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The Value of Forests

Payments for Ecosystem Services in a Green Economy

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THE VALUE OF FORESTS

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Abstract

Payments for Ecosystem Services (PES) describes the situation where the user of an environmental service, such as water purification, pays the landowners who provide that service. For PES to exist, there must be a clearly defined user and supplier, as well as a number of other necessary conditions, which are defined in this document using a summary of current sources. Particular attention is paid to how these conditions currently obtain within the UNECE region. The range of forest environment services is explored through fourteen detailed case studies, which examine best practice in promoting PES. Political and public relations implications of PES are discussed at length, and recommendations include the need for clarity about where PES may be a useful tool in moving towards a green economy and where other methods may be more appropriate.

Keywords

Biodiversity, ecosystem, environmental, erosion, forest policy, forest services, green economy, habitat, leakage, monitoring, payment for ecosystem services, PES, private, protective functions, public, recreation, subsidies, tenure, timber, tourism

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Preface

What is the value of sitting under a forest tree's shade, and enjoying a cool drink of water or lunch? What is the value of a vista of a pristine grove of conifers or a stand of hardwood trees in full autumn colour? And how do we place a value on wildlife habitat; protection from floods, landslides, avalanches; and perhaps most important of all, clean water, air and climate? Our forests provide many critical services to humanity. We have long valued the forest for things that have very tangible monetary worth, such as wood and wood products, but we have not been able to demonstrate and capture the values of its services that are difficult to measure or even priceless.

It is not that we don't recognise these services from our forests. We have long understood the importance of the key ecosystem services that our forests provide, but we have been slow to realize that these things could be worth paying for; especially when the costs and responsibility for stewardship of the forest are not in the public sector. Payment for ecosystem services (PES) is a tool to enable a forest owner or owners to capture the financial benefits from the positive externalities derived from forest ecosystem services and encourage them to continue to provide these services to another party or society at large.

This publication is a joint effort of UNEP, UNECE and FAO (through the joint UNECE/FAO Forestry and Timber Sections in Geneva) and discusses the concept of PES, as well as the various approaches, applications and resulting benefits in the UNECE region. It also covers some negatives that could occur without good policy in place. It uses lessons learned to provide guidance on what is needed for the success of PES schemes and their possible future.

UNEP, UNECE and FAO express their appreciation to all those who have played a part in the production of this timely publication and hope that it will highlight the critical role that forests play in maintaining our environment and contributing to a green economy.

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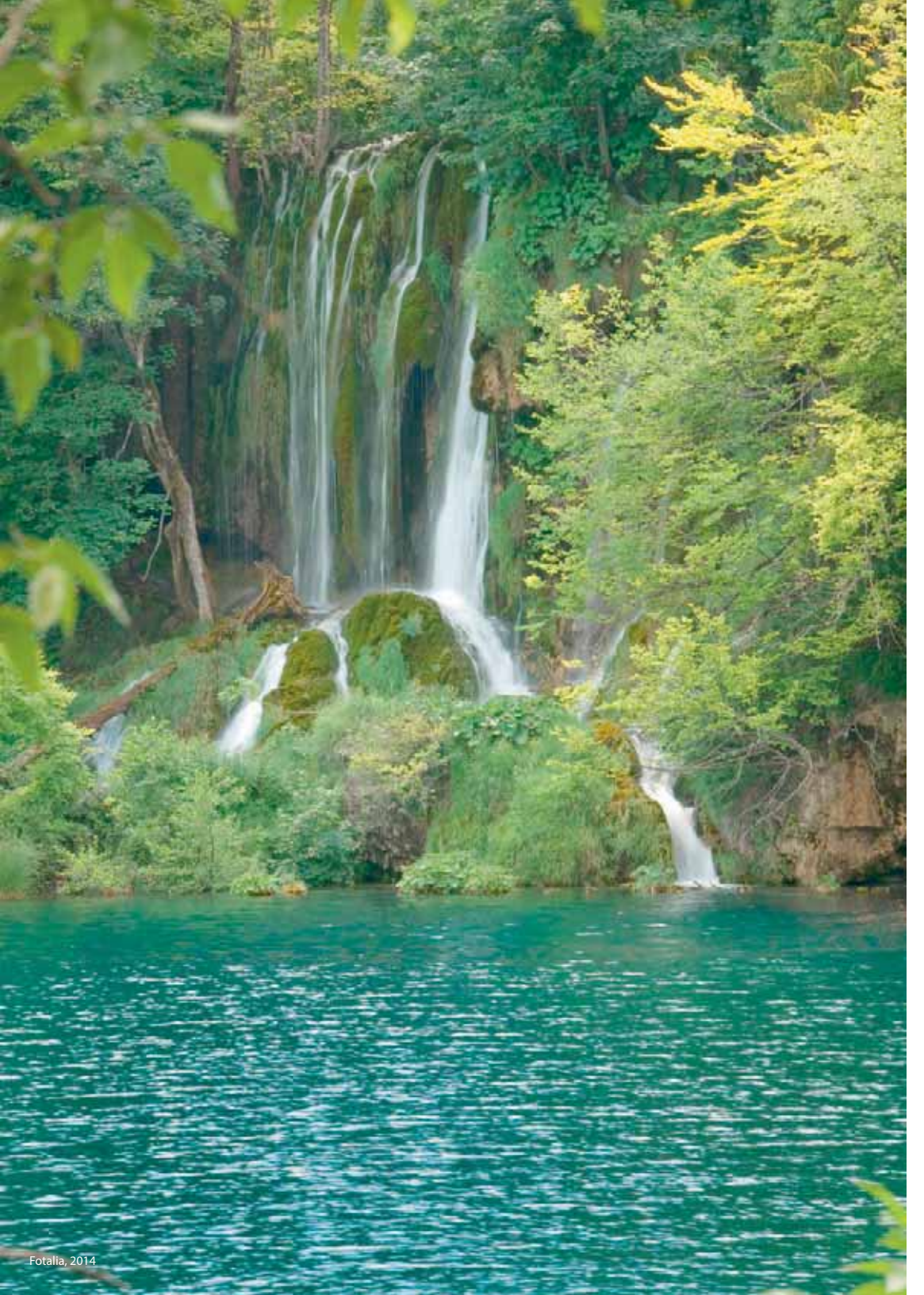


Fotalia, 2014

Introduction

There are a number of definitions for the term 'Payment for Ecosystem services' (PES), but in general it refers to situations where a specific, usually local, agreement is made for users of an ecosystem service to pay the providers of that service. It is distinct from environmental payments such as taxes, subsidies, grants and penalties, because the payment is agreed in advance between the user and provider, and the monies paid go to the provider, not into a general public purse.

So, for example, a firm needing pure drinking water, such as the Coca-Cola® bottling plant at the Tagua Reservoir, Portugal, agrees to pay local forest owners to maintain their forests in good condition so the plant may continue to draw pure water from the reservoir. This successful example is the kind of 'win/win' solution which PES can give, whereby both parties benefit in a way which would not have been the case if the PES option had not been available (Bulgaho, Presentation to ThinkForest Conference, 2012).

PES is generally based on a "user pays" rather than a "polluter pays" principle. Broadly speaking:

User Pays: Under this arrangement, the beneficiary of an environmental service provides payment, whether this is directly for an environmental service such as water purification, maintaining biodiversity, or storage of carbon.

Polluter Pays: In this situation, the parties responsible for damaging the environment are taxed or fined for doing so.

With PES, the fact that the money goes directly to the provider helps ensure that the service will continue to be supplied. This payment can be used to strengthen that particular ecosystem against pressures that may affect it, including climate change. As a voluntary agreement, rather than a tax or fine, it is hoped that there is more willingness to comply from the paying party (though at present no evidence is available to substantiate this) leading to lower transaction costs.

At the time of writing, the majority of PES schemes are unique, often innovative and do not fit easily into subsidy/tax programmes such as the EU Common Agricultural Policy (EU CAP). PES projects are particularly effective tools for rural development, especially where they succeed in bringing together public and private partners. Financing through a PES scheme secures long-term commitments to provide ecosystem services, which may otherwise be hard to achieve, especially in an economic recession. In some situations, PES schemes may be used as an instrument for poverty alleviation, if they provide employment and income for impoverished populations. The local nature of agreements may also be an effective tool for raising awareness about environmental concerns among a local community, although, as mentioned in section 5, partnership agreements of this kind are a change from a more traditional environmental message

in which natural biomes are left untouched, so this awareness-raising will have to be carefully managed.

PES has come to prominence in the past decade as a possible solution to environmental problems. As a relatively new cooperative tool for environmental protection, it is important that it is used carefully, as early failures could bias the public against a useful solution. The following sections examine what is meant by ecosystem services; how they can be valued; what kind of PES agreements have been used so far; the conditions necessary for their success, and possible future directions for PES.

Fotalia, 2014

1. Ecosystem Services

Before discussing how they can be paid for and what types of schemes are available, it is important first to define ecosystem services and the context in which they are found. This section defines what ecosystems are, their different categories, and how these relate to forest ecosystems. It goes on to examine the commitments that have been made towards forest-related PES schemes in Europe.

1. General ecosystem services

The Convention on Biological Diversity (1992) defines an ecosystem as "*a complex of living organisms and the abiotic environment with which they interact in a specified location*." In other words it is a local network of interacting plants and animals, and the landscape in which they live. An ecosystem service therefore, is a direct, measurable benefit from an ecosystem, for example, prevention of soil erosion by forests.

The concept of local agreements to pay for such services was clarified by Wunder (2005) who defined basic principles of PES projects:

- Participation in PES schemes must be free and voluntary.
- The compensated ecosystem service, or land-use, likely to provide the service is well defined.
- At least one provider is involved.
- At least one buyer exists.
- The ecosystem service provider guarantees the availability and conservation of the particular ecosystem service. This proviso is called conditionality: the buyer needs to know they will continue to get what they have paid for.

The UNECE defines PES as "a contractual transaction between a buyer and a seller for an ecosystem service, or a land use/management practice likely to secure that service." (UNECE, 2007). PES therefore covers a variety of arrangements through which the beneficiaries of ecosystem services pay the providers of those services. (Gutman, 2006). It is a range of financing arrangements for the conservation and sustainable use of natural ecosystems, such as forests, to ensure that the cost to the environment is paid for. It is not, therefore, one model to be universally applied, but rather a series of schemes which can be considered for application to particular circumstances, whether or not they exactly conform to the CBD or UNECE definition.

Recent increased promotion of PES has been due, in part, to new research by the UN-sponsored Millennium Ecosystem Assessment (hereafter MA) (Vihervaara et al., 2010). This report assessed the state of the world's ecosystems and examined 24 essential ecosystem services in the context of "benefits people obtain from ecosystems." It found

that over the past 50 years, only four of these services have shown improvement whereas fifteen have shown serious decline, with the remainder under stress in some parts of the world. Practical measures such as PES, that may reverse this tendency, are therefore of great interest to the UNECE.

1.2 Categories of Forest Ecosystem Services

The MA classifies ecosystem services into four types, which apply to forest ecosystems as follows:

Provisioning: Useful physical products of the forest such as food, wood, fibre and fuel.

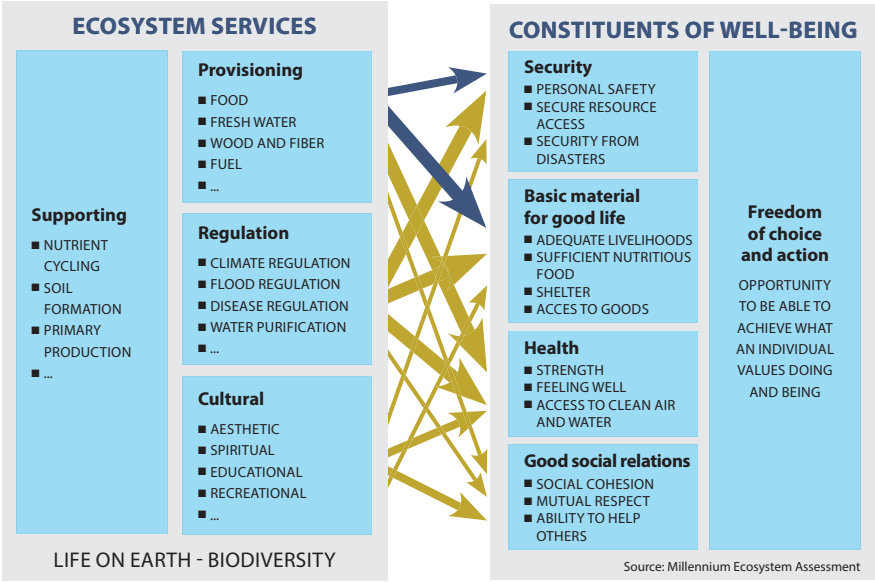
Regulating: These are the 'preventative' benefits of forests: their role in erosion control, flood prevention, climate regulation, carbon sequestration and water purification. As will be shown, this last has been one of the most common areas for PES schemes, partly because benefactors of water purification services are often easier to identify.

Cultural: Forests are sources of aesthetic and spiritual regeneration as well as providing recreation and education, which supplies services for the tourism industry.

Supporting: This describes the role of ecosystems as a 'nursery' for other environmental benefits, such as nutrition cycling and soil formation. Biodiversity services such as species and habitat conservation fall into this category.

The relationships between these different ecosystem services, and their contribution to human well-being, are set out in the diagram below:

Figure 1: Linkages between Ecosystem Services and Human Well-being.



Source: Millennium Ecosystem Assessment. Ecosystems and Human Well-being. A synthesis. p.vi

Forests fit the Wunder's condition of being well-defined areas, and also provide all four ecosystem services:

Provisioning: Models for extraction of provisions from forests have varied widely across the world, from complete deforestation, to commercial schemes which follow a model similar to PES where the goods extracted are paid for directly whilst still contributing to forest well-being. For example, sustainable forest management has been practiced for many decades in Europe and has been shown to lead to healthier forests.

Regulating: Whilst there seems to be a high awareness of the key role of forests in carbon sequestration and purification of water (World Bank/WWF, 2003), their role in climate regulation, flood control, air purification and land stabilization, especially in mountainous areas, (FAO Forest Resources Assessment (FRA), 2005) are ecosystem services which are rarely paid for by the industries and communities which benefit from them.

Cultural: Forests are treasured natural assets for society in general, but in particular are vital to the cultural activities of indigenous societies. Furthermore, modern cultural trends such as ecotourism can also be seen as a cultural service (Millennium Ecosystem Assessment, 2005, p.7), as these generate income for those involved in their promotion. It is not just ecotourism that benefits, however; most non-urban tourist industries would not exist were it not for the natural beauty (rivers, woodlands) that is part of the service they sell.

Supporting: Forests are extraordinarily abundant in life; they provide biodiversity protection, acting as habitats for over half the world's known terrestrial plant and animal species (Millennium Ecosystem Assessment, 2005 p.587). Given that this is half of the genetic and biological wealth of the planet, this may also be an area for future development of PES.

Such is the interest in the potential profitability of PES that stakeholders in forest management and services have formed consortia to collect data and develop models. The recent Newforex conference in Copenhagen, for example, ran workshops considering new methods of cost and valuation of PES, as well as its benefits and pitfalls (Newforex 2012, Copenhagen).

PES schemes may help to maintain or enhance forest ecosystem services where markets and incentive mechanisms are lacking. These schemes are most commonly linked to carbon, water, or biodiversity.

- For example, PES can be used to:
- Enhance biodiversity and to conserve healthy vital forests and other wooded land.
- Strengthen the provision of non-wood forest products.
- Improve water quality.
- Mitigate climate change by sequestering and storing carbon.
- Mitigate flood risk.

PES can be a tool to help maintain the multi-functional role of forests. Forests may be at risk from increased demand for renewable energy, environmental damage and the effects of climate change. Forest ecosystem services and resilience become more crucial, and PES is an important method by which direct payments can be made to maintain these services.

1.3 Commitments towards forest-related PES schemes in the UNECE Region

Within Europe, protecting forests has been rising on the political agenda. The government ministers at the Forest Europe Oslo Conference 2011 called for a legally binding agreement to ensure continuity of all environmental, economic and social forest functions. This built on earlier work, beginning with the Fourth Ministerial Conference on the Protection of Forests in Europe, held in Vienna in May, 2003, which recognized the essential benefits that forests provide. The signatory countries committed to promote incentives that have positive impacts on sustainable forestry, and also to the removal of incentives that have negative impacts. At the Fifth Ministerial Conference, held in Warsaw in 2007, signatory countries and the European Community recognized the vital role that sustainable management of forests plays in protecting water quality, and committed

themselves to implement tools for securing water-related services provided by forests, such as payments for ecosystem services. They also agreed to:

- Enhance the protective role of forests for water and soil as well as mitigating local water-related natural disasters.
- Assess forestation programmes for their effects on quality and quantity of water resources, flood alleviation and soil maintenance.
- Develop and improve policies for forest and water resource management contributing to the maintenance of sustainable ecosystems.
- Assess the economic value of forest services related to quality and quantity of water resources and flood alleviation.
- Incorporate the economic valuation of water-related forest services into policies and strategies on forest and water.
- Facilitate the implementation of measures, including payments for ecosystem services, to diversify the financial basis for sustainable forest management.
- Maintain the protective function of forests.

At the international level, the Strategic Plan for Biodiversity 2011-2020, adopted at the 10th Conference of the Parties to the Convention on Biological Diversity (COP-10) in Nagoya, Japan contained the following goals:

Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society.

Goal B: Reduce the direct pressures on biodiversity and promote sustainable use.

Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

Furthermore the Convention on Biological Diversity (CBD) mapped out twenty global targets to be achieved by 2020. The following are particularly relevant:

- The integration of biodiversity values into national/local development plans, poverty reduction strategies and planning processes, and incorporation into national accounting and reporting systems as appropriate (target 2).
- The elimination, phase-out or reform of incentives, including subsidies, harmful to biodiversity, and the development and application of positive incentives for the conservation and sustainable use of biodiversity (target 3).
- Taking steps to achieve, or have implemented, plans for sustainable production and consumption and to have kept the impacts of the use of natural resources well within safe ecological limits (target 4).

- The sustainable management of areas under agriculture, aquaculture and forestry, ensuring conservation of biodiversity (target 7).

Other initiatives are also relevant, such as those related to the implementation of the United Nations Convention to Combat Desertification (UNCCD), on the economics of desertification, and on land degradation.

As can be seen from the above, commitment to, the concept of PES is strong in the UNECE region, and many of the conditions (outlined in Section 4) are already in place.

1.4 Green economy, the economics of ecosystems and their services

The Action Plan for the Forest Sector in a Green Economy, developed under the auspices of the ECE Committee on Forests and the Forest Industry and the FAO European Forestry Commission, refers to the need to protect the welfare of all forest stakeholders, with particular reference to compensating suppliers, wherever possible. Payment for Ecosystem services is a possible mechanism for this, and different approaches to the compensation process are addressed.

A number of different economic valuation approaches have been developed to determine the value of ecosystem services and biodiversity. The study on "The Economics of Ecosystems and Biodiversity" hosted by UNEP and financed by the European Commission and other country donors, was launched at the 10th Conference of the Parties to the Convention on Biological Diversity (CBD) in Nagoya, Japan in 2010 and compares different valuation approaches (TEEB, 2010). It also estimates that the global value of ecosystem services may run to several trillions of dollars annually. TEEB presents recommendations to policy makers and the business community at national, international, regional and local levels on how to take proper account of the value of ecosystem services and biodiversity in decision making.

Labelling, certification, and payments for ecosystem services can complement regulation, by encouraging consumers of ecosystem services to recognize and pay for their value. PES should change the economics of ecosystem management to support biodiversity-friendly practices that benefit society as a whole (TEEB).

To be in line with the Action Plan, payments for ecosystem services must encourage resource owners to adopt management practices that maximize social benefits within existing regulations and market incentives. PES may offer an opportunity, therefore, to increase the profitability of conservation, with benefits for both the private landowner and for society. In the absence of PES, landowners might not choose to conserve their land or to maintain a specific ecosystem service unless other incentives, such as tax incentives, or other instruments such as regulation, were in place (TEEB).

Fotalia, 2014

source: Pölkky Oy, 2013

2. Valuation of Ecosystem Services

Agreeing a level of payments for ecosystem services is essential for any PES scheme. A wide range of different methods are available for this, and there will always be differences of opinion between the 'buyer' and 'seller' of an environmental service as to which is the most appropriate. The monetary value of ecosystems depends on the potential payers as well as several other factors, including the long-term sustainability of the service.

With any type of scheme in which market-based instruments are being used for ecosystem services (cap-and-trade, subsidy, fines or PES), defining the 'true' value of ecosystem services is a major challenge. There is no accepted universal method but instead a range of approaches. Annex 1 presents a consolidated overview of these.

More specific information on different valuation methods can be found in the CBD Technical Series 28 "An exploration of tools and methodologies for valuation of biodiversity and biodiversity resources and functions" (CBD, 2007), and the TEEB 2010 report "Ecological and Economic Foundations." This also includes an overview of forest services and the valuation methods most suitable for different ecosystem services (Table A2.1b Conceptual matrix based on forest ecosystem services, benefits/value types and valuation approaches).

A more recent document with much useful information on valuing forest services is that of the Advisory Group on Finance Collaborative Partnership on Forests of 2012. The minutes of the June 2012 'Kick-off Meeting' of the Forest Europe Expert Group also contain useful approaches, especially from a European perspective.

Whilst all of the above are useful in enabling parties to bring bids to the table, a perfect method of valuation is not always necessary for establishing successful PES. Valuation can be used to discover how much a buyer would be willing to pay and to develop a payment mechanism – after all, the important point is that all parties agree on the valuation, not that it can be scientifically proven beyond all doubt. In the forestry sector, for example, payments have sometimes been based on opportunity cost linked to foregone timber sales, a method which can be effective even if 'true' value is more complex to ascertain. Ultimately, no matter what figures the different PES partners start with, they will have to agree some type of compromise, influenced by factors such as impact on other ecosystems and sustainability.

As a final point, traditionally, timber production is an environmental service paid for by conventional means, but could continue even where a PES might be considered beneficial to maintain another ecosystem service provided by the forest. If biodiversity is a key priority, it may not necessarily be in conflict with timber production: thinning forest stands can be beneficial as it introduces more light and could help to promote long term stability of the standing trees. Allowing an owner in a PES scheme to produce

timber may well provide the funds for the type of management that will help to protect some of the other key ecosystem services that the forest provides as well as reduce the size of PES payments needed.

A direction for future work might be to clarify how valuation studies carried out by environmental economists are, or are not, used in future in designing PES. It may be that less academic approaches will be needed to help those setting up PES schemes.

source: UNECE/FAO

3. PES SCHEMES IN THE UNECE REGION

A 2011 literature search focused on the UNECE region, North America, Europe and Central Asia, to identify PES schemes. The search found 78 PES schemes were in operation, with 13 under development (Annex 2). Of these 78 schemes, 37 were focused on forest/biodiversity, 28 were watershed-related, and 13 were water quality trading programmes. The PES schemes in operation or being developed were found from:

- The "Web of Science" database (Web of Science, 2013).
- Environmental ministries.
- The internet, using various search terms.
- A review of literature.
- The PES case studies brought to the attention of the secretariat.

The number of PES schemes increases year by year. Many PES programmes are located in Latin America, but there are also numerous schemes in Europe and North America, particularly in forest/biodiversity programmes. It is unlikely that the literature review has identified all the PES schemes, which are in use in the UNECE region. The search does, however, show different types of schemes throughout the region, covering a range of ecosystem services, which may rely on funding from public, private, mixed public/private sources, or trading.

The search uncovered two main approaches to PES:

- Paying to maintain or enhance the services that an ecosystem provides.
- Paying to rescue those services at risk, or prevent a change of land-use with potential negative impacts.

These divided into four main types of financial arrangements:

- Publicly-funded schemes at the local, national and sub-regional levels.
- Private self-organized deals.
- Mixed (public-private schemes).
- Trading schemes.

3.1 Public schemes

In these, a public body, such as a municipality, national or local government is the primary buyer of the ecosystem service, generally a land-use or management practice in the general interest whilst also benefiting local concerns. Public funds are administered and paid out to the service providers (UNECE, 2007, p. 33).

Prominent forest sector examples in Europe include the Southern Finland Forest Biodiversity Programme (METSO) and the KOMET Programme for forest conservation in Finland and Sweden, both of which increased the share of protected forest area (see Examples 1 and 2). These public schemes were instituted by the government to conserve biodiversity and change management practice.

Example 1: The Southern Finland Forest Biodiversity Programme (METSO)

The Southern Finland Forest Biodiversity Programme (METSO) was launched in 2002 to protect forest land in Southern Finland, where most forests are in commercial use by small-scale non-industrial private landowners. The pilot programme introduced new voluntary conservation measures, under which landowners could

- Contract their land for a fixed period.
- Establish a private protected area.
- Sell the land to the state.

This 'nature values trading' mostly led to 10-year contracts and became the flagship instrument of the METSO pilot. Implementation emphasized nature values, which the compensation incentivized protecting.

After the successful pilot, it was extended across the country in 2008 through the METSO II programme, excluding only the northernmost parts of the country, where conservation was already good. The criteria for eligible sites were defined in more detail, and administrators were trained in standardized interpretation of them. Compensation was based on lost timber income only (a good example of the 'opportunity cost' approach mentioned above) and nature values became simply eligibility criteria, not influencing the payments. In Finland, landowners have the right, and sometimes even responsibility, to produce timber and the compensation is for giving up a part of this (Primmer et al., 2010).

Example 2: KOMET Programme, Sweden

This voluntary scheme, initiated by the Swedish Government and introduced in spring 2010 was a partnership of three government bodies with a budget of 11 million SEK in 2011 for administrative costs and covering 9% of Sweden's forest land. It aimed to raise owners' awareness of the conservation value of biologically important forest, and encouraged them to enter nature conservation agreements or other forms of protection for them. Agreements may last for between 1 to 50 years, depending on the site's significance. Owners receive fixed-rate payments to compensate for limitations placed on their management in the interests of nature conservation. For habitat protection sites and nature reserves, owners receive full compensation plus an additional 25%.

Other countries have established voluntary forest conservation schemes to increase the protection of biodiversity and related ecosystem services. In Norway, the Ministry of Environment along with the largest private forest owners' association, identified forests eligible for conservation contracts. In addition, individual forest owners could propose their own land. The government negotiated to purchase eligible forests to establish forest reserves, banning all extractive uses. As in the case of METSO, compensation was for the value of timber, which would otherwise have been sold, and uses a standard formula (Zanderson et al., 2009).

In public payment schemes a public body is responsible for implementation, so there is a need to show public demand for the service and the cost-effectiveness of the mechanism. An ad hoc working group on non-wood forest goods and services under the Standing Forestry Committee of the European Commission found that, "it may be possible to increase the number and value of such schemes through innovative approaches, ideally based on revealed preferences to more convincingly demonstrate the public value of forest goods and services" (Standing Forestry Committee, November, 2008).

Incentive payments also allow governments to support smaller-scale PES schemes. These could take the form of grants for footpath maintenance, as well as third-party transactions such as the 'sale' of tourist services (for example, guided walks through a forest) with a portion of the income channelled to the forest owner. In the Netherlands, for example, an entrance fee is paid to visit some natural sites. In Latvia, entrance fees are charged for the use of special trails or enclosed areas for game watching (Standing Forestry Committee, November, 2008).

As well as payments for conservation, governments can institute fiscal mechanisms such as dedicated taxation. In the United States, the Catskills watershed management was publicly funded through higher water fees which were earmarked to protect the quality of drinking water supplies to New York City.

In the water sector, public schemes usually target services to secure supply (quality and quantity), flood protection and erosion control, usually by the provision of financial incentives to encourage more sustainable land-use. The New York City's Catskills programme is an example of a local-level public scheme (The Catskills/ Delaware Watershed Protection programme (New York) Stanton et al. 2010; FAO 2010 web pages) but public water schemes are often related to improving agricultural practices beyond legal requirements and normal practice. For example, the nitrate strategy of Switzerland encourages farmers to enhance the environment of their farmland (UNECE, 2007, pp. 38-40). Similar schemes also used to pay for the maintenance of forest areas and afforestation or reforestation to ensure high quality drinking water supply for municipalities, such as the canton of Basel (see Example 3).

Example 3: Payments for drinking water from forested catchments Canton Basel-Stadt, Switzerland

Forest covers 12% of the canton of Basel-Stadt. The broadleaf-dominated stands cover an area of 429 hectares, of which 90 hectares are the property of 330 private forest owners. Approximately half of the drinking water for the canton of Basel-Stadt is supplied from the Langen Erlen catchment area. In this area, water from the Rhine is purified in a natural and sustainable way by forest stands. Among other good practices, this also required changes in species composition, such as replacing hybrid poplars, which have damaged the soil, with willows and Prunus avium (wild cherry tree).

In addition, water consumers pay for the sustainable management of forests belonging to the city of Basel through an extra charge in their water bill.

(http://www.waldwissen.net/wald/boden/wsl_wald_wasser/index_DE)

Public schemes tend to be more significant in terms of volume so it is particularly important that their permanence is assessed, ensuring that the ecosystem service continues to be maintained, especially in cases where there is a one-time payment to cancel debt or improve the land.

3.2 Private schemes

In private schemes, privately owned bodies (such as companies, farmers' associations, cooperatives or private individuals) compensate a private landowner for the maintenance of an ecosystem service. The agreement of the Coca-Cola® bottling plant with local forest owners in Portugal is a good example. Payments were made for the owners to maintain their forests in good condition to keep the Tagua Reservoir pure. The bottling plant paid via a voluntarily-negotiated contract. Another example is Vittel (see Example 4 below), where the mineral water company compensates farmers for using sustainable agricultural practices compatible with maintaining water quality. The private funding ensures a steady income flow for maintaining the service.

Typically there is a management entity which administers the contract, collecting the funds from the buyers, disbursing them to the sellers and holding them accountable for the provision of the service (UNECE, 2007).

Privately funded schemes tend to be linked to water as good quality water has a commercial value which is relatively easy to calculate. This is not always so easily done with forest ecosystem services where the protection of soil quality or a key habitat for wildlife, for instance, does not easily translate into a cash value.

Privately funded water-related PES projects therefore abound. Two examples are the cases of Henniez SA., Switzerland (Example 5) and Bionade GmbH, Germany (Example 6). In the first, the forested land is owned by a private company. In the second, external landowners are part of the scheme, both public and private. These examples are included to showcase forest-related examples, which may be replicable to other situations where the maintenance of a sustainably-managed forest is crucial for water quality.

Example 4: Vittel PES Scheme, France

This is one of the most successful examples of a privately initiated PES system. Nestlé Waters, owner of the Vittel brand of bottled water, entered into long-term (30-year) contracts with the 26 largest farm operations in the watershed. Nestlé Waters agreed to abolish the farmers' land-ownership debt, cover the cost of all new farm equipment and assist in modernization with up to 150,000 Euros per farm.

The farmers agreed to follow the management plans prescribed by Agrivair, the environmental consulting firm established by Vittel to oversee the programme. By 2004, after 12 years of operation, the programme succeeded in incorporating 92 percent of the basin's hectares and reducing the baseline nitrogen load of the spring's source waters. The value of direct payments to farmers was concentrated in the first seven years of operation and has decreased afterwards as the programme reached its goal of enrolling all farms in the target watershed service area. Vittel paid $230 per hectare/year for seven years to cover the reduced profitability resulting from the changed management practices. Threats to water quality have now shifted from the rural to the urban areas, and Agrivair is moving its focus to programmes targeting pollution from storm- and waste- water management. (Ecosystem Marketplace, 2010)

Example 5: Henniez SA, Switzerland

Henniez, a mineral water company in Switzerland, extracts water from a natural spring nestled in quiet, secluded woodland, comprising more than 70,000 trees. The forest is partly located in a natural park, the "Domaine d'Henniez": 100 hectares with no intensive agriculture. The forest plays a regulating role for the quality and purity of the natural mineral water. Until the end of the 1970s, the area around the source was used as arable and pasture land but, in the early 1980s, Henniez bought the land, halting arable production to protect its mineral water from pollutants such as nitrate, chloride and pesticides. From 1984, the company planted 200 hectares of new forest in the surrounding area to form a protective belt around the remaining natural meadows in the source area. This has the positive effect of limiting the nitrate content of the mineral water.

(Waldwissen 2013), (Henniez, 2013)

Example 6: The "Drinking water forest" (Trinkwasserwald® e.V.), and its cooperation with BIONADE Corporation, Germany

Starting in 1995, the German NGO Trinkwasserwald®e.V. (Drinking Water Forest) brought together forest owners and privately owned companies to create range of environmental education initiatives. The main goal was the creation of "Drinking water forests" under the Trinkwasserwald®e.V.-slogan: "We plant drinking water". This required the conversion of conifer plantations to deciduous broadleaved forest. The effect has been that, after10 to 12 years, on average there has been an increase in the annual volume of available water of the order of 800,000 litres per hectare. Trinkwasserwald® e.V. organizes the process of creating new drinking water forests together with public or private forest owners. Private contracts are signed between Trinkwasserwalde.V. and the public or private forest landowners for a period of more than 20 years.

In April 2008, Trinkwasserwald®e.V. (Drinking Water Forest Association) started a project with the BIONADE Corporation for sustainable regeneration of drinking water. BIONADE Corporation, a privately owned German company situated in Bavaria in a Biosphere Reserve, needs good quality water for "BIONADE", an organically manufactured non-alcoholic refreshment drink. The partnership between BIONADE Corporation and the NGO Trinkwasserwald® e.V. has resulted in more than 63 hectares of "drinking water forests" throughout Germany. Through its financial support of Trinkwasserwald® e.V., BIONADE Corporation has sustainably generated 50 million litres of additional ground water and drinking water. This action has compensated for the total amount of drinking water used in the "BIONADE" product each year.

The BIONADE Corporation has covered most of the costs of converting the forest land from conifers to broadleaves, including the costs of ground preparation, nursery stock, planting and fencing, possible re-plantings, as well as on-going care and maintenance over several years. The NGO Trinkwasserwald® e.V. is actively acquiring further partners for similar projects across Germany.(www.trinkwasserwald.de Final report study on the Economic value of groundwater and biodiversity in European forests:

http://ec.europa.eu/environment/forests/pdf/grounwater_report.pdf)

3.3 Public-private schemes

In these, the seller is a private entity whilst the buyer (or one of the principal buyers) is also a private individual, but represented by a public body. The PES contract is usually administered by a third-party PES-management entity (UNECE, 2007, p.34), similar to many private schemes.

The Catskills project referenced above could be seen as a scheme of this kind, where the public body acts as a broker between the New York taxpayers and the forest owners, but a better example is the Copenhagen Energy PES scheme (Example 7). The environmental service of improved groundwater quality is assured by a private forest owner agreeing not to use pesticides, as well as by private farmers who sell their land so that it can be afforested. These private persons are compensated by other private persons, the customers of Copenhagen Energy who consume the supplied water, and contribute to Copenhagen Energy's fund. Copenhagen Energy plays the role of an intermediary by collecting money from the clients then investing it to give incentives to private land owners to change forest management practices or to sell their agricultural land.

Example 7: Copenhagen Energy PES scheme

During the last 20 years, Copenhagen Energy Corporation, which delivers drinking water to around one million consumers around Copenhagen, has seen a reduction in supply of about 14 million m^3 of groundwater per year. One of the largest groundwater bodies used by Copenhagen Energy is the Vigersted Well Field from which also 5 million m^3 per year are taken, equal to a year's consumption by 100,000 Copenhageners. Copenhagen Energy has therefore needed to protect this groundwater body through afforestation measures and the designation of well-head protection zones with no pesticides. Two forest-groundwater PES schemes have been developed to have two main effects:

- A change from agriculture to forests through afforestation of mainly broadleaf species.
- Restrictions on the use of fertilizers or pesticides in existing forest areas, and in some cases also replacing conifer stands with broadleaf tree species, to increase groundwater recharge.

To maintain quality of groundwater in the privately-owned forest adjacent to the Vigersted Well Field, Copenhagen Energy pays the private owner not to use pesticides on 95 hectares of the forest. In addition, Copenhagen Energy was able to buy 530 hectares of farm land on which broadleaf trees were then planted. Afforestation activities were implemented and managed by the state and local municipalities.

(Final report study on the Economic value of groundwater and biodiversity in European forests: http://ec.europa.eu/environment/forests/pdf/grounwater_report.pdf)

3.4 Trading schemes and conservation banking/offsets

These usually occur where compensation for the provision of an environmental service comes from funds generated in markets in which permits, quotas or other rights can be exchanged. Among these are "cap-and-trade" schemes, where governments set a cap for the delivery of a particular service and suppliers can either accept the capping level, or trade permits so that others deliver the obligations on their behalf. This includes emissions trading through voluntary and compliance market credits for Reducing Emissions from Deforestation and Forest Degradation (REDD) and water and pollution trading schemes. For example, environmental pollution quotas for nitrate, phosphorus and/or salt discharges can be traded by low polluters to high polluters for whom the buying of permits is cheaper than installing anti-pollution technology. Despite initial difficulties, projects like the Clean Development Mechanism (CDM) where carbon credits can be generated through afforestation and sold in existing markets indicate a possible way forward on this.

Example 8: Moldova Soil Conservation Project

The Moldova Soil Conservation Project, implemented as a Clean Development Mechanism (CDM) project is afforesting and reforesting 20,290 ha of degraded state-owned or communal agricultural lands throughout the country.

The project is expected to sequester about 1.22 million tonnes of CO_2-equivalent (tCO_2eq) by 2012 and about 2.51 million tCO_2eq by 2017. The World Bank BioCarbon Fund will purchase emission reductions of 600,000 tCO_2eq, while the Prototype Carbon Fund purchased 1.3 million tCO_2eq under a separate agreement in 2002. In addition to the World Bank and Moldsilva (the Republic of Moldova's Forestry Agency), 384 local councils represent the participating rural communities.

This will allow investment not previously possible due to financial and capacity constraints of the state forest agency and local councils. The investment will prevent soil erosion and restore degraded lands as well as promote biodiversity benefits from the restored habitats of endangered flora and fauna. The newly forested area will also produce fuel wood, timber and non-timber products to meet the needs of rural communities as well as additional social benefits such as local employment in tree cultivation. The active involvement of local councils, who own about half of the land under the project, is likely to ensure sustainable management of the afforested lands once transferred back to them.

The project has adopted a renewable 20-year crediting period, which is expected to be extended for a further two consecutive 20-year periods, over a total project period of 60 years. The implementation cost for the project during first 11 years (2002-2012), is estimated at $18.74 million. Moldsilva financed the implementation costs during this period andestablished all new plantations and maintained existing plantations on state-owned land. On communal land, the new forests were returned to the municipalities under long-term management contracts.

In October 2012 the United Nations Framework Convention on Climate Change (UNFCCC) announced the first carbon credits generated by the Moldova Soil Conservation Project. 851,911 temporary Certified Emission Reductions (tCER: a tCER is equal to one metric ton of carbon dioxide) were issued, the largest number of carbon credits from a reforestation project in the Accession Countries. The project was cited as "an excellent example of how co-operation between a numbers of forestry actors in a large-scale project can make a difference." (Worldbank 2012)

The success of this project led to the development of a follow-up project – the Moldova Community Forest Development Project, which aims to reforest 8,157 ha of eroded and unproductive agricultural lands. The project, launched in November 2006, brings together Moldsilva and 265 communities with a total investment of $21.7 million over the period 2006-2035. (http://cdm.unfccc.int/Projects/DB/SGS-UKL1216031019.22/view)

(http://www.worldbank.org/en/news/press-release/2012/10/24/world-bank-helps-moldova-restore-degraded-lands-and-earn-carbon-credits)

Example 9: Afforestation with Hazelnut Plantations in Western Georgia

AgriGeorgia, a subsidiary company fully owned by the Ferrero Group, has developed a project to sequester carbon on previously abandoned land in a poor rural region near the Black Sea coast. The plan is to halt land degradation by creating permanent forest cover, whilst providing local communities with sustainable and long-term income opportunities.

The Samegrelo region was a primary supplier of fruit and nuts in Soviet times until the 1990s when the region was left with a serious lack of capacity, including deteriorating infrastructure and uncertain land tenure issues. Land abandonment and degradation followed, aggravated over the last twenty years by slash and burn clearing for grazing and small-scale crop cultivation, deforestation of wind-breaks and illegal waste dumping leading to pollution. Investment in the region is also currently hampered by several risk factors, including those of political, social and armed conflict.

Established in 2007, the project rehabilitates local soil, land and water resources, restoring land production while generating necessary financing from the carbon credits. Afforestation with hazelnut plantations represents a replicable model for the Samegrelo region, offering significant environmental and economic opportunities, including higher employment, income, transfer of technology and know-how. (http://www.carbonfix.info/HAP/)

(http://www.climateprojects.info/GE-HAP/)

Fotalia, 2014

Example 10: Albania Assisted Natural Regeneration Project

The Assisted Natural Regeneration project aims to afforest and reforest badly degraded land. Started in 2010, it will cover about 6,317 ha spread over 24 communes and five regions as part of the Natural Resource Development Project (NRDP), a World Bank loan project. This will establish or maintain sustainable, community-based natural resource management in hilly or mountainous lands, prone to erosion and resource degradation.

Assistance for natural regeneration fits within the afforestation/reforestation definition of the Marrakesh Accords. It also fits the 'Additionality' criterion, which refers to the need to show that achieved levels of services would have not occurred in the absence of PES. In this case natural regeneration was prevented by excessive grazing of goats, so the regeneration can be shown to be additionality as a result of the PES scheme. The activities included in the project are expected to sequester a total of 0.14 Mt CO2eq by 2012 and around 0.25 Mt CO2eq by 2017. The reforestation will help to halt the degradation of forests, soil erosion and loss of vegetative cover. It will also improve water quality and watershed capacity, and reduce siltation of watercourses and reservoirs. The forests will provide valuable habitats for a wide range of native flora and fauna, adding to natural biodiversity. #

The project provides an opportunity to bring critically needed sustainable revenue streams directly to poor rural communities in exchange of public goods and services, and can therefore have a significant impact on the populations' livelihoods. Over 80,000 people will benefit from this project through.

The restored forest serves as a sustainable source of firewood, timber, fruit, fodder and other products for the local communities who currently have usufruct rights. This project supports a participatory approach within the community to reach a common agreement on the selection of sites and their protection from grazing, as well as the planning and implementation of interventions needed to accompany this change. As the source of funds in this case is a World Bank Loan, this example possibly stretches the definition of a PES slightly, but from the point of view of the rural communities it operates in a 'PES-like fashion' and can be used as a model for other, similar projects in future.

This is a comparatively recent project, only fully approved in 2013, and so can be seen as a hopeful sign for future developments.

(http://cdm.unfccc.int/Projects/DB/TUEV-SUED1245851243.49/view)

Within the forestry sector there are also a few examples of public/private conservation banking or offsetting. To explain terms:

Conservation banking is based on the concept that markets can deliver "offsets" to those who need them.

Habitat banking is a type of conservation banking where the particular habitat types are conserved through a compensation activity.

Species banking has the purpose of generating an increase in the population of a particular species through the compensation activity.

The central idea behind conservation banking/offsetting is that 'credits' can be bought by paying for environmental investment elsewhere. The goal of biodiversity offsetting, for example, is to achieve "no net loss" and preferably a net gain of biodiversity

in habitat structure, species composition, ecosystem function, and land use practices associated with biodiversity. "Currencies" can be used to determine biodiversity losses (in destroyed areas) and gains (increases in biodiversity value of restored areas). To determine these, area alone can be considered, or the area and quality of biodiversity. Success can be determined by whether offsets achieved better conservation outcomes than would have occurred if the offset had not taken place (TEEB).

Example 11 refers to conservation banking linked to species protection, which could inspire forest sector policy makers to start similar projects. It should be borne in mind that this approach is only suitable for habitats that can be restored within a reasonable time-frame as lengthy restoration processes may lead to contrary impacts, such as ecological damage.

The EU Habitats Directive also allows for offset schemes. An innovative example exists in France where, through a public bank, a type of trading scheme has been instituted. The scheme, CDC Biodiversité, from the Caisse des Dépôts, a public institution, aims to offset the residual impacts of construction work which could not be avoided or reduced. Project managers subject to legal obligations to offset, or offsetting on a voluntary basis, can be represented by CDC Biodiversité which can also organize environmental operations such as creating "natural assets reserves" likely to be recognized as offsetting measures for land development projects. The first project was launched in the Camargue, on the Crau Plain in France.

Example 11: Conservation Banking in California, USA

To protect endangered species, California introduced conservation banking in 1995. To receive approval to sell endangered species offset credits, agencies must agree to conserve high quality habitats. In addition, a conservation easement, legally restricting the usage of the land covered, must be signed. Normally a permanent endowment fund is set up to pay for ongoing site management and maintenance. Credits can be sold to compensate for public infrastructure projects and the impacts of private development. Since the introduction of the policy, more than 100 conservation banks have been set up in California. The annual market volume for the entire US has been estimated at $200 million. (TEEB for local and regional policymakers. Chapter 8, p.158)

3.5 PES schemes at the regional level

The trans-boundary dimension of watersheds and water-related ecosystems can easily apply to forests. Forest management measures in one region or country could lead to environmental impacts in another, for example, floods caused by forest management measures such as clear fell in the upstream part of a watershed. Existing trans-boundary networks and protected areas might lend themselves to the consideration of PES scheme development. In protected area networks, the type of protection status would need to be assessed, together with the type of scheme, which could possibly be developed, for example linked to biodiversity conservation or offsetting.

Third parties, other than governments or private institutions, often act as project drivers for PES schemes, especially where they expand across national boundaries. This role is often taken by NGOs such as Nature Conservancy in the USA, and the WWF.

Trans-boundary projects currently under development include a number of pilot projects under the auspices of the UNECE Water Convention to implement the earlier "Recommendations on Payments for Ecosystem Service in Integrated Water Resources Management" (UNECE, 2007) in trans-boundary watersheds.

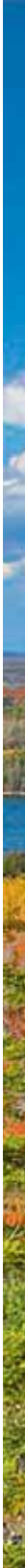
Example 12: Krygyzstan water project

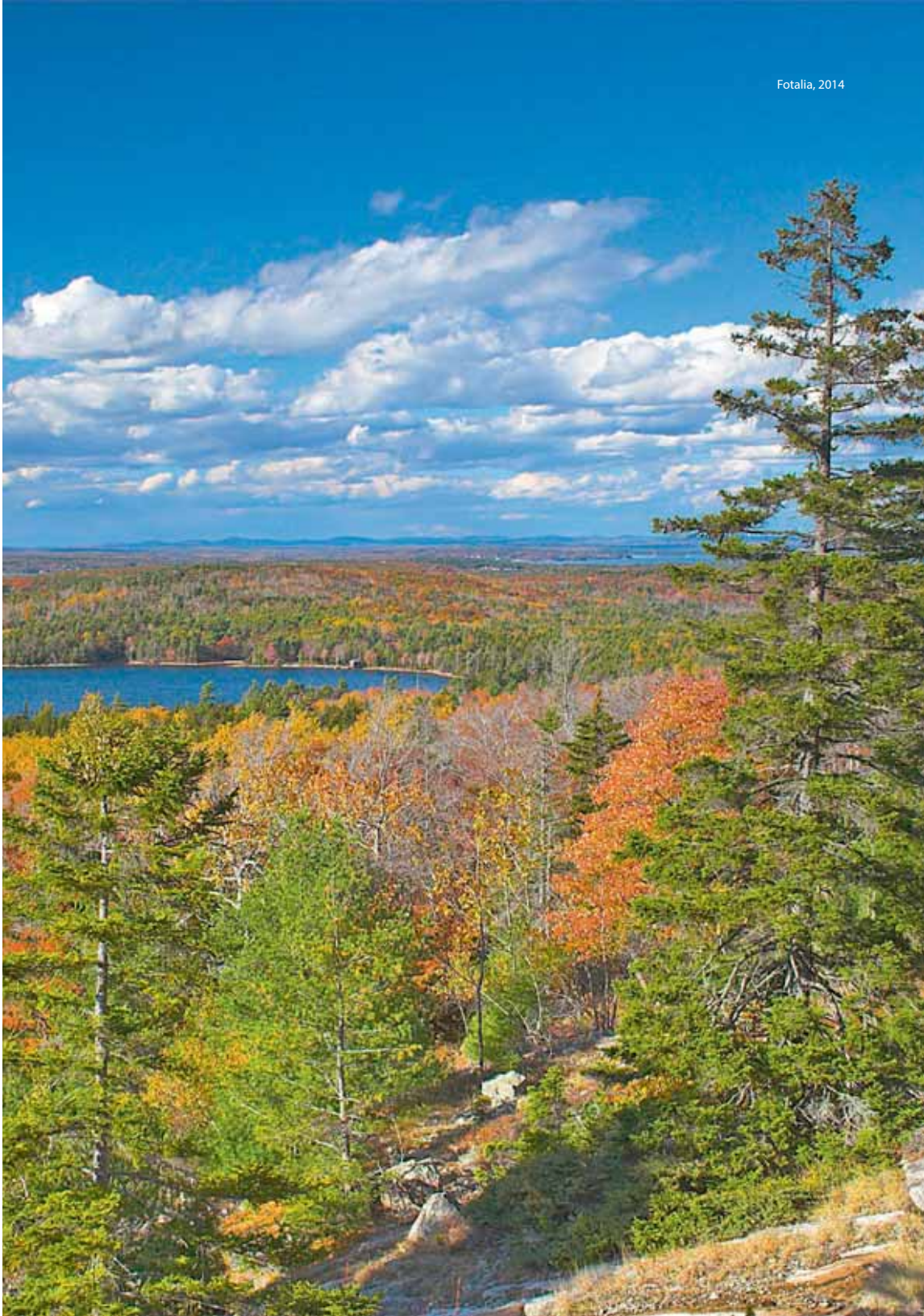
In the area of Lake Issyk-Kul in Kyrgyzstan, a 2006 project led by the Central Asian Regional Environmental Centre (CAREC) focuses on the development of five different PES schemes. One pilot project focuses on improving land use practice within the runoff area in the Chon-Aksuu river basin and the reconstruction of the water-pipeline network of the Temir. The purpose of the project is to change water and land use practices through the implementation of the ecosystem approach. The aim is to provide people with clean drinking water by improving the conditions of water flow formation in the upstream water catchment. The seller of the ecosystem service under this project is the forest located within the water flow formation area of the Chon-Aksuu river basin. The water-user federation along with the population pays the forestry unit for additional expenses caused by the introduction of an ecosystem approach in forest and pasture management.

The project was begun in December 2006, continued and updated 2011, with completion expected end 2013.

(http://www.carecnet.org/programmes-and-activities/environmental-management-and-policy/payment-for-ecosystem-services/integrating-pes-and-reducing-emissions-from-deforestation-and-degradation-redd-in-kyrgyzstan/?lang=en)

Similarly, in Ukraine, project partners are introducing payments for ecosystem services in the border areas of the Tisza River Basin, including a draft toolkit to help public authorities to introduce PES in the Ukrainian part of the river basin.





Fotalia, 2014

Fotalia, 2014

4. Ecosystem services at the policy level: enabling conditions

A number of preconditions for the implementation of PES emerge through the literature and practical experiences. The following list, which is not exhaustive, illustrates some key considerations:

- Legal and Institutional Framework
- Ownership and Tenure rights
- Stakeholders and Negotiations
- Monitoring, Enforcement and Compliance
- Ensuring Permanence and Avoiding Negative Impacts

4.1 Legislative and institutional framework

For PES to succeed, a number of legal and institutional frameworks need to be in place, as well as a particular administrative culture (Primmer et al., 2010). A regulatory framework is needed to:

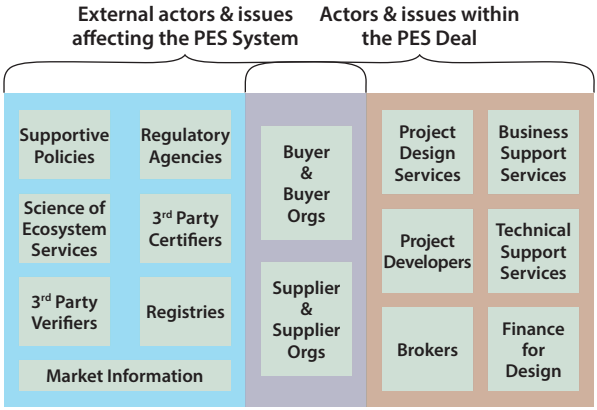
- Allow deployment.
- Legal recognition of services.
- Enabling of contracts and payments.
- Avoid counterproductive or unintended distributional effects.

Rules and institutions must have mechanisms to enforce contracts based on reliable contract law with good governance, and credible enforcement (IUCN, 2006, p.9). Institutions are also important to:

- Facilitate transaction and reduce transaction costs
- Coordinate with other policies and mechanisms
- Set up insurance or other mechanisms to manage risks
- Provide related business services should the need arise

Furthermore, institutions define the roles of different actors in a PES scheme. Figure 2 below demonstrates the range of actors with a role in a PES mechanism, including its establishment and in the maintenance of registers to keep track of payments (TEEB).

Figure 2: Institutional actors involved in PES deals



Source: Adapted from Bracer et al. 2007, TEEB for national and international policy makers. Chapter 5, p.20)

Institutions provide vital direction for the valuation, utilization and conservation of ecosystem services (Vatn, 2010), helping to avoid conflict between the conservation and use of natural resources. Integration of conservation and management can provide traditional natural resource managers with new competencies, improve the sustainability and public perception of their business, and maintain competitiveness (Primmer and Wolf, 2009; Primmer and Karppinen, 2010).

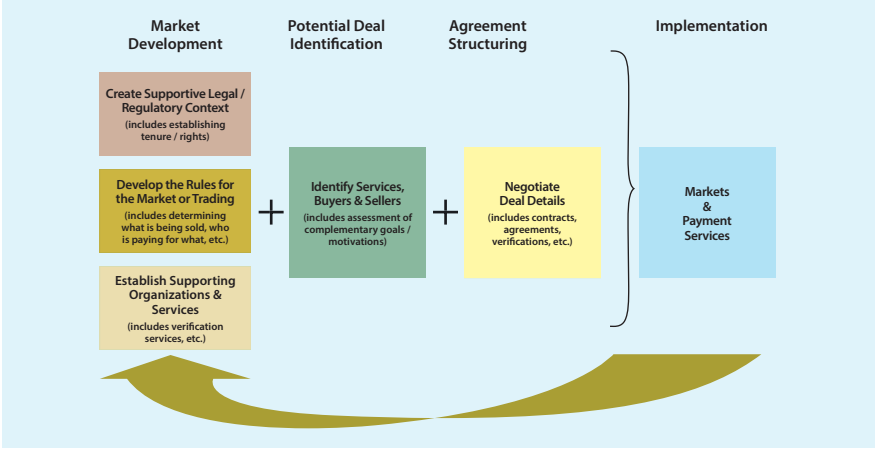
Effective governance is needed to support the establishment of PES schemes via legislation, for example laws to implement a new public payment scheme, which can then be applied for as in the METSO pilot in Finland and KOMET in Sweden. Government support can also enable changes in legislative practice, as has been the case for METSO II in Finland. Legislation can also be amended to include provisions which facilitate PES such as in Bulgaria where, since 2011, PES for forests is part of the forestry law (WWF Danube Carpathian Programme).

Legislation also provides mechanisms to maintain ecosystem values that go beyond PES schemes, for instance in protected areas. In Latvia, for example, a special law regulates compensation for management restrictions on protected natural areas and micro-reserves. In France, numerous fiscal mechanisms apply to protected areas, including land tax exemptions in Natura 2000 areas, and land revenue tax reductions for expenses for the preservation or restoration of protected areas. In Denmark, the private forest sector receives an average of $10 - $15/ha in subsidies for specific management changes, such as the introduction of native species, setting aside forests as nature reserves and using environmentally friendly silvicultural techniques (Standing Forestry Committee, November 2008). As the TEEB recognises agri-environment schemes of this nature as PES schemes, these can also be considered as PES examples.

All the above create a legislative climate in which forest ecosystem services are recognized as having value and in need of conservation/restoration, a necessary prerequisite for forest-based PES schemes to develop.

Ensuring the existence of a supportive legal and regulatory context is, however, only the first of the many steps in PES developments. Further steps can take the form of a review of the existing framework and an assessment of the extent to which it is supportive of PES, as well as establishing supporting organizations and targets. Figure 3 below highlights the main stages in PES development.

Figure 3: Main stages in PES development



Source: Adapted from Brand 2002, TEEB for national and international policy makers Chapter 5, p.18)

The exhaustive WWF survey of Serbian legislation: "Analysis of PES Needs and Feasibility in Serbia" by Goran Seculic (funded by UNEP and GEF) is an excellent example of the type of work referred to in this section. It summarises all the recent changes in Serbian environmental laws (e.g. The Law on Waste), their allowances, penalties funding arrangements (e.g. for forests) and implications for PES. The 2012 paper "Paying for water-related forest services: a survey on Italian payment mechanisms" by Pettenella, Vidale, Gatto and Secco is a good example of a more specific work, examining the impact of one part of a law on water-supply, which is necessary background for any potential water-supply PES scheme.

4.2 Forest tenure rights

For PES to work, forest tenure must be clearly defined and recognized. Tenure is a generic term referring to a variety of arrangements that allocate rights to, and often set conditions on, those who hold land. Tenure regulates access to and use of resources.

"Ownership" refers to a particular type of tenure in which strong rights are allocated to the landholder. Tenure arrangements may involve exclusive access (when only one person or group has access), or different types of access for different groups of people at different times. In addition to inalienable title, there are many other forms of tenure. Tenure theorists describe tenure as a "bundle of rights" (FAO, 2011). These rights need to be effectively registered and administered (IUCN, 2006 PAY, p.9).

The ecosystem service provider must hold the rights to the service as a condition for PES because if property or use rights are unclear, the buyer of the service cannot define the conditions of payment. In situations where the land is 'open access' with no clear private, public or communal owner, PES is not the solution. Instead, collectively defined rules will need to be developed for the management and conservation of the area concerned (Ostrom, 1990; Vatn, 2010). Where resource access and ownership are disputed, "buyers" have little incentive to participate in a PES scheme as there is no guarantee that they will get what they are paying for. (TEEB)

Forests throughout the UNECE region are governed by a range of different ownership and tenure rights. In Europe, for example, approximately half the forested area is privately owned, though this differs significantly from country to country. In Austria, Finland, France, Iceland, Norway, Slovenia and the UK more than 25% of the forested area is privately owned but public ownership is predominant in Bulgaria, the Czech Republic, Lithuania, Poland, Romania, Sweden and Switzerland (Schmithüsen et al., 2010). Similarly, diverse rights apply throughout the Russian Federation and North America. As previously stated, PES schemes are applicable to all situations where ownership is clear, however they are generally easier to apply to private forests and so are currently used on a larger scale in countries with predominantly private ownership. User-rights will also need to be respected, such as the right enshrined in the laws and traditional practice in many countries in Central and Eastern Europe for the public to use the non-wooden products and services of the forest.

4.3 Motivation and responsibilities of landowners

The success of PES is also influenced by the many socio-psychological and socio-cultural factors behind the use and conservation of ecosystem services and their valuation. For example, social motivations about ecosystem services may determine whether PES will encourage further conservation or just supplant voluntary conservation (Vatn, 2010).

It is also important to consider the legal management responsibilities of the landowner in the establishment of PES. For example, if land owners are already responsible for preserving specific trees, modifying this requirement to compensation for setting aside entire habitat patches as part of a PES might face little resistance as the precedent has already been made. However if the land owners have no such responsibility the controls needed to enforce the new PES scheme may be substantial.

Wherever possible, existing rights of landowners should be maintained under PES schemes (Vatn, 2010). For example, Finnish landowners have an exclusive right to produce timber on their land, so their payment is for timber income loss rather than for conservation. This reflects the Finnish cultural view that forest land is primarily for timber production.

For the landowner the opportunity cost of changing practices as part of a PES scheme must not be perceived as too high. It should be possible to improve the supply of the ecosystem service through a change in resource use such as land set aside, and the adoption of more sustainable practices such as the use of water-saving irrigation techniques (Wunder et al 2008).

Much useful documentation is available on this topic, for example the 2012 CEPF Statement on Payments for Ecosystem Services (presented at the 2012 Newforex Conference) gives an excellent overview of the concerns of forest landowners across Europe. Similarly, Gavriil Xanthopolous's 2012 summary of issues affecting Greek forest managers gives valuable insight into their concerns and motivations. (http://www.thinkforest.efi.int/files/attachments/events/2012/xanthopoulos_-_statements_on_pes_made_on_27-11-2012.pdf).

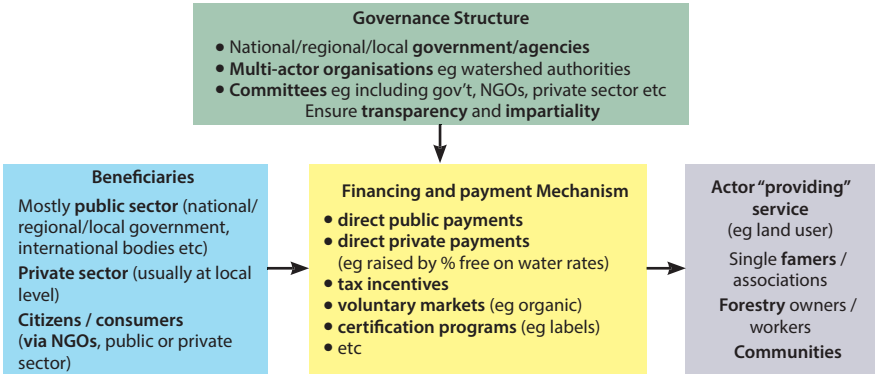
4.4 Stakeholders and negotiations

The forest ecosystem service and its provider must be fully understood for PES to function. As well as being clear about who will benefit, there is a need to assess historical and expected trends in demand and supply as well as other contextual factors. This is vital in targeting payments to those who can actually deliver the desired service (TEEB).

The identification and participation of a number of key stakeholders is also necessary when making a PES agreement in forestry. Figure 4 below presents the variety of forest PES stakeholders and their interactions. As forests are frequently of value to the wider community, or even the entire region, the social context also needs to be taken into account, to identify the parties that need to be involved in the agreement's negotiation. As noted in the TEEB report, "wide participation in decisions relating to PES design and implementation can help ensure transparency and acceptance and to avoid the covert privatization of common resources" (TEEB). Forest stakeholder analysis could help guide negotiations towards an agreement which is socially and politically acceptable as well as institutionally feasible. (IUCN, 2006).

As forest stakeholders may include the general public, or specific groups within it, capacity building and appropriate support are needed to ensure that these potentially weaker-voiced stakeholders are able to participate in negotiations, as successful PES schemes need a strong commitment by all parties. (TEEB). Advocates or representatives will be needed to ensure that that changes to forest use are acceptable to them, and bad-publicity repercussions thereby minimized. (IUCN, 2006, p10).

Figure 4: PES stakeholders and their interactions



Source: Adapted from Pagiola 2003, TEEB for national and international policy makers. Chapter 5, p. 10

Forest PES schemes are easier to implement where there is equal bargaining power between stakeholders, especially the service providers and the 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 provisions and access" (TEEB).

As a result of this, completing a forestry PES deal may take a long time. To complete negotiations successfully all parties need to understand each other's interests, assets, capacities and powers. Throughout the negotiations, "the aim should be to form an agreement that specifies the design and rules for operating a payment scheme, which is effective, efficient, enforceable, transparent, equitable and sustainable" (IUCN, 2006, PAY, p. 8). Given the strong emotional attachment many regions have to their forests, early involvement of the right parties must be ensured, with a mutually acceptable intermediary as facilitator, for example a well-respected local NGO with a track record in forestry, or a community group or trusted government agency.

4.5 Monitoring, enforcement and compliance

All of the forestry PES examples in this document involve long time scales (in some cases, decades) or even permanent change in use. Therefore effective monitoring and enforcement is necessary to ensure the continued functioning of the PES scheme, the delivery of the intended service and its measurement. Payments need to be clearly linked to service provision and should be withdrawn if users of the forest resource abandon management practices associated with the service. Monitoring data of the services at the site can help improve the targeting of payments (TEEB).

How compliance will be determined and monitored needs to be decided in advance. For instance, if compliance is assessed through field inspections of forest conditions,

the methods and procedures used, and access for the institutions involved, need to be determined. Self-monitoring and monitoring by service sellers and buyers using agreed procedures is also an option but, whatever the approach, it is crucial to clearly delineate responsibilities for providing compliance and agree on sanctions in the event of non-compliance (IUCN, 2006, PAY, p.9). As many of forestry PES schemes involve vast areas of land, agreements on sampling and degree of non-compliance or delivery failure will also have to be agreed.

Control systems are an essential part of any PES scheme. Where these are already in place, for example to promote sustainable forest management or agro-environmental schemes, establishing a PES can be easy. However, this is rarely the case and the establishment of new control systems is often required, usually adapted from already existing institutions and structures (Vatn, 2010) and shaped to the PES scheme (Corbera et al., 2007; Primmer et al., 2010).

The effectiveness of forestry PES schemes is closely tied to the regulatory base and enforcement process. The challenge is to work out how much forest owners might be expected to undertake activities at their own expense and how much more they might be willing to do with the support of a PES. This needs to take into account the allocation of environmental rights and duties which may vary widely between different regions and countries. For instance, where downstream populations assert a right to clean water, it may be considered that upstream landowners, such as forest owners and managers, should bear the cost of reducing pollution. On the other hand, if landowners enjoy

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Example 13: The Forestry Commission of Great Britain Woodland Carbon Code

The Woodland Carbon Code is a voluntary code, which is designed to provide reassurance to investors in woodland creation for purposes of carbon sequestration. A number of British companies, including The Green Insurance Company and Marks and Spencer have invested in creation of new woodland, as a result of the Code.

Landowners registered agree to provide independent verification of responsible management of forests, and estimates of carbon sequestration, as well as meeting other criteria. Full details of projects are submitted to the Forestry Commission with the above information as well as long-term plans. In return, the project is registered and thereby its attractiveness to investment increased.

The main focus on the code is on woodland creation, with the additional benefits to biodiversity, recreation, timber and fuel production, soil and water protection and so on.

http://www.forestry.gov.uk/forestry/INFD-863FFL

unencumbered rights to manage their land as they see fit, it may be the beneficiaries of the water services who have to bear the burden of paying them to modify their practices (TEEB). TEEB states that "PES should ideally be used to reward good resource management practices that go beyond legal requirements or customary norms." (TEEB). In the context of forest owners, it is important to understand the management responsibilities which are already part of the forest management plan, so that PES is used only where conservation and the sustainable management of land go beyond obligations stipulated by law.

An example of the type of monitoring framework which needs to be in place for PES scheme is the UK Woodland Carbon Code, instituted by the Forestry Commission of Great Britain. Accreditation systems of this type do not create PES in and of themselves, but are part of the monitoring/enforcement/compliance system which needs to be in place for PES schemes, especially 'cap and trade' ones, to attract serious investment.

4.6 Permanence and avoiding negative impacts

Permanence refers to the provision of an ecosystem service over the long term. This may be undermined by unforeseen events such as fires, hurricanes and the invasion of alien species, or illegal logging. These factors should be taken into account in the PES conservation contract (OECD, 2010, p.52). In this context, climate change adaptation strategies are crucial to ensure the continued provision of PES.

Maximizing the provision of one ecosystem service may have negative impacts on the provision of others, in which case trade-offs will be involved (TEEB). One example of such a trade-off would be the encouragement of a non-indigenous species for rapid carbon sequestration at the expense of other species with higher biodiversity values. Normally this would only be an issue if changes in ecosystem services provision occur

outside the established PES monitoring and accounting framework, therefore, if the risk is high, the monitoring framework would need to be extended beyond the geographic boundaries of the PES programme, to be able to introduce measures to address it (OECD, 2010, p.51).

Other negative impacts include 'leakage' where a PES scheme relieves pressure on one ecosystem, only for it to be moved to another. For example, where payments are made to a forest owner for carbon sequestration, this is of little global use if other forests are felled to make up the difference. The implication here is that further involvement with extra stakeholders is needed, bodies outside the current agreement that will be affected by leakage. It also has strong implications for monitoring to determine if the demand that the PES scheme 'thwarts' is being taken up elsewhere in the region, or, indeed, in the world. Leaving aside the obvious environmental problems of leakage, it could also generate bad publicity that might destroy the chances of future schemes, as it leaves PES schemes open to the accusation that they merely move a problem elsewhere.

There is a similar problem with the concept of 'additionality'. If the payment for an environmental scheme is the sole cause of an environmental benefit, then it is said to demonstrate additionality. However, forest schemes are notoriously multi-factorial, and it can be problematic proving that such a benefit came entirely from actions undertaken by the forest manager/owner as a result of payment, instead of from changes in the law (especially as changes in environmental law are usually a prerequisite of PES schemes), changes in practice that the manager/owner may have instituted anyway, or even knock-on effects from other ecosystems. Once again, the bodies that monitor forest PES schemes may have to cast their net wide to include similar schemes without benefit of PES that can be used as 'control' studies, to demonstrate additionality has actually taken place.

Additionality is of particular concern in forestry as many landowners look after their forests wisely and do not view them simply as purely commercial enterprises. In the United Kingdom, for example, the Forestry Commission has adopted the approach of combining regulation with education and incentives to encourage good forest practice. To qualify for incentives for forest management, owners have to accept the minimum standards laid down in a series of guidelines that cover water, habitats and biodiversity, and archaeology, for instance. Some forest owners adopt higher standards in their forest management than the minimum standards enshrined in the various guidelines. Many other UNECE countries have worked to increase forest-owner awareness of the impact of their activities on others who benefit from the existence of well-managed forests, showing how low-cost changes in management practice may yield disproportionately high benefits to forest stakeholders in terms of conservation and protection of the woodland habitat. Introduction of a PES scheme when such awareness already exists risks losing goodwill, and may have the effect of 'rewarding' landowners who have not promoted good practice.

source: VAPO, 2013

5. What role can PES play in moving towards a green economy?

The Action Plan for the Forest Sector of member states in the UNECE region in a Green Economy (hereafter Action Plan) specifically refers to compensating suppliers for providing ecosystem services wherever possible, and PES is a possible mechanism for providing this. According to TEEB, "there is potential to scale up existing PES (from local initiatives to national coverage), to implement PES in more countries, to make PES more efficient and to address issues of permanence" (TEEB). The possibilities to apply PES at a larger scale and the associated benefits for a green economy are further discussed in this Chapter. The issues for consideration are:

- How expanding PES schemes could lead towards a green economy
- PES as a complement to regulation and other measures
- Political considerations in promoting PES as part of green economy measures

5.1 Expanding PES schemes: towards a green economy

The Action Plan recognizes the forest sector as making a maximal contribution to human well-being through the supply of ecosystem services, and its necessary role in creating a green economy. As has been discussed, implementation of PES is one way to do this, through improving resource management practices beyond the legal minimum, creating income and sustainable livelihoods for rural (and in some cases, urban) populations.

PES could, for example, provide additional income for sustainable forest management practices if there is a willingness to pay for a service they provide. This promotes rural development and ensures that populations maintain their income and livelihoods in rural areas. PES schemes furthermore help to provide sustainable ecosystem services, as the payment component introduces the notion of scarcity of the ecosystem service and encourages its users not to over-use or under-value them.

Scaling up PES schemes would also result in improved, resilient ecosystems. Forest-related PES schemes reduce forest degradation by providing economic incentives to maintain forest ecosystems for their essential functions and services. Such schemes may become increasingly important as the pressure on forests increases due to climate change impacts such as pests, diseases and natural disasters. Further pressure may come on wood resources from forests from renewable energy policies, as steep increases in wood production are required to meet ambitious renewable energy targets. It is increasingly important, therefore, to promote a debate on what is needed to ensure that essential forest ecosystem services are available, in addition to their more widely understood roles in biodiversity conservation and timber production. Discussion of PES would be an essential part of this debate.

5.2 PES as a complement to regulation and other measures

As a market-based approach, some commentators consider PES to be a more effective policy tool than government intervention. Although PES schemes may be viewed as a market solution to environmental problems (e.g. Engel et al., 2008), they seldom operate as pure free markets, but rather as a mixed market-state-community management configuration (Vatn, 2010). Others argue that PES can operate unethically as a hidden subsidy to encourage compliance with existing laws, unfairly burdening public expenses where schemes are entirely government funded. (TEEB). PES can also be seen as a mechanism to enforce the "user-pays principle" which is the variation of the polluter-pays principle calling upon the user of a natural resource to bear the cost of using that resource (OECD, 1997, Glossary of Environment Statistics).

TEEB argues that PES can be more cost-effective than strict enforcement as well as more progressive, in particular where benefits are provided beyond minimum legal requirements. Clearly this depends on the specific national and local circumstances. Voluntary PES agreements can be particularly promising when regulatory or enforcement capacity is weak, or where little or no regulatory authority exists (FAO, 2010). Furthermore, in many cases the buyer has a chance for a public relations gain when they are seen as championing the environment, which would not have been the case if they merely complied with legislation.

PES also has the flexibility to secure potential gains in cost-effectiveness when compared to indirect payments or other regulatory approaches (OECD, 2010; Engel et al., 2008). Voluntary agreements can be a useful alternative to government rules and regulations, as they lead to a more inclusive solution through the involvement of different stakeholders (FAO, 2010).

PES may also work as a temporary measure, motivating new management practices and technologies, which may possibly become economic in their own right over time (Johnstone, N. and Bishop, J. 2007, cited in TEEB for national and international policy makers. Chapter 5, p. 10).

Other voluntary approaches such as certification or labelling may also reward a landowner who practises sustainable land management above the legal minimum. These may complement PES or provide an alternative mechanism. In fact there is an ongoing debate on the extent to which labelling or certification may be considered a PES-type mechanism. Governments could create conditions that favour certification schemes through the adoption of appropriate laws and regulations and though independent certification bodies. These independent bodies are essential to give credibility to 'chain of custody schemes', for example, where goods may be handled by several different organizations.

5.3 The Politics of PES

Whilst the foregoing has made the case for the usefulness and application of PES, it must be acknowledged that this approach does not exist in a vacuum and will need to 'win the hearts and minds' of the governments, private sector and the general public in the countries in which it is hoped it will be adopted. Other apparently benign environmental approaches, such as renewable energy for wood, have turned out to be politically explosive as commentators and eventually populations, have become increasingly concerned about potential or supposed impacts on land for food production. It would be unfortunate for similar bad publicity to engulf the idea of PES.

Much could be written on the possibly political/social impact of PES and how it will be perceived by the public but the foregoing information has implications for the 'public relations' side of PES, for good or ill.

On the plus side, the 'selling points' of PES are:

- Public relations boost for companies: being involved in a PES offers a publicity boost for the companies involved: especially important for sales of products such as bottled water and Coca-Cola®, where competition is intense. Undoubtedly these companies will present themselves as environmental champions, including the information in advertising materials and so on. This is a benefit for the company involved, but it may mean that the reputation of PES may rise or fall with the reputation of these high-profile companies.
- Easy to understand: Funding for environmental protection in most countries is done by complex systems of tax, subsidy, penalty and budget. PES makes a simple link between the use of an environmental service and the payment, which goes directly to providing it. Any system like this which can be easily grasped by the public, the media and opinion formers can be immediately seen to be 'doing good' in environmental matters: forests are saved, water supplies are ensured.
- Raising Awareness: Linked to the above, the easily understood PES arrangements have already been shown to be useful tools in raising awareness about environmental issues with the general public. Whilst there are examples of this effect within the UNECE region, the impact on public awareness only seems to have been measured in a PES programme undertaken in Latin America, specifically Peru.

Example 14: ECOAN Project, Peru

ECOAN, a respected NGO worked with local communities to improve the quality of Polyepsis forests, the wood of which had formerly been used as firewood by the local community. In common with all good PES projects, stakeholders were consulted about possible solutions, which eventually included the provision of more efficient wood-burning stoves to the community, reducing the need for firewood.

In addition, a survey about the degree of the community's environmental awareness and concern before and after the project found that those parties directly involved in the process, perhaps unsurprisingly, had more knowledge and commitment and were more likely to change their actions as a result. Whilst it has been assumed that PES can lead to greater environmental awareness of this kind, at the time of writing only this project seems to have measured it.

Cranford, M., Mourato, S. (2011) Community conservation and a two-stage approach to payments for ecosystem services. *Ecological Economics*. 71: 89–98

These three positives may seem unassailable, but there are three corresponding negatives which may arise:

Paying for Damage: Whilst the emphasis of PES has always been on improving the quality and permanence of environmental systems, it would be easy for media commentators to label the contributions of companies as conscience money, paying for irreplaceable environmental damage. It will be the job of any future PES scheme to address and allay such fears which will undoubtedly arise. Trading schemes will be particularly vulnerable to this criticism.

Seen as Public Relations stunt: one media-friendly aspect of PES projects is that they are high profile with obvious and immediate gains. This very accessibility leaves the projects open to accusations of simple good advertising or PR 'stunts' for the company participating in them. Given the previous environmental record of some private companies currently involved in PES projects, such an accusation could carry considerable force: that the PES project is mere 'window dressing' for an unscrupulous organization which is perfectly willing to despoil the environment elsewhere. Companies such as Coca-Cola and Nestlé have previous environmental 'strikes' against them of this kind, and whilst their wish to restore their environmental credibility is admirable, they may be open to these types of accusations.

Diversion of funds: One of the 'pluses' of PES is that the money paid goes straight to the environmental service provider. It is not gathered as a tax and redistributed across the economy. This could be seen as a downside, however. It could be that the environmental service paid in the PES scheme is not the most vulnerable, or most vital, service in the region, however it will benefit due to its fortunate proximity to an identifiable user. For example, PES tends to favour environments involved with populated regions rather than, remote areas which may be under more environmental stress.

It is also sometimes argued that PES schemes can be unfair and can provide perverse incentives where payments go to those who have degraded or threaten to degrade their land, rather than those already sustainably managing it.

There will be a need for more research and consideration of counters to the above, plus careful forethought over such issues as to which private partners some PES schemes may wish to be involved in. These political considerations need to be given just as much heed as the funding and monitoring resources of a region considering a PES project.

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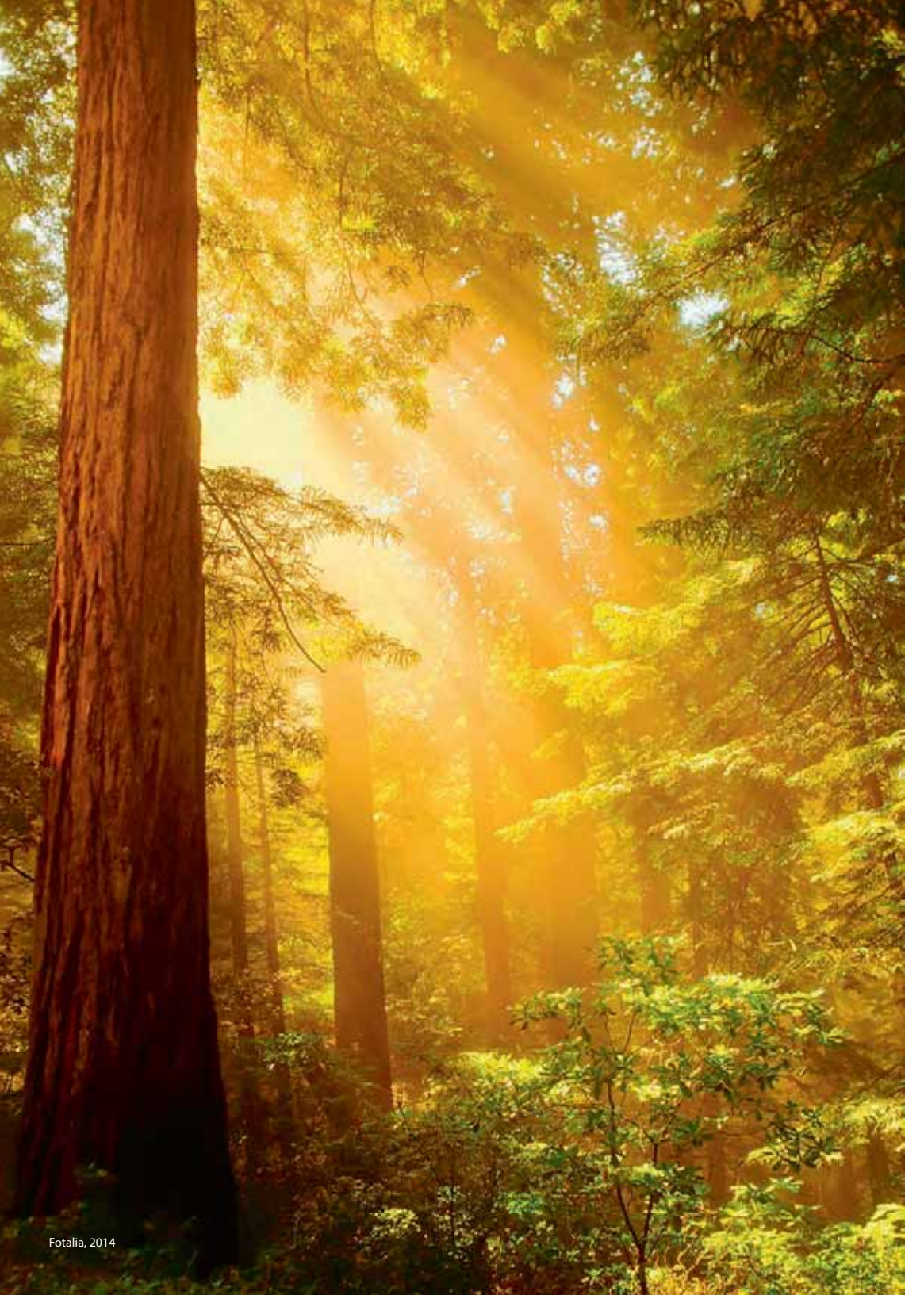

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6. Future directions and recommendations

All of the foregoing should make clear that forest-based PES schemes are not a universal solution and do not respond to all needs. It is a complementary tool to legislation, regulation and democratic accountability. Identifying the tipping point where payment for a forestry environmental service would be used in preference to environmental legislation is not an easy task: cost-benefit analysis and political temperature-taking will be essential, especially given the strong attachment many regions have to their forests. To operate, forest-based PES schemes nevertheless need appropriate legislative and institutional frameworks as well as cost effective implementation. Bundling different services together may help to diminish transaction costs.

As forest use and tenure is usually deeply rooted in a specific region's culture, it seems that PES will need a proliferation of different and larger projects rather than universal adopting of a single model. With this, critical questions will appear that should be addressed, such as negative impacts on the forest and other environments, permanence and additionality. Capacity building is also necessary to implement this approach. Special attention should be paid to securing tenure rights, because land-use is often the basis for schemes which normally compensate a restriction of land-use (timber production for example) or finance specific management measures on a specific type of land.

Some successful schemes have been developed from the demand side: where society and business have been willing to pay for a forest-based environmental service. In any case, consultations with all relevant stakeholders are critical, with special note being taken of how far-flung these may be in the case of forest services. Communication actions should not only be directed at ecosystem providers or buyers; they also should target decision-makers and the general public because political support is often needed, especially during the early phases of development. Pilot projects are often a good way to demonstrate the relevance of PES and show results and, of course, performance should be monitored in the widest sense, as outlined above, in order to win long-term support from donors.

6.1 Recommendations

The UNECE Member States should broadly support the development of PES as a means of achieving some of the goals of the Action Plan. It can aid the successful promulgation of PES by drawing up a Code of Conduct concerning:

1. When to Use: Where its use is appropriate, and where other methods of forest/environmental protection would be more effective.

   Method: Commissioning research on the topic, building on this general paper and other UNECE/UN/FAO resources to come up with a clear questionnaire/guidance document.

2. Valuation: Guidelines on valuation of PES projects to aid stakeholders in negotiating a fair settlement.

   Method: Extending the materials in the Appendix to provide a set of guidelines regarding appropriate valuation methods for different situations and making use of the work currently developed by Forest Europe on Valuation of Forest Ecosystem Services.

3. Monitoring: Guidelines on methods for monitoring compliance, leakage and additionality in PES schemes, with information on which may be appropriate for different schemes.

   Method: Drawing on Forestry and Timber Section expertise concerning monitoring of Forest Ecosystem Protection schemes.

4. Stakeholders: A range of techniques for ensuring the involvement of stakeholders, especially those which may not otherwise be heard (people on low-income, people indigenous to forest areas, the wider public). There should also be guidance on the appropriate level of effort that should be expended on this.

   Method: A survey of methods used in successful PES schemes and elsewhere.

5. In addition, a virtual expert network should be established and supported by a virtual library of documents, valuation methods, case studies and projects on PES and forests, with an up to date list of contacts.

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Fotalia, 2014

Annex 1: Overview of valuation methods

Economic valuation is based on the concept of total economic value. Total economic value can be looked at from two angles: use values and non-use values (see Table 1 below).

Table 1: Possible types of economic value commonly identified in the literature and links to the classification of forest goods and services

Use value			***Non-use value***	
Direct use value	Indirect use value	Option value	Existence value	Bequest value
Extractive, consumptive or structural value, mainly derived from goods that can be extracted, consumed or enjoyed directly	Services that the environment provides	Value attached to maintaining the possibility of obtaining benefits from ecosystem goods and services at a later date, including from ecosystem services that appear to have a low value now, but could have a much higher value in future because of new information and knowledge	Value people derive from the knowledge that something exists, even if they never plan to use it	Value derived from the desire to pass on ecosystems to future generations
Material goods Cultural and amenity services	*Regulating services Supporting services*	*All services*	*All services*	*Supporting services*

Source: Standing Forestry Committee ad hoc Working Group on Valuation and Compensation Methods for Non-wood goods and services, November 2008: http://ec.europa.eu/agriculture/fore/publi/sfc_wgi_final_report_112008_en.pdf).

Use values can be divided into direct use values, indirect use values and option values.

Direct use values can be derived from the actual price paid for an ecosystem service, for example, timber. Economic valuation is thus often quite simply based on adding up the many services that have direct-use and market prices (timber, food, fuel wood, fishing etc.). In addition to commercial value, direct use can also involve non-commercial activities, such as subsistence livelihoods.

Indirect use values are related to regulating and supporting ecosystem services, such as of water cycling, nutrient cycling, filtration of pollutants, pollination, etc. They include "indirect benefits derived from ecosystem services related to the maintenance and protection of natural and human systems[1]", such as the maintenance of water quality and flow, the maintenance of forest biodiversity, recreation, aesthetic appreciation and spiritual values.

Option value is the value individuals place on retaining the possibility of benefiting from ecosystems in the future. This includes ecosystem services that appear to have a low value now, but could have a much higher value in the future, possibly because of new information or knowledge. It could include the value of retaining biodiversity to keep open the future possibility of identifying medicinal plants for pharmaceutical uses, for instance.

Non-use values can be subdivided into existence values and bequest values.

Existence values refer to individuals' willingness to pay to ensure the continued existence of a given ecosystem. It is the value that people derive from the fact that a certain forest or watershed exists, even if they do not use it directly.

Bequest value is the value derived from the desire to pass on the ecosystem intact to future generations, leaving them the option to use the ecosystem in accordance with their own preferences.

With the aim of calculating the **total economic value of ecosystem services**, information is collected on individuals' preferences as seen in their market transactions relating directly to the ecosystem service (the direct market valuation approach). If such information is not available, price information can be derived from other market transactions indirectly associated with the service, or goods, to be valued (the revealed preference approach). Where either direct or indirect price information is not available, hypothetical markets can be created to elicit values (the stated preference approach). Below is a brief synthesis of these different approaches which are presented more fully in the Economics of Ecosystems and Biodiversity (TEEB) initiative[2].

[1] UNECE 2007, p. 26

[2] More information on the different approaches, their application and their limitations can be found in the TEEB report "Ecological and Economic Foundations" Chapter 5 "The Economics of Valuing Ecosystem Services and Biodiversity." TEEB also presents examples of the application of the different valuation approaches to forests and wetlands (Table 5.7, pp. 207-208, Table 5.8 pp. 210-211, "Matrix Table for Wetland and Forest Ecosystems" (Annex Table A21a)) and an overview of the monetary value of ecosystems, e.g. by coastal and inland wetlands (pp. 380, 382), lakes and rivers (p. 384), temperate and boreal forests (p. 388) and woodlands (p. 391).

Direct market valuation approaches comprise the following:

- Market price-based approaches, which are often used in the case of provisioning services such as of timber or water.
- Cost-based approaches, which are essentially an estimation of the costs that would be incurred if ecosystem service benefits needed to be substituted through artificial means. This could comprise the avoided cost method (the cost that would have been incurred in the absence of the ecosystem service, for instance, the value of a flood control service is derived from the estimated damage if flooding did occur); the replacement cost method (the cost incurred in replacing the ecosystem service with artificial technologies, for instance, estimating the value of groundwater recharge from the cost of obtaining water from an alternative source); and, the mitigation or restoration cost method (the cost of mitigating the effects of the loss of ecosystem services, for instance, the cost of installing flood defences in the absence of wetland areas, which would have acted as flood-water receptors).
- Production function-based approaches, which estimate how much a given ecosystem contributes to the delivery of another commodity or service traded on an existing market, for instance, trees in agro-forestry systems act as windbreaks, resulting in raised crop productivity.

Revealed preference approaches are based on the observation of the choices of individuals in existing markets that are related to the ecosystem service that is the subject of the valuation. These comprise the following two methods:

- Travel cost method (TC), based on the logic that recreational experiences are associated with a cost (the direct expenses and the opportunity cost[3]).This is mostly relevant for determining recreational values related to biodiversity and ecosystem services.
- Hedonic pricing (HP) approach, which uses information on what individuals' are willing to pay for an environmental attribute. For instance, the higher cost of property in scenic, forested landscapes can be a proxy for assessing the benefits of a certain recreation area. The value of a change in biodiversity or ecosystem-based quality or service, such as clean air or aesthetic views is reflected in the change of the price (value) of the property.

When undertaking revealed preference valuation studies, it is important to assess whether surrogate markets exist, before deciding which of the two methods should be used. Revealed preference approaches need quality data on transactions since market imperfections and policy failures can distort the estimated monetary value. Revealed preference approaches therefore tend to be expensive and time-consuming.

[3] Opportunity cost here is what the individual would have been doing with the time, if not traveling.

Stated preference valuation approaches, also referred to as "simulated valuation" simulate a market and the demand for ecosystem services through surveys of hypothetical changes in the provision of the ecosystem service. The three main techniques are:

- Contingent valuation, which uses questionnaires to ask people how much they would be willing to pay to increase or enhance the provision of the ecosystem service, or inversely, how much they would be willing to accept in compensation for its loss or degradation. The approach, using either an individual`s willingness to pay (WTP) or an individuals willingness-to-accept (WTA), can use a range of survey formats to generate measurable pseudo-market values for non-market resources. A questionnaire might, for example, ask respondents to state their willingness to pay towards the cost of increasing the water quality in a river or lake, to the extent that they might then be able to enjoy swimming or fishing in it.
- Choice modeling, which attempts to model an individual's decision-making process by asking them to choose between various options (choice experiments), to rank their preference for different things (contingent ranking) and to choose between two different things (pair comparison).
- Group valuation, which combines stated preference techniques with elements from political science.

Stated preference approaches are often used to estimate non-use values. The use of hypothetical markets has raised questions with regard to the validity of estimates. Often it is also difficult for the respondents to give accurate responses, as they have not always fully thought out the issues.[4]

Valuation methods are usually site specific. It is important to carefully assess their costs and benefits and to take into account the fact that many of the values are proxy values, that is, valuations based upon the price of related goods or services or hypothetical situations[5].

A different valuation technique, which is not based on economic analysis is **multi-criteria analysis** (MCA). In cases where multiple values of ecosystem services need to be measured and compared, the use of MCA has been found to be a fruitful approach. MCA allows formal integration of multiple values, after each of them has been assigned a relative weight. Its output is a raking of preferences that serves as a basis for taking decisions amongst different options.

Multiple use of forests is an illustrative example of successful application of MCA[6]. This approach has the potential to be broadened to cover ecosystem services. For example, a study of the estimates of forest benefits in Mediterranean and sub-Mediterranean areas

[4] See TEEB Ecological and Economic Foundations, pp. 203-20
[5] Standing Forestry Committee ad hoc Working Group report 2008
[6] Kangas et al. 2008; Leskinen & Kangas 2005

(total economic value) shows that the value of wood forest products, such as timber, accounts for only a small portion of the total forest benefits and that other benefits such as watershed protection are much more important. Recreation is also an important value in the northern Mediterranean.[7]

In each context, the basis for the remuneration for the ecosystem service will need to be assessed, with the choice of the most suitable method but also taking account of the economic and socio-economic preferences and conditions of the targeted buyers of the ecosystem services. Affordability considerations should be kept in mind in particular since ecosystem services are often to be conserved and enhanced in rural, often poorer areas. In some cases, there may not be the need to resort to complex valuation methods. The cost of forest management to maintain a certain ecosystem service could, for example, be a proxy for the remuneration to the forest owner. It will, however, in most cases be difficult to differentiate the cost associated with each service from the expenses incurred by forest management more generally.

The integration of biodiversity and ecosystem values into economic system and national accounting frameworks (as stipulated by TEEB) are challenging projects, which some governments have started to embark on. Developing an understanding as well as definitions and measures of integrated land use management and planning is an important first step in applying PES across the landscape, covering different ecosystems.

[7] TEEB Ecological and Economic Foundations, pp. 389-390

Annex 2: PES schemes in UNECE countries. Overview of survey results.

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Albania	Assisted Natural Regeneration project	PFS/BD	afforestation and reforestation of degraded land	M, H, Cm		www.cdm.unfccc.int; Example 9 in this report
Austria	Austrian Agri-environmental program ÖPUL	PWS	agri-environmental quality, watershed, agriculture	H	Payments for environmental friendly practices	UNECE 2005;
Bulgaria, Moldova, Romania, Ukraine	WWF Danube Basin	several projects	biodiversity, environmental quality, many watershed and forest services	M, H, Cm	several	WWF web pages[8]; Example 12
Bulgaria, Romania, Ukraine	Fieldfare *(in development)*	PFS/BD	habitat creation	M	self-financing	Fieldfare web pages[9]
Bulgaria, Hungary, Poland	The Biodiversity Technical Assistance Units program (BTAU) *(in development)*	PFS/BD	several	M	business-biodiversity banking	BTAU web pages[10]

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Canada	Assiniboine River Watershed	PWS	wetlands and waterfowl protection	M, H	benefits per unit cost, via auction	OECD 2010
Canada (Ontario)	South Nation River Phosporous Management program	WQTP	phosporous	M, H		Stanton et al. 2010
Canada	National Fish Habitat Compensation HADD	PFS/BD	fish	M, H		Madsen et al. 2010
Canada	Wetland Compensation Agreement Between Manitoba's Infrastructure and Transportation Agency and Manitoba Habitat Heritage Corporation	PFS/BD	watershed services	M		Madsen et al. 2010
Canada	Provincial Wetland Compensation program *(Alberta, New Brunswick, Prince Edward Island, Nova Scotia)*	*PFS/BD*	*watershed services*	*M,H*		*Madsen et al. 2010*

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Canada	British Columbia's Wetlands Mitigation and Compensation Strategy *(in development)*	PFS/BD	biodiversity, watershed services	-		Madsen et al. 2010
EU	Habitats Directive (base of Natura2000)	PFS/BD	biodiversity	H	direct compensation, uniform payments for given management practices	http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm; http://eur-lex.europa.eu/
EU	Birds Directive (base of Natura2000)	PFS/BD	biodiversity	H	direct compensation, uniform payments for given management practices	http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
EU	Environmental Liability Directive	-		H		http://eur-lex.europa.eu/
EU	Habitat Banking *(in development)*	PFS/BD	biodiversity	M, H (?)	biodiversity and habitat banking	Madsen et al. 2010
Finland	Forest Biodiversity Programme for Southern Finland METSO I and METSO II	PFS/BD	biodiversity intrinsic value, deadwood, old-growth carbon storages	M,H, Cm	auction, payment, direct compensation etc.	METSO I web pages[11]; METSO II web pages[12]; Example 1
Finland	Predator compensation	PFS/BD	Golden eagle	H	direct compensation	
Finland	Finnish Natural Heritage Foundation	PFS/BD	biodiversity intrinsic value, old-growth forests, cultural services	M, Cm	self-financing with donations	FNHF web pages[13]
France	Nestle – Vittel	PWS	water quality, water resources	M	payments via negotiations	Zandersen et al. 2009; Stanton et al. 2010; OECD 2010; Example 4

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
France	Danone – Evian	PWS	water quality, water resources, watershed services	M	payments via negotiations	Evian web pages[14]; Stanton et al. 2010
France	French Biodiversity Banking - CDC Biodiversité *(in development)*	PFS/BD	biodiversity	M	biodiversity banking	Madsen et al. 2010
Georgia	Samegrelo Hazelnut afforestation	PFS/BD, PWS	soil, land and water enhancement via carbon sequestration	M	trading scheme	www.carbonfix.info/HAP; Example 8
Germany	Germany's Impact Mitigation Regulations (Eingriffsregelung)	PFS/BD		H	several	Madsen et al. 2010
Germany	North Rhine-Wetphalia Pilot Tender	PFS/BD	grassland conservation	M	payments per unit area cost, via auction	OECD 2010

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Germany	Lower Saxony (Niedersachsen, OOWV)	PWS	water & watersheds	H, (M)	payments of compensation, payments on voluntary agreements, land for afforestation	IUCN 2009
Germany	Bionade GmbH/ Trinkwasserwald NGO	PWS	water quality via forest habitat conservation	M	private income from sold water	Example 6; IUCN 2009
Germany	Kaufering	PWS	ground water quality, decreasing nitrates by increasing deciduous forests	H, M	payments (incentives) for good forest management practices	IUCN 2009
Greece	Amfissa	PFS/BD	landscape quality	M, H	uniform payment for given management practices, per unit area	OECD 2010; UNECE 2005

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Italy	Compensating the landowners in (Alpine) catchments use for hydro-power production	PWS	compensating watershed services of hydropower production	H, M	compensation for landowners	http://www.federbim.it/
Italy	National Law on Water regulation	PWS	drinking water	H	compensation for maintenance and good land-use practices	Madsen et al. 2010
Italy	Romagna Acque Agency (case)	PWS	promoting sound forest management for watershed services	M(?)		http://www.romagnacque.it/fonti_idriche_ridracoli-d-78.html
Ireland	NeighbourWood Scheme	PFS/BD	recreation	H, Cm		SFC ad hoc WG 2008; this report page 14
Kyrgyzstan	Lake Issyk-Kul	PWS, PFS/BD	water quality, several forest services	M, Cm	payments, several	www.unece.org; this report page 21

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Latvia	Game watching trails	PFS/BD	fauna, flora, especially game	M	entrance fees	SFC ad hoc WG 2008; this report page 14
Moldova	Soil Conservation Project	PFS/BD	several forest services via afforestation/ reforestatio, carbon sequestration	M, H, Cm	trading scheme, CDM	www.cdm.unfccc.int; Example 7
Netherlands	Integrated Water Resource Management	PWS	watershed services	H		UNECE 2005
Netherlands	Landscape Fund	PFS/BD	forest services	H, Cm	subsidies	UNECE 2005
Netherlands	Farming for Nature Pilot program	WQTP	water quality	M, Cm (?)		Stanton et al. 2010; FNP programe's web pages[15]
Netherlands	Ecological Compensation in Dutch Highway Planning	PFS/BD	biodiversity	M	compensatory conservation elsewhere	Cuperus et al. 2001

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Netherlands	Friends of the Landscape *(in development)*	PFS/BD	landscape	M, Cm		Madsen et al. 2010
Netherlands	Wadden Sea Fund *(in development)*	PFS/BD	recreation, water quality			Madsen et al. 2010
Norway	Compensation for conservation of forestry	PFS/BD	forest services, biodiversity	H, Cm (?)	compensation for voluntary forest conservation	TemaNord 2009:571, Nordic Council of Ministers, Copenhagen.
Poland	Polish National Fund for Environment Protection & Water Management (NFOSIGW) *(in development)*	PFS/BD	water, several services	M, Cm (?)		NFOSIGW web pages[16]; UNECE 2005
Poland	The National Ecofund *(in development)*	PFS/BD		M, Cm (?)		The National Ecofund's web pages[17]

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Spain	Guadiana river basin (SPUG)	PWS	water quantity affected by irrigation, i.e. recharging overexploited aquifers by 2027, restoration of biodiversity, enhancing toursim	H	supporting reforestation	IUCN 2009
Sweden	Komet program	PFS/BD	biodiversity intrinsic value, deadwood, old-growth carbon storages	M,H, Cm	auction, payment, direct compensation etc.	Komet's web pages[18]; Example 2
Sweden	Nordic Shell Holdings	PWS	water quality	H	uniform payments per weight of pollutants filtered	OECD 2010

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
Sweden	Environmental Offsets				infrequently mandatory	Madsen et al 2010
Sweden	Predator compensation	PFS/BD	wolverine, Golden eagle	H	direct compensation	Zabel & Holm-Müller 2008
Switzerland	Ordinance on the Regional promotion of Quality and Interlinking of the Ecological Compensation Areas	PWS	agri-environmental quality, nitrate decrease	M, H	uniform payments for given management practices (zonal schemes)	OECD 2010; UNECE 2005, 2007
Switzerland	Canton Basel-Stadt	PWS	water quality, filtration	H	additional charge in water bill	www.waldwissen.net; Example 3
Switzerland	Henniez SA	PWS	water quality via forest conservation and decreased nitrate input	M	private income from sold water	www.waldwissen.net; Example 5

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
United Kingdom of Great Britain and Northern Ireland	Species Banking	PFS/BD	biodiversity	M		Madsen et al. 2010
United Kingdom of Great Britain and Northern Ireland	Rural Development Programme	PWS	agri-environmental quality	M, H	uniform payments for given management practices	OECD 2010
United Kingdom of Great Britain and Northern Ireland	Tir Gofal (Wales)	PWS	agri-environmental quality	M, H	uniform payments for given management practices	OECD 2010

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
United Kingdom of Great Britain and Northern Ireland	Scottish Challenge Fund (Scotland)	PFS/BD	forest services and conservation	M, Cm	environmental benefits index per unit cost, via auction	OECD 2010
United Kingdom of Great Britain and Northern Ireland	North Ireland - Countryside Management Scheme (NICMS)	PWS	agri-environmental quality, biodiversity, water quality, mitigate climate change, improve soil quality, enhance landscape	M, H	payments for enhancements and management practices	Stanton et al. 2010
United Kingdom of Great Britain and Northern Ireland	UK Biodiversity Offsets *(in development)*	PFS/BD	biodiversity	M, H		Madsen et al. 2010

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
United Kingdom of Great Britain and Northern Ireland						
United Kingdom of Great Britain and Northern Ireland	'Slowing the Flow', Pickering, North Yorkshire	PWS	Flood protection, carbon sequestration	H		http://www.forestry.gov.uk/fr/INFD-7ZVEQV
United Kingdom of Great Britain and Northern Ireland	Waste to Woodlands, Lancashire	PFS/BD	Carbon sequestration	H	Payments for waste treatment and woodland planting	http://www.globalrenewables.co.uk/content/contentPage.asp?contentID=89&countyID=1&pgID=1

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
United Kingdom of Great Britain and Northern Ireland	West Country Rivers Trust, Southwest England	PWS, PFS/BD	Flood protection, water purification, drought management, carbon sequestration, biodiversity corridors, recreation	M, H		http://www.wrt.org.uk/land.html
United Kingdom of Great Britain and Northern Ireland	Woodland Carbon Code	PFS/BD	Carbon sequestration	M	Standards in voluntary market for forest carbon	www.forestry.gov.uk/carboncode
United States	The Catskills/ Delaware Watershed Protection programme (New York)	PWS	water quality, watershed services	M, H, Cm	taxation	Appleton 2002; Pagiola et al. 2004; Stanton et al. 2010; FAO 2010 web pages; Example

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
United States	The Conservation Reserve Programme	PFS/ BD and PWS	agri-environmental quality, BD, carbon, water quality	H	cost factor included in environmental benefits index, via auction	CRP web page[19]; OECD 2010
United States	US Conservation Banking	PFS/BD	biodiversity, forests	M	payments for species banking	CB web page[20]; Example 11
United States	The Wetlands Reserve Program (Compensatory wetland mitigation)	PFS/ BD and PWS	hydrological services	H	to some extent enrolment on case by case basis	OECD 2010
United States	Recovery Credit System	PFS/BD		M, H		Madsen et al. 2010
United States	Bureau of Land Management Mitigation Policy	PFS/BD		H		Madsen et al. 2010
United States	Maryland's forest offset law	PFS/BD		H		Madsen et al. 2010
United States	North Carolina's Buffer Mitigation program	PFS/BD		H		Madsen et al. 2010

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
United States	Acres for America	PFS/BD		M		Madsen et al. 2010
United States	Chesapeake Bay Fund	PWS	water, watershed services	M, H, Cm	cap-and-trade water scheme	Stanton et al. 2010; Ecosystem Marketplace web page[21]; Example 10
United States	Quabbin and Wachusett Watersheds (Massaschusets)	PWS	water, watershed services	M, H		Stanton et al. 2010
United States	Cedar River (Washington)	PWS	water, watershed services	M, H		Stanton et al. 2010
United States	Hetch Hetchy (California)	PWS	water, watershed services	M, H		Stanton et al. 2010
United States	Agricultural Management Assistance Program (AMA)	PWS	water, watershed services	M, H		Stanton et al. 2010
United States	The Environmental Quality Incentives Program (EQUIP)	PWS	water, watershed services, agri-environmental quality	M, H	to some extent enrolment on case by case basis	Stanton et al. 2010; OECD 2010

UNECE country/ region	*Name of PES*	*Type of PES scheme:*	*Compensated/ improved ecosystem services or environmental values*	*Governance structure*	*Compensation means*	*Reference*
United States	Conservation Stewardship Program (CSP) [earlier Conservation Security Program]	PWS	water, watershed services, agri-environmental quality	H	to some extent enrolment on case by case basis	Stanton et al. 2010; OECD 2010
United States	EPA's 319 Program	PWS	water, watershed services	M, H	subsidy payments or grants	Stanton et al. 2010
United States	Water Quality Trading Programes (11*)	WQTP	phosphorous, nitrogen, water temperature	M, H		Stanton et al. 2010
United States	Habitat Credit Trading Scheme (in development)	PFS/BD		M		Madsen et al. 2010
United States	Williamette Partnership's Ecosystem Marketplace (in development)	PFS/BD		M		Madsen et al. 2010
United States	Bay Bank (in development)	PFS/BD		M		Madsen et al. 2010

Abbreviations in the "Type of PES scheme" column are: PFS/BD, payments for forest services and/or biodiversity; PWS, payments for watershed services; and WQTP, water quality trading program.
Abbreviation in the "Governance structure" column are: M, market (referring mainly to private schemes);
H, hierarcy that is to say public administration (referring mainly to public schemes); and
Cm, community management. Community management is interpreted here to include also actions of NGOs, although this is not exactly the same as for common ownership of forests, for instance.
The PES schemes presented may have characteristics of several governance types, but these are not necessarily included in the table.
The column on "Compensation means" includes: direct compensation, payment, auction, taxation, subsidy, compliance-related, community fund, self-financing etc.

[8] WWF web pages, Available at: http://wwf.panda.org/what_we_do/where_we_work/black_sea_basin/danube_carpathian/news/?193440/Promoting-Payments-for-Ecosystem-Services-in-the-Danube-Basin

[9] Fieldfare web pages, Available at: http://www.fieldfare.biz/

[10] The BTAU project is an RSPB, European Centre for Nature Conservation, and BirdLife International consortium project which seeks to create 'Pro-Biodiversity' Businesses (PBBs) through dedicated Biodiversity Technical Assitstance Units, one in each of the following countries: Bulgaria, Hungary and Poland. BTAU web pages, Available at: http://www.smeforbiodiversity.eu/details.php?p_id=70&id=75

[11] METSO I web pages, Available at: http://wwwb.mmm.fi/metso/international/

[12] METSO II web pages, Available at: http://www.metsonpolku.fi

[13] Finnish Natural Heritage Foundation web pages, Available at: http://www.luonnonperintosaatio.fi/english/index

[14] Evian web pages, Available at: http://www.evian-waterinstitutes.com/html/_com/environnement/environnement02.php

[15] Farming for Nature Pilot program web pages, Available at: www.boerenvoornatuur.nl

[16] NFOSIGW's web pages, Available at: www.nfosigw.gov.pl

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[18] Komet program web pages, Available at: http://www.naturvardsverket.se/sv/Arbete-med-naturvard/Internationella-skogsaret-2011/Kometprogrammet/

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Annex 3: Excerpt from draft Action Plan on "Forests and a Green Economy" on "Valuation of and Payments for Forest-related Ecosystem Services"[22]

4	Valuation of and payment for forest ecosystem services	To identify and value forest functions and to establish PES transactions, encouraging sustainable production and consumption patterns.	Review and develop approaches to valuation of and payment for different forest ecosystem services, in the UNECE region, involving research and policy bodies.	
4.1	Valuation of forest ecosystem services	To support the assigning of economic value to non-marketed forest goods and services and to enhance the understanding and recognition of the public goods generated by forests.	Estimate forest ecosystem values at the national and regional levels. Encourage research linked to policy objectives on the valuation for ecosystem services, and possible sources of financing for ecosystem services. Undertake a comparison of the value of marketed and non-marketed goods and services of the forest, and recommendations as to how academic valuation could be transformed into payment systems. Organize a policy forum on emerging dilemmas for forest managers and policy makers, focusing on identifying critical trade-offs between forest functions.	Undertake national review of forest ecosystem services and assess their values using, as appropriate, the results of existing valuation studies (value transfer) and possibly from other sectors. Encourage the participation of researchers, forest managers and consumers of forest ecosystem services in the review and assessment of valuation methods. Undertake and fund research projects to quantify and value (preferably using internationally compatible methods) all forest ecosystem services. Develop mechanisms for incorporating the results of forest ecosystem valuation into national accounting frameworks.

			Organize a policy forum, based on survey and analysis, leading to concrete recommendations on the valuation of the public goods provided by forests such as human health and well-being. Cooperate with other communities such as health, biodiversity, climate change, energy, agriculture to exchange knowledge on valuation methodologies. Establish and maintain online platforms where research institutions could validate and exchange research results on the value of forests and forest products.	Promote disclosure of values of ecosystem services at the corporate level.
4.2	Payment for forest ecosystem services: moving from theory to practice	To promote best practice to develop and implement PES to ensure the continued provision of forest ecosystem services.	Review and compile experience on payment for forest ecosystem services, and monitor progress , taking into account existing material. Review and analyse relevant information in State of Europe's Forests. Share experiences on the different enabling conditions amongst countries, including on ownership patterns and their implications for PES design and implementation.	Identify opportunities for payments for ecosystem services. Review experience and incorporate into existing strategies, as appropriate. Disseminate information on PES case studies and build capacity for PES development and implementation. Enhance policies and instruments for setting the framework for PES. Identify potential funding options. Promote partnerships between forest owners and other actors/stakeholders, for instance to develop forest tourism/ ecotourism.

4.3	Forests and human health	To review ways in which forests contribute to human health and wellbeing, and ascertain whether this information is properly incorporated into policies and practices	Organise a regional forum on forests and human health to review the situation, opportunities and challenges, and make recommendations for future work, at the international and national level. This would constitute a resource for health and planning authorities etc. Study on wellbeing in wooden buildings vs. buildings with other structures.	(to be developed, notably in the light of the regional forum on forests and human health)

[22] The Action Plan has been developed, following stakeholder input by the UNECE/FAO secretariat, and reviewed with participants at the Stakeholder meeting on forests and the green economy, 10-11 May 2011. It will be presented at the joint session of the UNECE Timber Committee and FAO European Forestry Commission in Antalya, Turkey, 10-14 October 2011. The finalized Action Plan will serve as a regional and sectoral example to be presented at the Rio+20 summit on sustainable development in Rio de Janeiro, Brazil, June 2012.

source: UNECE/FAO, 2013

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The Value of Forests

Payments for Ecosystem Services in a Green Economy

Payments for Ecosystem Services (PES) describes the situation where the user of an environmental service, such as water purification, pays the landowners who provide that service. For PES to exist, there must be a clearly defined user and supplier, as well as a number of other necessary conditions, which are defined in this document using a summary of current sources. Particular attention is paid to how these conditions currently obtain within the UNECE region. The range of forest environment services is explored through fourteen detailed case studies, which examine best practice in promoting PES. Political and public relations implications of PES are discussed at length, and recommendations include the need for clarity about where PES may be a useful tool in moving towards a green economy and where other methods may be more appropriate.

Further information about forests and forest products, as well as information about the UNECE Committee on Forests and the Forest Industry and the FAO European Forestry Commission is available on the website www.unece.org/forests.html

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