

# Markets for forest environmental services: reality and potential

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*Market mechanisms and regulation are both needed to increase demand for services generated by sustainable forest management.*

**M**arket-based development of environmental services from forests has recently attracted attention as a potential tool for promoting sustainable forest management by providing new sources of financing and incentives to adopt sustainable management practices. Biodiversity, carbon sequestration, watershed protection and forest landscape beauty have been cited as the services with the most market potential. Market-based services appear to have significant potential to complement services financed by the public sector and to contribute to sustainable forest management. Markets are still nascent and the areas affected are small. The expansion of forest-related environmental markets will be slow, with the possible exception of carbon offset trade. Despite recent positive developments it is important to be realistic and avoid overblown expectations.

## CLARIFYING CONCEPTS RELATED TO FOREST ENVIRONMENTAL SERVICES

The concept of forest environmental ser-

vices is construed in a variety of ways. In this article, it refers to ecosystem services provided by forest ecosystems, i.e. desirable outcomes such as flood mitigation and reduced global warming that benefit human beings. Markets for forest environmental services in the strict sense cover only the service flows from forest ecosystems and do not include markets for forest goods (non-wood forest products and wood), irrespective of the end use (Daily, 1999).

The existing literature on markets for (forest) environmental services has often adopted a broad definition of market (e.g. Landell-Mills and Porras, 2002) to refer to any transaction where financial, or sometimes in-kind, compensation is made for providers of an environmental service. These transactions can include government-to-government trading (e.g. through the Global Environment Facility [GEF] or debt-for-nature swaps) or more spontaneous market-driven trading involving the private sector. Underlying this broad definition is the notion of trying to capture environmental values by introducing mechanisms to turn the willingness to pay for environmental services into actual payments. However, it is important to avoid considering all of these interventions as market-based approaches and equating valuation of environmental services with markets for environmental services. For example, many GEF-financed protected area management projects have relied on the State as the manager, controller and "buyer" of the service. These do not have much to do with market-based approaches.

On a similar note, it would be misleading to classify bilateral grant aid or development bank financing for forest biodiversity conservation as market demand, although it can be considered as an indicator of the demand for global biodiversity services. Defining markets

*Biodiversity, carbon sequestration, watershed protection and forest landscape beauty are the forest environmental services that appear to have the most market potential*



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for forest environmental services too broadly may be counterproductive because it may confuse the respective roles of the market (private sector) and the State, lead to the adoption of ineffective policies and development interventions, and result in unfair allocation of benefits and costs (Simpson, 1999). As considered in this article, markets are about bringing together a buyer and a seller so that they can trade commodities, be they services or goods. Consistent with this definition, assessment of the supply and demand factors will ultimately determine the development of markets for forest environmental services.

However, it is sometimes difficult, and also unnecessary, to define markets very narrowly. There is a continuum of market-based approaches, with varying degrees of government involvement. The desirability and relevance of an approach will largely depend on the prevailing socio-economic, competitive and political context.

#### **LIMITED ROLE OF “REAL” MARKETS TO DATE**

At present, extensive markets exist only for forest products that are directly consumable, such as timber. Proper markets rarely exist for environmental services. Forest environmental services, such as watershed protection and biodiversity conservation, cannot be commonly traded in the market mainly because in most cases they can be considered as public goods.

Despite the proliferation of various kinds of private payment schemes for forest environmental services, most schemes still rely on active public-sector involvement and financing. International or public transfer payments, e.g. through the Global Environment Facility (GEF) or bilateral financing, dominate the “markets”. Examples of established markets bringing together

a buyer and a seller interested in trading an environmental forest service in a marketplace are still relatively rare and limited in scope, with the exception of carbon offsets.

The potential of various environmental services for market development varies considerably, because some services lend themselves better to trade, whereas in some cases supply can be best ensured through instruments such as taxation and government regulation (see Table). Many factors influence market creation for environmental services such as demand and supply potential, value and significance of the service, geographic location of the market, commoditization potential, ease of defining and enforcing a property right, degree of excludability (extent to which the owner of the resource can exclude others from exploiting it) and rivalry for the service provided, transaction costs, scientific uncertainty and verification possibilities, and risks. Because the constraints differ, the measures needed to promote markets for environmental services vary depending on the service.

#### **TRANSACTION COSTS AS A HINDRANCE TO MARKET FORMATION**

Transaction costs appear to be a common limiting factor for creating efficient markets for forest-related environmental services. They are often ignored or underestimated, although they can greatly influence price formation for a forest environmental service, especially when significant market creation costs are involved. Transaction costs vary depending on the service but generally include costs associated with the time, effort and resources needed to search out, initiate, negotiate and complete a deal. Transaction costs are also incurred during the operating phase (e.g. for monitoring and verification). Transaction

costs reduce the market size and in some cases (such as watershed management services) can be so high that they hinder the formation of a market.

Means of reducing transaction costs include standardization of project design and approval procedures, certification systems based on standard criteria and indicators, and bundling of environmental services (explained below). Donor agencies have often facilitated market creation by covering transaction costs, but schemes assisted in this way will be financially sustainable only if outside financing continues or ways to reduce transaction costs are identified and adopted. Costa Rica’s Environmental Services Payments Programme, for example, is at present struggling with the sustainability issue.

#### **CARBON OFFSETS AS A GLOBALLY TRADED SERVICE**

Carbon sequestration will probably be the most significant forest-based environmental service in terms of trade. So far, uncertainties regarding ratification of the Kyoto Protocol and final rules for its practical application have hindered full trade development, and trade volume has remained limited. Nevertheless, in 2003 there were about 110 projects covering a total of about 5 million hectares, of which most are related to forest conservation, an activity not allowed for credit by the Kyoto Protocol; the total area of forest plantation projects was only about 450 000 ha (Katila and Puustjärvi, 2003). Currently, the potential to increase carbon sequestration through afforestation or reforestation under the Clean Development Mechanism (CDM) exceeds the demand. Available estimates (Bernoux *et al.*, 2002) suggest that the actual size of this market, in tonnes of carbon permitted under CDM, will be only about one-fifth of the maximum allowed in the first commitment period

### Market development potential of key environmental services provided by forests

Attribute of marketability	Biodiversity	Carbon	Watershed protection	Nature-based tourism
How easily the property right can be defined and enforced	Possible only for some aspects	Easy for carbon credit; sometimes problems with the forest resource	Difficult in many cases	Usually rather easy for specific tourism objects and wildlife, but not possible for landscape protection
Excludability and rivalry	Possible in some cases	Possible for trade in offsets but not for sequestration	Possible in some cases	Not possible for landscape protection
Commoditization potential	Difficult to develop a measurable and verifiable proxy that can be traded	Already commoditized	High potential if forest-watershed service link can be established	High
Demand and supply/value of the service	Supply still exceeding demand in many cases	Both demand and supply expected to increase	Unclear demand and supply; value of service may be limited	High demand; benefits captured by service providers often limited
Locality of market	Mainly global; no secondary markets	Global, national, domestic	Predominantly local; not yet transboundary	International and local
Transaction costs	Can be excessively high	Initially high; can be reduced with growth in trade volume and development of standards	Often high because of large number of actors and difficulty of monitoring	Low to moderate
Scientific uncertainty	High, but with great local variation	Low because scientific evidence is strong	Lack of scientific evidence of benefits main problem for market creation	Not an issue
Risk	High because of scientific uncertainty and enforcement problems	High because many issues still unresolved at international and national levels	Risk of non-delivery of requested services high because of scientific uncertainty	Risk of environmental degradation from excessive consumption
Impact on trade	Mainly local positive impacts, but national and even global impacts from traditional conservation	Considerable value for trade in credits; impacts on trade in forest products likely to be small	Insignificant on the global level, but may have importance at national level in selected countries	Insignificant at national and global levels
Impact on sustainable forest management	Positive contribution, depending on the mechanism, but needs to be improved	Likely to increase plantation area significantly; impact on sustainable forest management and biodiversity likely to be limited unless natural forest management and avoidance of deforestation supported under Kyoto Protocol	Positive contribution; insignificant on the global level, but may have importance at national level in selected countries	Positive but usually small for landscape protection; possible mixed impact from wildlife utilization

(2008 to 2012). Establishing 14 million hectares of new plantations in subtropical areas in the period 2002 to 2012 could satisfy this demand.

The ratification of the Kyoto Protocol by the Russian Federation in November 2004 and the beginning of the European Union Emissions Trading Scheme in 2005 have stimulated carbon trade and associated investments. Unfortunately, the interest in CDM forest sink projects is still relatively limited.

### RESTRICTED MARKETS FOR BIODIVERSITY SERVICES

The proliferation of market-based schemes and data on increased private-sector financing for delivery of biodiversity services suggest that these markets have grown very rapidly recently and that this trend is likely to continue. Protected areas, bioprospecting rights and biodiversity-friendly products are the most common commodities in biodiversity-related trade, with protected areas covering more than 90 percent of the area (with some overlap). They have traditionally been managed with financing from the public sector, including financing through non-governmental organizations (NGOs) and international conservation organizations. Private forest conservation areas are becoming more common but still account for no more than a few percent of total protected areas except in a few countries in southern Africa and Central America.

Conservation easements and conservation concessions bring new forest areas under protection while allowing restricted but continuous use of land for production purposes; they are becoming increasingly popular because of their simplicity. A conservation easement is a legal agreement under which a non-profit land trust, government agency or NGO that wants to protect certain ecosystems pays a landowner to manage his or her

land sustainably to provide environmental services such as ecosystem protection, watershed management and scenery. This type of agreement has gained ground especially in the United States, where about 1 million hectares have been protected in this way. The Government of Guyana granted Conservation International the first conservation concession, covering 80 000 ha, in 2002. Recently, a Peruvian NGO, with help from Conservation International, was granted a concession covering about 135 000 ha.

As a whole, the supply of conservation opportunities still far outstrips willingness to pay for conservation. High competition in supply, i.e. between projects available for funding, and relatively low competition in demand tend to push the payments for conservation low, barely above the opportunity cost of land. This suggests that more emphasis must be paid to measures that strengthen the demand side to enhance competition and willingness to pay for management and conservation of biodiversity. Difficulties in commoditizing biodiversity services pose a major challenge to their development (see Table).

#### **GROWING MARKETS FOR SERVICES ASSOCIATED WITH NATURE-BASED TOURISM**

Forests provide many services contributing to the development of nature-based tourism and recreation. However,

it is difficult to estimate the share of forest-based services in the markets for nature-based tourism, and the estimates on the significance of nature-based tourism themselves vary widely. Yet the growth rate of nature-based tourism has been estimated to be higher than that of tourism overall (TIES, 2003).

The provision of forest-based services is typically compensated from revenue that is generated by nature-based tourism and used to manage protected areas. The overall growth of nature-based tourism will provide increased financing to protected area management, but the present trends suggest that government budgets will remain the main source of revenue, at least in the short and medium term. There are a few successful cases, such as Costa Rica, where tourism generates more than a quarter of total funding for public protected areas. However, in most countries, both developed and developing, tourism-based revenue accounts for much less (usually zero to 15 percent) (Katila and Puustjärvi, 2003).

Outside protected areas, hunting leases are a significant source of revenue for forest landowners in some regions. Some

of the highest levels have been reported the United States; in the southeastern states annual hunting and fishing rights for all game species range from US\$5 to \$100 per hectare (MSU, 2001).

The market for nature-based tourism and associated forest-based services is large and expanding. Thus the problem lies less in market creation than in ensuring that a fair share of the benefits are channelled back into the management of protected and conservation areas. Unless this can be achieved, nature-based tourism may be good for business but may have limited impact on the sustainability of resource use.

#### **GOOD DEMAND PROSPECTS FOR WATERSHED SERVICES**

Watershed services were among the first forest environmental services recognized to have potential for market-based transactions. The basic notion, where upstream action generates benefits downstream and the beneficiaries pay for the service, is usually understood and accepted by the public. The existing markets for watershed services, however, are modest and local, often involving wa-

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tersheds that supply nearby urban or rural settlements. Typically, payment schemes are confined within national boundaries. On a global scale market-based arrangements represent a small portion of all watersheds; in terms of forest area the existing arrangements seldom cover more than 10 000 ha in one country. In the United States, in China and in Viet Nam the area covered by these schemes exceeds 100 000 ha, but these areas are still very small in relation to the total watershed area in each of the countries (Katila and Puustjärvi, 2003).

By far the most common arrangement, in terms of area covered, is a public payment scheme where funding for tree planting or protection of natural forest in the watershed area comes from national, subnational or municipal government budgets, not from direct beneficiaries. In some cases beneficiaries contribute complementary financing, for example select industries in China and hydropower companies in Costa Rica (Lu *et al.*, 2002; Pagiola, 2002). Arrangements organized without government involvement are rare; they tend to emerge in exceptional circumstances

where the benefits are substantial and the link between watershed protection and downstream benefits is very direct and clear. Other arrangements such as trading schemes and payments by private trusts are emerging and even expanding in the developed world, but the lack of a robust institutional framework and private capital hinder their advance in developing countries. In the future, it is likely that public payment schemes will remain the dominant arrangement because of the high transaction costs involved in other types of arrangement and the public-good nature of watershed services.

A number of factors constrain demand, in particular a lack of scientific evidence on the contribution of forests to watershed services. Perceptions on the impacts of forest cover and various management interventions vary widely and are often contradictory. For instance, the payment scheme in use in South Africa applies logic that is opposite to the general vein; a charge is levied on commercial afforestation areas (including those in watersheds) to compensate for the capture of water by trees (Department of Water Affairs and Forestry, 2004).

The future development of markets for forest-based watershed services is subject to many uncertainties. Currently, the main drivers behind demand are continued degradation of watersheds and the failure of regulatory measures to protect them adequately, while at the same time the demand for clean water is increasing. Greater scarcity of clean and safe drinking-water may enhance the value of watershed services and give a boost to development of market-based watershed mechanisms.

#### **INCREASING DEMAND FOR BUNDLED ENVIRONMENTAL SERVICES**

The costs associated with creating a functioning marketplace for environmental services and carrying out market transactions limit the markets for forest environmental services. In many cases forests provide various services jointly, such as watershed services, biodiversity and carbon sequestration. Selling environmental services together (“bundling”) can reduce transaction costs from both the supply and demand perspectives. Markets for bundled environmental services are expanding, especially because of developments in the supply and intermediary mechanisms and increasing awareness of the opportunities provided by joint production.

Examples include the FACE Foundation and the World Bank’s Prototype



*In the most common type of payment for watershed services, tree planting or forest protection in the watershed area is funded from national, subnational or municipal government budgets, not direct beneficiaries*

Carbon Fund, which bundle carbon services and other environmental services. Costa Rica's Environmental Services Payments Programme has developed a sophisticated market infrastructure for selling different services such as watershed management, landscape beauty, biodiversity and carbon reduction units (a shopping-basket approach) to local, national and international buyers while bundling payments to land managers (Chomitz, Brenes and Constantino, 1998; Landell-Mills and Porras, 2002).

#### NEED FOR VERIFICATION

The expansion of markets for forest environmental services will require verification to ensure credibility of the service delivery; private investors and other beneficiaries want to know that they get what they pay for. Buyers of services also require transparency and accountability. Independent third-party certification would help land managers gain public confidence and credibility. However, verification and certification add to the transaction costs and consequently reduce market opportunities – except in the case of bundled services, where certification can reduce the transaction costs and facilitate marketing of multiple services. Linking verification of environmental services with certification of sustainable forest management is another option to reduce transaction costs. However, not all certification criteria are necessarily consistent with the production of a given environmental service.

#### CONCLUSIONS

The emerging markets for forest environmental services could offer an opportunity for low-income forest owners and managers in many locations to benefit economically from good stewardship of their forest resources, especially in developed countries. However, markets may be too limited in size to provide impetus for

improved practices. Direct payment schemes for managing and conserving forest biodiversity, including conservation concessions and easements and private conservation funding, are expected to have the most positive impacts on sustainable forest management. The positive impacts of other mechanisms will depend on how closely the marketed commodity is related to the environmental service itself. Most market-based mechanisms will mainly influence the sustainability of already existing forest conservation areas. The challenge is to turn the increased revenue flows to incentives for resource managers to adopt more sustainable practices.

Markets cannot develop and operate without government interventions. International environmental agreements and regulations have a strong potential to increase demand for services generated by sustainable forest management. Markets and regulation are both needed; at issue are the balance between the two and the strengths and weaknesses of the market mechanism. The incentives for sustainable forest management will only be created if the revenue generated by establishing markets for forest environmental services exceeds the total market costs, and the "profit" is channelled equitably to the land stewards. ♦



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