 42.

Wunder, S. (2007) The efficiency of payments for environmental services in tropical conservation. Conservation Biology 21(1): 48–58.

Wunder, S. (2008) Necessary conditions for ecosystem service payments. Paper presented at the Economics and Conservation in the Tropics: A Strategic Dialogue conference, Moore Foundation/ CSF/ RFF, San Francisco, 31st January-1st February, 2005, URL: http://www.rff.org/News/Features/Pages/ConservationStrategiesintheTropics.aspx (last access Nov 10, 2009).

Wunder S. and Wertz-Kanounnikoff, S. (2009) Payments for ecosystem services: a new way of conserving biodiversity in forests. Journal for Sustainable Forestry 28: 576-596.

Yunus, M. (2007) Creating a world without poverty. Public Affairs, New York.

Zanderson M.; Bråten K. G. and Lindhjem H. (2009) Payment for and Management of Ecosystem Services. Issues and Options in the Nordic Context. TeamNord 2009:571 Nordic Council of Ministers, Copenhagen 2009.

Zilberman, D.; Lipper, L. and McCarthy, N. (2006) When are Payments for Environmental Services Beneficial to the Poor? ESA Working Paper No. 06-04 (April), FAO, Rome.