BASIC PRINCIPLES OF PES

USAID PES Brief 1

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Introduction

The city of New York receives most of its water from the Catskill-Delaware watershed. In the 1990s, a new federal water quality standard would have required the city to set up a filtration plant at an estimated cost of $4 billion to $6 billion. Instead, in 1997, the city entered into an agreement with farmers in upstream communities to undertake a conservation easement and forestry program to protect environmentally sensitive parts of the watershed. Since then, this watershed protection agreement has helped to improve the quality of drinking water while saving the city more than $1 billion.

Similarly, the Ministry of Environment in Costa Rica operates a nationwide program under which forest owners receive payments for providing four particular environmental services: carbon sequestration, biodiversity protection, watershed management, and maintaining landscape beauty. The Ministry in turn sells some of these services to international investors while helping to add precious forest cover in the country.

In these examples, upstream farmers in New York and local landowners in Costa Rica are seen as providers of useful environmental services for which they receive payments from the service buyers (service beneficiaries or “users”). Over the last decade, several such schemes have evolved. Known as Payments for Environmental Services (PES), these approaches constitute a new frontier in conservation and sustainable development efforts. Valid questions that arise here are: What is so new about PES, and what makes it special? We answer these questions by discussing why it is generally difficult to encourage natural resource users to provide environmental services and the relative merits of PES compared with other approaches to promote conservation.

Market failure and PES

Environmental services are often underprovided by markets due to three interrelated characteristics: externalities, non-excludability, and intangibility. **Externalities** exist when the activities of one person affect the welfare of others who have no direct control over them. For instance, when upstream landowners cut trees, it may lead to flooding (a harmful or negative externality) in downstream areas. However, the landowner may consider only the private timber benefit without accounting for the social damage due to flooding. We are usually concerned about negative externalities, but there can also be beneficial (positive) externalities. An upstream land use associated with reduced erosion downstream is a positive externality.

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Non-excludability refers to the difficulty of excluding people from consuming a resource even if they do not pay for it. Forests absorb carbon dioxide from the atmosphere and release oxygen, the benefits of which are available to all, irrespective of who planted the trees. Thus when a resource is non-excludable, people tend to "free ride" or benefit from it without paying for its upkeep. This may result in underinvestment in the resource.

Finally, the flow of environmental services often is not apparent. For example, even though aquifers are interconnected, it is often difficult for communities to establish a causal relationship between conservation efforts in one part of the watershed and availability of groundwater in another. This **intangibility** reduces the users' willingness to pay for the upkeep of the resource.

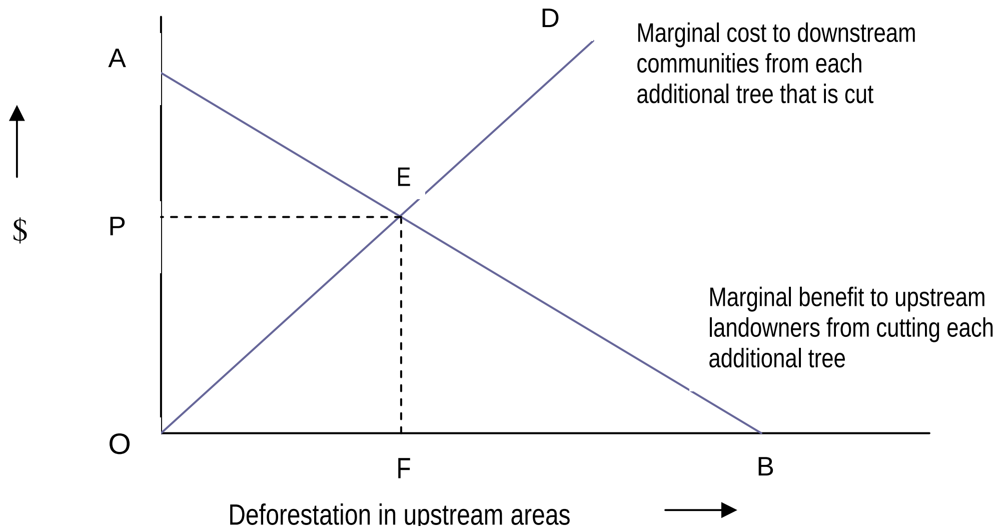
Historically, because many environmental services were not under threat, people took them for granted. As they became scarce, governments took steps to ensure their provision through command-and-control measures such as imposing local land use regulations or establishing nature protection areas. Similarly, in many countries farmers were required to invest in measures that were thought to conserve natural resources, like planting trees or building soil conservation structures. However, governments lack sufficient funds to secure all environmental services, and national priorities may differ from local priorities, ultimately affecting which resources are conserved.

Local communities often organize collective action around environmental services that are valuable to them. In this regard, examples of *Van Panchayats* (local forest councils) in India and the Subak irrigation system in Indonesia are well documented (Ballabh and Balooni, 2002; Lansing, 1987). However, such locally initiated collective action is not always forthcoming and does not normally focus on environmental services of value beyond the local community.

Another conservation approach that has been tried is known as Integrated Conservation Development Programs (ICDPs). These programs aim to create economic opportunity for local people alongside conservation of globally valuable resources, typically biodiversity including wildlife. They may include job training, infrastructure, and other investments in the local economy. The objective is to build a better relationship between local people and conservation authorities, and to overcome weaknesses of "fines and fences" approaches that were based on an adversarial relationship in which authorities tried to protect valuable natural resources from local land users. A major problem with this approach is that economic incentives are indirect and not linked to specific conservation outcomes. In other words, local people gain the economic incentives whether or not they protect the resources. In addition, in some cases strengthening the local economy simply increased the pressure on scarce natural resources. Overall, such programs were not effective in securing an environmental service.

PES, on the other hand, is a direct approach to conservation whereby service providers receive payments that are conditional on acceptable conservation performance. Although researchers usually point out other features to PES, such as that the payment should entail a voluntary transaction between at least one provider and one user for a well-defined environmental service, conditionality is the characteristic that most distinguishes PES from previous approaches.

The theoretical foundations of PES lie in the principle of mutually beneficial bargaining, as suggested by economist Ronald Coase. Through such bargaining, two parties may arrive at an adequate allocation of an environmental resource that is socially efficient (see chart, following page).



Mutually beneficial payment system between two parties

In the diagram, line AB represents the marginal benefit to upstream landowners from cutting each additional tree. The marginal benefits are declining, perhaps due to a lower price for timber as more reaches the local market or because the highest-quality trees are cut first. In this simple example ignoring the costs of harvesting trees, landowners will keep deforesting the area as long as their marginal benefits are positive, i.e., up to point B. However, as more trees are cut, downstream users face costs of flooding and increased sediment flow, represented by line OD. These marginal costs increase as more trees are cut. The two lines intersect at point E, where the marginal benefit for upstream landowners is equal to marginal cost for downstream users. To the right of point E, the marginal cost for downstream users is more than the marginal benefit for upstream landowners. Therefore, the two parties can negotiate a deal whereby downstream users pay price P to upstream landowners for each tree that is *not* cut. Note that price P is mutually beneficial for both parties. Through this payment, they achieve the socially efficient point E where the deforestation level, F, is much less than the privately determined deforestation level B. This in essence is the rationale for PES programs.

Repeatedly pointed out by Coase himself and in subsequent literature, however, is that this bargaining is difficult to achieve in the real world due to high transaction costs, especially given the existence of multiple parties affected by an environmental service. Transaction costs refer to costs of negotiating a contract, implementing a payment scheme, and monitoring and measuring changes in the level of the environmental service in question. As more parties are involved in a payment scheme, transaction costs tend to escalate. Until recently, high transaction costs thwarted any attempts to address externality and non-excludability in environmental services through direct contacts. However, newer institutional and technical innovations have helped to scale down transaction costs considerably. In the case of carbon sequestration for example, on the institutional side, establishment of carbon markets like the Chicago Climate Exchange facilitate carbon trading without requiring buyers and sellers to search for each other. On the technical side, science can now determine much more accurately (and relatively inexpensively) the amount of carbon dioxide sequestered by specific stands of trees, so that one country can sell carbon sequestration rights to another.

Prominent environmental services

Forests and natural ecosystems provide several kinds of environmental services, such as storm protection by mangrove forests, erosion control, pollination of crops, abatement of noise pollution, maintenance of air quality, and scenic beauty. However, not all of these are directly marketable, either because they are not perceived as valuable enough or due to economic and technical constraints as described above. It is useful to note that PES can help in securing only those environmental services for which environmental service users are willing to pay. To date, the four most common services found in developing country PES schemes are:

Carbon sequestration. Forests absorb (or sequester) significant amounts of carbon dioxide from the atmosphere, which helps in mitigating global warming. Many governments, corporations, and even individuals are willing to pay landowners and communities to adopt land-use practices that promote carbon sequestration.

Watershed protection. Ecosystems such as wetlands and forests regulate hydrological flow and control soil erosion. Better management of agricultural chemicals protects water quality. As clean water becomes scarce and people are more concerned about its quality and quantity, downstream consumers (e.g., hydropower plants, water utilities, irrigators and other downstream farmers, fishermen, and aquaculture.) in some places are willing to pay upstream land users for watershed services.

Biodiversity conservation. A significant proportion of the world's biodiversity exists in tropical forests and other threatened ecosystems, but local people often cannot directly benefit from it. Some agricultural practices are more compatible with local biodiversity than others, and small payments to land users might make them sufficiently profitable to replace practices that destroy biodiversity. Several companies and international non-governmental organizations (NGOs) now support biodiversity conservation through PES.

Scenic beauty. Natural areas provide aesthetic beauty, which is treasured by most human societies. Local land-use practices can enhance or destroy scenic beauty, affecting local quality of life and affecting nature-based tourism opportunities. Tourism companies and even private foundations are paying local farmers or other landowners to preserve this valuable environmental service.

Conditionality, additionality, leakage, and permanence

As explained earlier, PES is distinct from other conservation approaches because any economic rewards to environmental service providers are conditional on their continued performance. This **conditionality** means that service providers are to receive payments only when their efforts produce detectable changes in the quality or quantity of the service. This is very different, for example, from programs that subsidize farmers to construct solid conservation or plant trees without any way to ensure that the investments are subsequently maintained. The International Small Group and Tree Planting Program (TIST) pays farmers in Uganda and India to grow trees for carbon sequestration services. Payments are linked to the number of trees protected; whenever a tree is cut, the farmer loses a portion of the payment.

Another important feature of PES and other conservation approaches is **additionality**, which requires that the payment should yield environmental benefits that would have not have been realized without it. If a landowner were not going to cut her trees anyway, it would be unnecessary and therefore inefficient to pay her not to cut them.

Leakage happens when a landowner receiving a payment simply shifts the activity that causes the environmental problem to another piece of land that is not under contract. Under such conditions there is no additionality and thus no point in making the payment, and it would be socially inefficient. Critics of payment schemes like the national PES program in Costa Rica say that many PES programs do not achieve additionality. The solution lies in better targeting of service providers and better monitoring.

Permanence refers to the sustainability of the environmental service. Users are interested in the long-term supply of the service, which requires making payments to providers on a continued basis. For some environmental services such as carbon sequestration, permanence has a different meaning. If the environmental service is discontinued, not only is the service no longer available, but all historic supplies of the service are invalid. For example, when a tree is planted, it continues to sequester carbon as it grows. If it is cut, however, this not only disrupts the present supply of carbon sequestration but also results in emission of all the carbon that the tree ever captured in its trunk and branches back into the atmosphere as carbon dioxide.

Types of payments

In general, payments can be made in cash or noncash incentives. In fact, many people argue that the term “payment for environmental services” should be replaced by “rewards for environmental services” or “compensation for environmental services,” reflecting the idea that payments need not be in cash. For this Sourcebook, we use “payment for environmental services” as shorthand to cover all kinds of arrangements that directly provide natural resource managers a conditional incentive for environmental services.

Depending on the local context and institutional arrangements of a particular program, payments can take several forms, including individual or group payments, or non-cash rewards such as tenure rights, employment opportunities, economic development investments, or access to government services. For non-cash rewards, care must be taken that conditionality is maintained, i.e., that the reward can be withdrawn if the environmental service is no longer supplied. Intermediaries may select group payments or provide local infrastructure development with a view to reduce transaction costs of dealing with individual service providers. However, community payments can introduce other kinds of transaction costs associated with organizing the individual members into a cohesive group and ensuring that all members receive their fair share. In addition, some noncash payments such as land tenure security may be difficult or impossible to revoke if the environmental service is no longer supplied.

PES and poverty alleviation

PES programs are often perceived as tools for poverty alleviation. Indeed, many potential service providers are poor people who depend directly on natural resources for their livelihoods. Any economic incentive to them for improving an environmental service might represent additional income and a potential for poverty alleviation. For example, in the Nhambita Community Carbon Project in Mozambique, carbon sequestration payments represent a significant portion of cash income for poor households (Jindal, 2004). Many donors and government agencies now insist that PES programs include poverty alleviation components to the extent that many such projects aim primarily to improve the economic well-being of the service providers. It is important to keep in mind that, while there may be many cases in which environmental and poverty alleviation goals are compatible, there are others where they are not. If the environmental objective is not achieved, the program may be unsustainable because environmental service users may decline to pay for a program that does not deliver what they are paying for.

Realistic expectations for attainment of environmental services

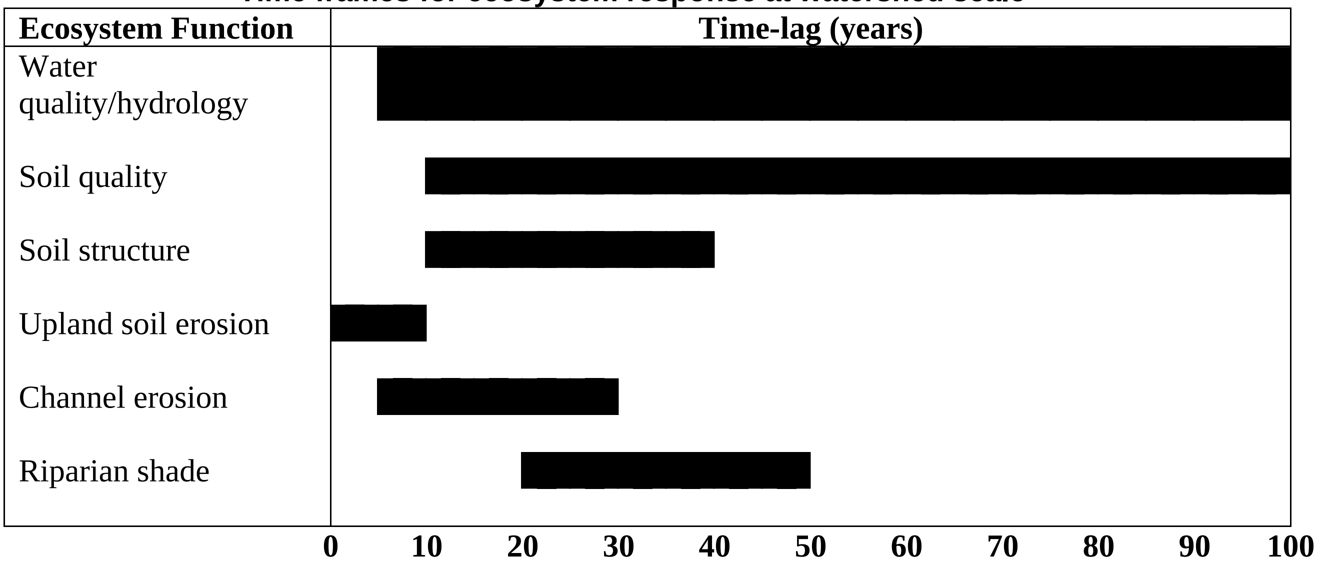
The goal of PES is to create sustainable programs for the provision of environmental services that compensate service providers and secure desired environmental services for service buyers over the long term. When considering, planning, designing, or implementing such a program, it is essential that all program participants have realistic expectations concerning the time that may be required to achieve the desired environmental services. If time lags are too great between payments from service buyers and the receipt of environmental services by the payers, then the payers may decide that the investment is not feasible and pursue more immediate and cost-effective solutions. This time lag between restoration activities and attainment of environmental services can be substantial and may range from months to years to decades or longer depending on the particular location, environmental service, and level of intervention. For example, the Kyoto Protocol is designed to reduce global carbon emissions and to sequester carbon in an effort to slow and perhaps reverse global warming trends. Actions are being implemented now, but it is recognized that it will likely take decades or longer for the Kyoto Protocol, even if implemented globally, to result in measurable reductions in the Earth's temperature. The following paragraphs provide a brief description of time lags that can be expected between the time of interventions and the desired environmental response.

Depending on the magnitude of the desired change in environmental services and the degree of degradation of the ecosystem, the attainment of desired ecosystem services may require decades or longer. In terms of realistic expectations, one of the most critical distinctions is that interventions to protect existing environmental services can be achieved/effective almost immediately. For example, paying land users to stop cutting down trees in a fully ecologically functioning forest can potentially stop ecosystem degradation immediately and maintain existing environmental services.

This is not the situation with degraded ecosystems that must be restored to provide the desired environmental services. For degraded ecosystems, restoration practices must restore a portion of impaired ecosystem structure and function and desired environmental services may require years to decades. Potential service buyers must be fully aware of these time lags. Time lags vary widely, but the table below suggests ranges that might be expected. The shorter response times would be expected for simple systems of limited size with: (1) clearly identified sources of ecosystem disruption; (2) slightly to moderately degraded ecosystem function, (3) straightforward restoration activities; (4) rapid energy and mass flow paths; (5) native flora and fauna with rapid reproductive rates; (6) restoration possible without ecological succession; and (7) little impact by non-native species.

The longer system responses would be more characteristic of complex systems of covering large areas with: (1) poorly identified sources of ecosystem disruption; (2) moderate to severely degraded ecosystem function, (3) uncertainty concerning necessary restoration activities; (4) slow energy and mass flow paths; (5) native flora and fauna with slow reproductive rates; (6) restoration impossible without ecological succession; and (7) severe impact by non-native species.

Time frames for ecosystem response at watershed scale



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Further reading

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