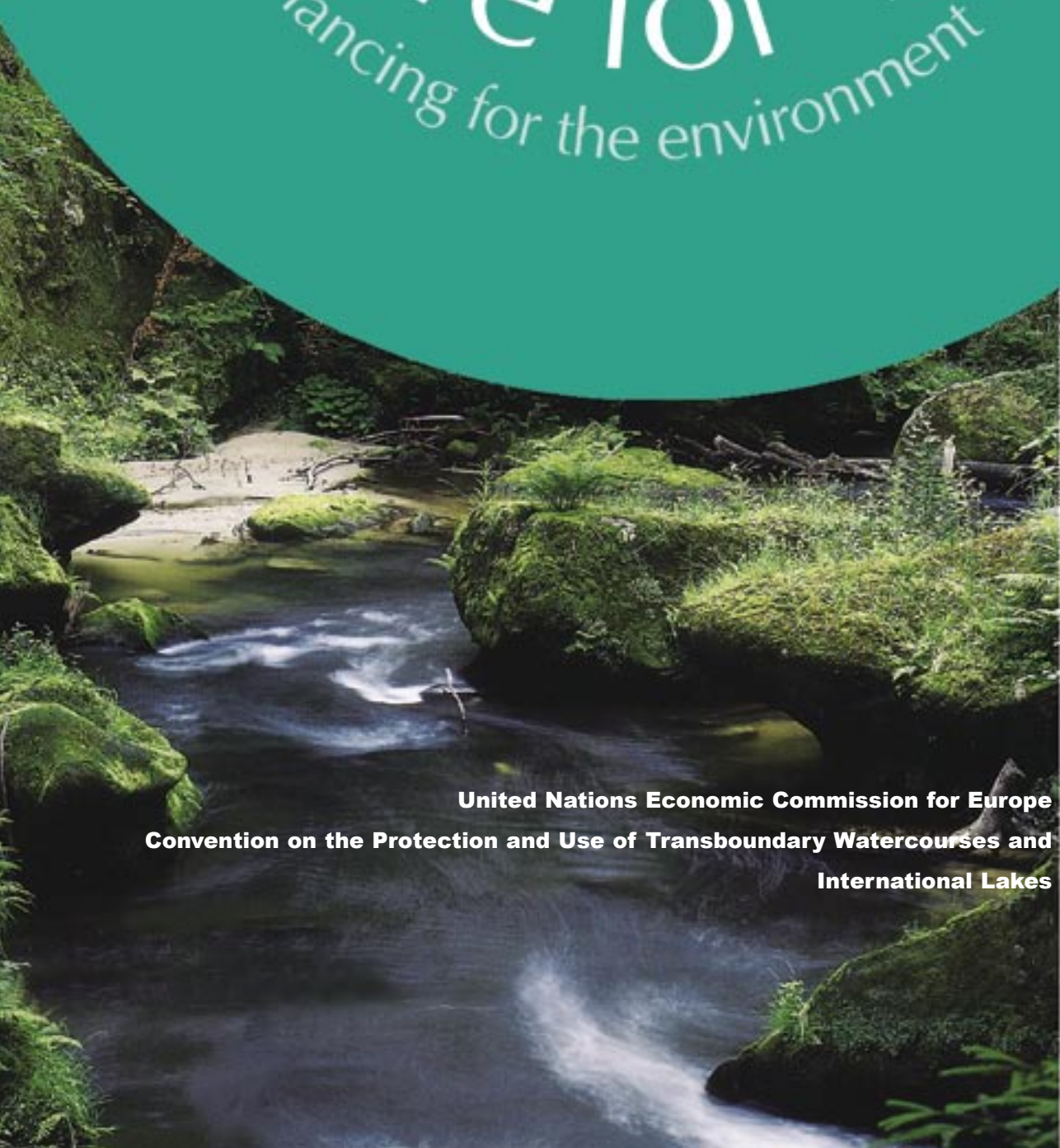




# Nature for water

Innovative financing for the environment



*“Everyone in the world depends on nature and ecosystem services to provide the conditions for a decent, healthy and secure life. Humans have made unprecedented changes to ecosystems in recent decades to meet growing demands for food, fresh water, fiber, and energy. The loss of services derived from ecosystems is a significant barrier to the achievement of the Millennium Development Goals to reduce poverty, hunger and disease.”*

**United Nations Economic Commission for Europe  
Convention on the Protection and Use of Transboundary Watercourses and  
International Lakes**

**Statement by the Board of  
the Millennium Ecosystem  
Assessment**



**UNITED NATIONS**

The good practices and recommendations presented in this brochure are based on the outcome of the seminar on “Environmental Services and Financing for the Protection and Sustainable Use of Ecosystems” organized in October 2005 by the secretariat of the UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) and the Swiss Federal Office for the Environment, in close cooperation with the World Conservation Union (IUCN) and the secretariat of the Ramsar Convention on Wetlands.

### **Acknowledgement**

The UNECE Water Convention secretariat gratefully acknowledges the scientific contributions to this brochure by the Swiss Federal Office for the Environment, the Ramsar Convention secretariat, the UNECE Timber Committee secretariat, the World Conservation Union (IUCN), the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environmental Programme (UNEP), the Ministerial Conference on the Protection of Forests in Europe (MCPFE) and the designated experts from Germany, the Netherlands and the Regional Environmental Centre for Central Asia (CAREC) as well as seminar participants from Governments, scientific institutions, non-governmental organizations and private companies.

The secretariat particularly appreciates the funding received from the Government of Switzerland.

### **References**

Unless otherwise indicated, the material used can be downloaded from the seminar’s website:  
[www.unece.org/env/water/meetings/payment\\_ecosystems/seminar.htm](http://www.unece.org/env/water/meetings/payment_ecosystems/seminar.htm)

**Photo credit:**  
UNECE Information Service.

## A paradigm shift: protect nature to improve water

Ecosystems provide a wealth of services that are fundamental for proper environmental functioning and economic and social development. While the demand for these services, including provision of clean freshwater, is continually increasing, the capacity of ecosystems to provide such services is hampered by their ever-growing degradation, which diminishes the prospects of sustainable development. This situation has many causes – not just economic growth and demographic changes, but also the fact that the value of such environmental services is often not captured and therefore not included in decision-making. Decision makers tend to prefer investing in water-related infrastructure (e.g. dams for flood control, water filtration plants for drinking water) rather than improving the capacity of water-related ecosystems to mitigate floods and purify water.

The brochure “Water for Nature – Protecting Water-Related Ecosystems for Sustainable Development” provided five essential pillars for promoting the integration of the ecosystem approach into integrated water resources management (IWRM) and thereby counteracting the degradation of these ecosystems.

In recent years, innovative financing mechanisms, and specifically payment for ecosystem services (PES), have been recognized as crucial for addressing some of the identified failures in environmental management. PES are valuable because they make it possible to take into account environmental externalities. When there are serious environmental concerns but limited financial resources, PES can generate additional alternative resources, redirect funds to environmentally friendly technologies and sustainable production patterns, create incentives for investment, and increase private-sector involvement in environmental protection.

This brochure focuses on the mechanisms for payment for services provided by water-related ecosystems like forests and wetlands, which are constituent parts of river basins, whether transboundary or not.

Intended especially for policy makers, the brochure explains how PES can help solve water management problems, and what legal, administrative and institutional arrangements are needed for implementing PES. It discusses valuation of ecosystems as well as the underlying principles of various PES schemes. It also highlights other measures to support PES implementation.

# Ecosystem services and integrated water resources management

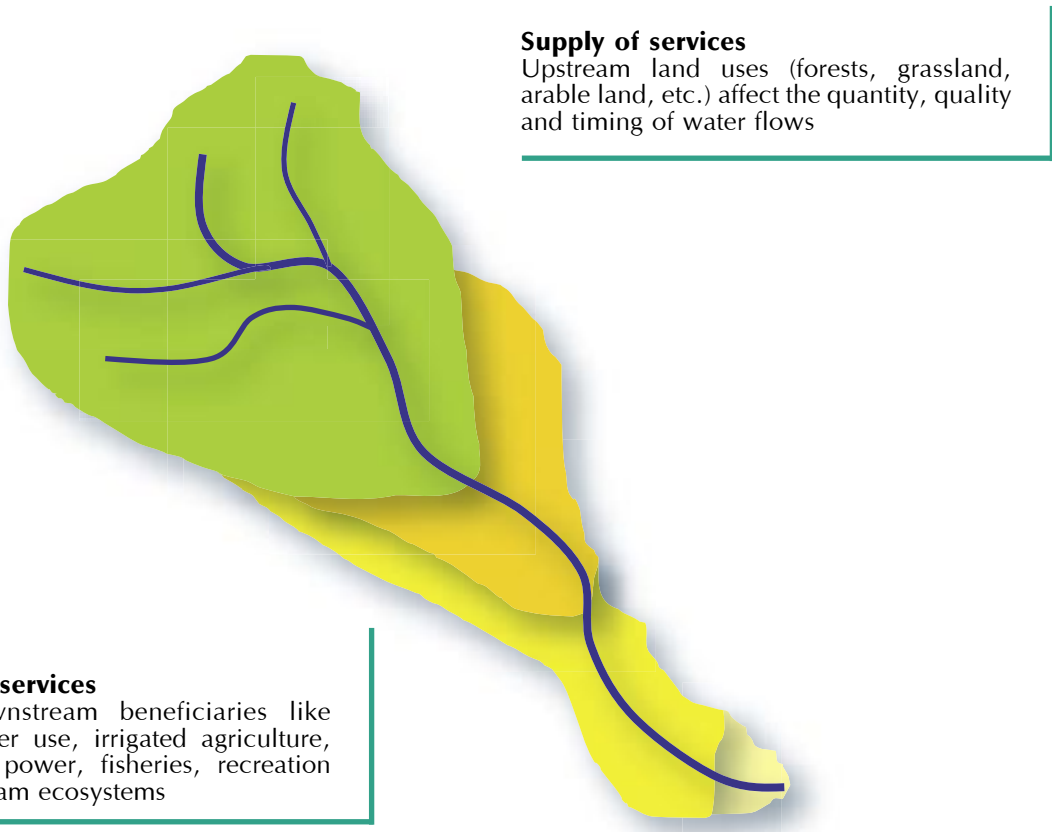
Ecosystem services refer to a variety of processes through which natural ecosystems, and the species that they contain, help sustain human life. Many of these services are related to water management: water purification, nutrient cycling, waste decomposition, soil generation and renewal, flood and drought mitigation and protection of soils from erosion. These services may have local, national and even transboundary significance.

The river basin is the natural unit for IWRM. In a basin, rivers, lakes and groundwaters interact with water-related ecosystems such as forests and wetlands.

The river basin's various functions and uses may compete or even conflict, particularly if water is scarce or its quality deteriorating. Examples include the competition for water within a country (e.g. water use for drinking, industry, irrigation) and differing upstream-downstream interests of riparian countries (e.g. hydropower production in an upstream country and irrigational water use or navigation in a downstream country).

To understand how ecosystem services can help address these and other challenges, it is useful to list current and expected water management problems. Examples include the adverse impact of flooding on human health and safety, the effect of excess nitrogen in groundwater on drinking-water supplies, the effect of pollution by hazardous substances on aquaculture, the impact of biodiversity loss on food supply, and the effect of suspended sediments on hydropower production). It is also important to know the geographical location and distribution of the various hydrological units in a basin. Here a land use inventory or map that identifies water bodies, forested areas, wetland and grassland areas, pastures, urban areas and other forms of land use is very helpful.

A list of water management problems and an inventory of hydrological units need to be compiled in order to see whether and to what extent existing and future problems can be addressed by enhancing ecosystem services or switching to alternative forms of land use. Cooperation with other sectors to gather this information is not only necessary but crucial for maximizing societal benefits.



**Supply of services**  
Upstream land uses (forests, grassland, arable land, etc.) affect the quantity, quality and timing of water flows

**Demand for services**  
Possible downstream beneficiaries like domestic water use, irrigated agriculture, hydroelectric power, fisheries, recreation and downstream ecosystems



## Valuing Ecosystem Services

The valuation of ecosystem services is a prerequisite for making optimal choices regarding their protection and sustainable use, including conservation. Valuation provides a set of tools for making informed decisions.

A valuation study highlights how much an ecosystem contributes to economic activity or society. It helps us understand the benefits and costs of an intervention that modifies the ecosystem. It makes ecosystem goods and services comparable with other investments and therefore allows the value of nature to be properly included in economic calculations.

Valuation studies should also show how the costs and benefits of a change in an ecosystem are distributed, who benefit from the change and who bear the costs. Thus valuation studies can show how to make conservation financially sustainable.

A valuation should be based as much as possible on scientific knowledge about the interactions in a basin among water, flora and

fauna, soil, climate, landscape, and so on.

Different valuation methodologies are available, and the choice depends on whether one is considering direct values (outputs that can be directly consumed or processed, such as timber, fodder and wild foods) or indirect values (for example, ecological services such as flood control, regulation of water flows and supplies, nutrient retention). Methods also exist for assessing option values (i.e. premium placed on maintaining resources and landscapes for future possible direct and indirect uses) and existence values (the intrinsic value of resources and landscapes, irrespective of their use – for example, their cultural, aesthetic and bequest significance).

In making a valuation, the following should be considered:

- Scale effects are important. Valuation studies for small sub-basins often underestimate ecosystem values on the scale of the entire basin. However, the larger the scale, the harder it is to assess the value of ecosystem goods and services.
- Results of ecosystem valuation studies are site-specific and are not transferable to other locations in the same basin or a different basin.
- Some ecosystems are not measurable or quantifiable, as the necessary scientific, technical or economic data are missing. The budget available and needed for the valuation should be assessed to define the level of detail and reliability which can be obtained. The outcome of the valuation study should be seen in this context.
- When ecosystem benefits are related to such attributes as human life and safety, cultural or religious significance, these attributes cannot be integrated into the economic valuation. Ecosystem valuation may be inappropriate when it focuses only on financial or cash benefits at the expense of other types of values that cannot – or should not – be valued and whose valuation can raise serious ethical questions.
- The value of ecosystem services can change over time; therefore, there is a need for periodic revision and assessment.
- The results of the valuation studies should be disseminated as widely as possible.

As part of the socio-economic cost benefit analysis, Guidelines for the valuation of nature, water and soil have been drawn up in the Netherlands. These are for physical projects on infrastructure (roads, railways, harbour expansions), water quantity (flooding), water quality (application of the EU Water Framework Directive), drinking water, soil cleaning and urban renewal. The Guidelines help to assess projects that damage the environment as well as to assess investments in the natural environment. For example, in Belgium the Government had to decide whether to increase the height of river dykes or create large inundation areas in the basin. The study revealed that the costs of building higher dykes were lower than the costs of creating inundation areas. However, the inundation areas' ecosystems benefits were much higher. Thus, it was decided to create them instead of building dykes.

Source: E.C.M. Ruijgrok. Valuation of nature, water and soil in socio-economic cost benefit – a supplement to the Dutch Guideline on CBA. Witteveen and Bos. 3 October 2005.

The Mountain Ecosystems Assessment Programme in Central Asia focuses on the following issues: current conditions in Central Asia's mountain ecosystems and human well-being linked to these ecosystems; demand for ecosystem services; possible changes in ecosystems and their consequences for human health and safety, means of subsistence, traditional culture, economic security and fair access to natural resources and distribution of benefits; way and means to preserve/restore ecosystems in each country and improve well-being; strengths and weaknesses of activities to be undertaken; activities that support or adversely impact specific future developments; and major factors affecting ecosystem services, management decisions and development of policies. The review process will reveal the real cost of goods and services produced by the identified ecosystems. Recommendations will be made to decision-makers at various levels and communities, including state enterprises, the private sector and civil society in order to help them integrate ecosystem services into their plans and activities. Since most physical-geographical mountain provinces of Central Asia are of a transboundary nature or are linked to transboundary waters, regional assessments are a major part of the planned work.

## Paying for ecosystem services

The classical way of deterring pollution and other adverse effects is to establish a legal norm coupled with a sanction for non-compliance. PES are part of a new conservation approach which explicitly recognizes the need to bridge the interests of landowners and outside beneficiaries through payment of compensation. Under a PES scheme, users of land upstream may accept voluntary limitation or diversification of their activities in return for an economic benefit. Practice indicates that PES schemes can benefit both “sellers” and “buyers” of ecosystem services while helping to protect ecosystems.

In river basin management, the basic premise of PES is the upstream-downstream hydrological dependency, where upstream ecosystem service providers can offer hydrological benefits to downstream water users. In river basin management, PES emerge where a perceived increasing pressure and threatened deterioration of the basin’s hydrological status coexist with an established commercial interest among downstream water users in water-dependent activities (generally water supply and flood mitigation).

In the UNECE region, public and private schemes are by far the most common types of PES. In some parts of the region – for example, Canada and the United States – other types of PES are also used.

**The Catskill/Delaware basin management programme is a striking example of a public payment scheme. These basins provide 90% of the water consumed by New York City (NYC). As the quality of drinking water sources throughout the United States decreased and new water quality concerns emerged from 1970 to the mid 1980s, the United States Environmental Protection Agency required, as part of the 1986 Safe Drinking Water Act Amendments, that all surface water should be filtered, unless safe water could be provided under natural conditions. At that time, the construction of a 9.5 million m<sup>3</sup>/day filtration plant for NYC supply was estimated to be US\$ 4-8 billion with yearly operating costs of US\$ 100-200 million. Instead of building a filtration plant, the NYC authorities decided to invest US\$ 1.5 billion over 10 years in a river basin programme, which included the enhancement of existing and the construction of new watershed sewage treatment/stormwater management infrastructure, the establishment of economic-environment partnership programmes, as well as the initiation of programmes to improve farm and forestry practices to reduce water pollution. The PES scheme was initiated and continues to be funded by fees collected from the nine million users of the NYC vast water supply system. The NYC Department of Environmental Protection contracted with local public, private and non-profit entities to implement the programme. Groups include the Catskill Watershed Corporation, the Watershed Agricultural Council and various county and town agencies. All contracts are subject to NYC procurement rules.**





**Public schemes** are established when a municipality or a local or national government decides to finance upstream activities, such as reforestation. In return the government entity expects improvement in hydrological services (safe drinking water or a sustainable water flow) downstream. Buyers are public authorities. Public schemes involve State, regional or even European Union subsidies or tax reductions in favour of more ecosystem-friendly activities, user fees, land purchases and land easement.

**In Switzerland, precipitation generates drinking water to the value of € 3,200–4,500 per hectare of agricultural land. Intensive farming not adapted to local conditions was the main cause of groundwater nitrate pollution; hence further measures had to be taken in addition to strong legislation covering water protection and agriculture. These measures include voluntary programmes promoting extensification, integrated production with fewer pesticides and fertilizers and biological farming. The Federal State has set the conditions for compensation, while the Cantons apply the relevant measures (contracts with farmers, payments and control/evaluation). Financial support is allocated by a contract and a one-time payment per year during a maximum of six years, after which the farm is evaluated and required follow-up activities and funding are examined. Different amounts will be paid – from € 130 per hectare and year for measures in open cultures to € 520 for keeping or enhancing a meadow's surface.**

**The EU Common Agricultural Policy and agri-environmental measures (AEMs) are incentives to encourage farmers to protect and enhance the environment on their farmland. Farmers are paid in return for a service. The main objectives are to reduce environmental risks and preserve nature and landscapes. AEMs go beyond usual good farming practice. The mid-term review of the 2000–2006 Rural Development Plans showed that AEMs improved soil and water quality, although it was difficult to quantify all benefits. In addition to AEMs, afforestation, including planting of trees on agricultural land, was encouraged. According to the review, the average agri-environmental payment was □ 89 per hectare and year (ranging from € 30 to € 240) and € 186 per hectare and year for organic farming (ranging from € 40 to € 440). Annual grants to compensate for the loss of income due to change of land use were made available, for example, in Denmark, Germany, Greece, Italy and Spain.**

Under **private schemes** (or “self-organized private deals”), both providers and buyers are private. Payments are made voluntarily by members of the private sector, such as private companies or associations of water users, with little or no government involvement. Private schemes involve user fees, transfer payments, land purchases, cost-sharing arrangements and/or low-interest credits. Private schemes may prove useful in certain circumstances, as in the case of Nestlé (see below), but they cannot develop without a legislative framework providing for the condition of their conclusion, in the context of a well-defined national policy for the protection of ecosystems, and also providing a set of rules for the regulation of contractual relationships.

**Nestlé, which owns the Vittel natural mineral water spring in northeastern France, bought agricultural land in the spring catchment area, which was being intensively farmed, and reforested it. The company has further reduced non-point pollution by signing 18-to-30-year contracts with local farmers to reduce nitrate pollution by adopting extensive and optimal cattle-ranching practices and replacing corn production with alfalfa. Nestlé also financed all investment costs. Yearly payments are based on the opportunity cost of technological change. Nestlé pays US\$ 230 per hectare and per year for a period of seven years to cover the reduced profitability. The scheme was possible because existing French water law provided a suitable regulatory framework for water quality standards and a framework for enforcing contracts. Equity was respected, as farms of all sizes had access to the PES.**

**Trading schemes**, sometimes referred to as public-private schemes, are common in the United States. They occur where governments set either very stringent water-quality standards or a cap on total pollution emissions – for example, of nutrients. A polluter with a nitrogen or phosphorus discharge level lower than the required standard may sell “water-quality credits” to a polluter with a “water-quality deficit”. A strong legislative framework is needed which establishes the total allowable emissions for point sources.

**Reducing environmental impacts through good agricultural practices is usually less expensive than investing in technology for point source control. Under the nutrient trading scheme, farmers in the United States who use good agricultural practices sell their “nutrient credits” to industries. By buying such credits, the latter can exceed allowable emission ceilings rather than investing in pollution abatement technologies. The scheme seems to be flexible and cost-effective. One example is the management of the Chesapeake catchment area. An agreement on water-quality standards among the seven political bodies sharing the basin was necessary to allow trading of water credits, equivalent to nutrient credits, which will be offered for sale in order to pay farmers to reduce their non-point source emissions of nitrogen and phosphorus.**

The proven capacity to mobilize local financial resources through a direct provider-user relationship and put ecosystem services at central stage in the management of natural resources is an enormous achievement that is promising for future PES development. However, caution is needed with regard to the final impact and sustainability of water-related PES in river basin management. PES will not replace traditional command-and-control approaches but only supplement them. PES should be demand driven and need political support for their creation and maintenance.

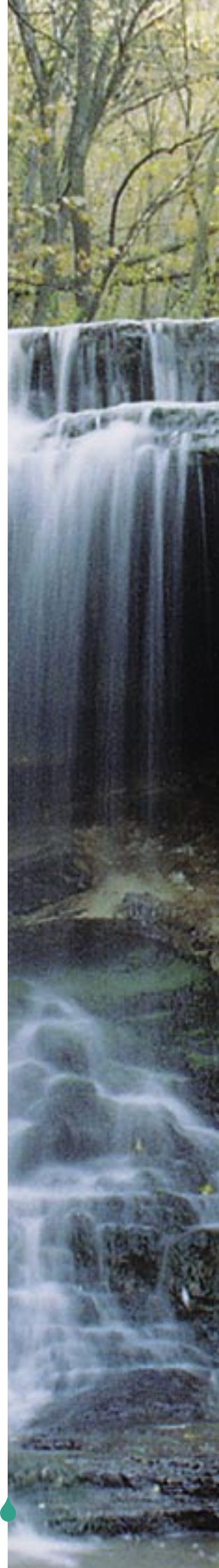
## Accompanying Measures

### Legal and regulatory frameworks at the national level

There are many ways in which Governments can facilitate the establishment of PES:

- **New legislation should recognize the ecosystem approach as a holistic approach to water management. It should consider water-related ecosystems as legitimate water users and as suppliers of ecosystem services.**
- **Not only should environmental legislation be adapted, but national legislation should be developed to regulate economic activities so that they do not adversely affect water-related ecosystems. In particular, perverse incentives that subsidize overuse of natural resources and decline of ecosystem health should be removed.**
- **Legislation should be drawn up and applied to reduce fragmentation between, and improve coordination among, government departments and institutions. This requires a clear definition of the responsibilities and duties of ministries for the environment, agriculture and forestry, economy and finance. Legislation should also provide for coordination with farmers' associations and water users' groups.**
- **Rules and regulations should secure property rights. Supportive legislative action covers formalization and registration of rights, land use registers, coordination among departments for allocating rights, and dispute resolution mechanisms.**
- **In some countries, legislation in fields other than environmental law – such as contract law or company law – may not be appropriate for the proper establishment and functioning of PES; thus any necessary adaptations should be considered. Issues to be regulated include involvement by the private sector (hydropower, farmers and foresters) in financing measures.**
- **Monitoring compliance by private contractors with the agreed terms is of critical importance and should be regulated; otherwise the effectiveness of PES will be impaired.**

These measures can lead to such specific institutional arrangements as interministerial cross-sectoral committees and new partnership approaches.



## Strategies and programmes

A number of studies suggest that PES can be a valuable instrument for diversifying and enhancing the security of existing community livelihood strategies. In some countries in transition, the integration of PES into National Sustainable Development Strategies and Poverty Reduction Strategy Papers should be considered.

Innovative financing mechanisms can catalyse efforts to introduce more sustainable production and management practices, and they can facilitate the building of a shared vision among a great variety of stakeholders. National forest programmes to establish a workable social and political framework for the conservation, management and sustainable development of all types of forests should therefore incorporate provisions for innovative financing mechanisms. River basin management plans, whether transboundary or not, should highlight measures to improve ecosystem services. Ramsar management plans, which specify actions for the wise and sustainable use of wetlands, should refer to innovative financing mechanisms and include processes that provide for continuing community and technical input.

## Stakeholder involvement

Payments for ecosystem services are multi-stakeholder affairs involving national and local governments, community groups, individual landholders, commercial enterprises, non-governmental organizations and donors.

Policymakers should create favourable conditions for such a dialogue at all levels and should facilitate public participation in decision-making. Then the establishment of PES will become a framework for better understanding the ecosystem services of river basins, ensuring ownership, improving cooperation and building trust.

## Capacity-building and awareness raising

Suppliers need to know the value of their ecosystem services and how much buyers are willing to pay for them. Potential beneficiaries need to know the value of these services and the conditions for continued provision. Environmental education and training programmes can help to build capacity and stimulate public demand for action. Special efforts should be made to address young people, who are the future decision makers. Clearing houses, "green schools" and thematic competitions and websites can provide information on the protection and wise use of ecosystems and promote the use of PES. The media can play a key role in increasing awareness of the value of ecosystem services and what will happen if these services decline.

## Arrangements for transboundary waters

Parties to bilateral and multilateral agreements on transboundary waters should adapt their agreements to incorporate the principles of and approaches to the protection and sustainable use of water-related ecosystems. At the transboundary level, PES can become an incentive for cooperation; they are, however, not a means to remunerate Parties for respecting their duties under transboundary agreements and international obligations.

Activities of joint bodies, such as international river commissions, arising from the UNECE Water Convention and other agreements could include the identification of water-related ecosystems and their joint valuation. Joint bodies can provide an excellent platform for dialogue and joint action by riparian States to ensure conservation and restoration of ecosystems. To this aim, the work of joint bodies should also involve representatives of non-governmental organizations and the private sector.

## Monitoring of efficiency

Once a PES has been established, it is important to periodically verify that the payment is in fact being invested in effective land use. Quantification between land use changes and hydrological services and monitoring of these biophysical relationships are needed to ensure the sustainability of PES, since in the long term buyers may not be willing to pay for a service that has not been measured and proven to exist.





# Nature for water

The outlook: Parties to the Water Convention and their partners - the Ramsar Convention secretariat, the World Conservation Union (IUCN), the secretariat of the UNECE Timber Committee, the Food and Agriculture Organization of the United Nations (FAO) and the Ministerial Conference on the Protection of Forests in Europe (MCPFE) - are developing a code of conduct for payment for ecosystem services in integrated water resources management. The code is expected to be adopted at the Parties' fourth meeting in November 2006. Under the Convention's future work plan, capacity-building and pilot projects in river basins will support the implementation of the code of conduct.

Water Convention secretariat  
United Nations Economic Commission  
for Europe  
Palais des Nations  
CH-1211 Geneva 10, Switzerland  
Tel.: +41 (0)22 917 2463  
Fax: +41 (0)22 917 0107  
E-mail: [water.convention@unece.org](mailto:water.convention@unece.org)  
Web site: <http://www.unece.org/env/water/>

UNECE Environment, Housing  
and Land Management Division

Fax: +41 (0)22 917 01 07  
Web site: <http://www.unece.org/env/>

UNECE Information Unit

Tel.: +41 (0)22 917 4444  
Fax: +41 (0)22 917 0505  
Web site: <http://www.unece.org>