

A New Method in the Analysis of the Environment: the Payments for Ecosystem Services

RENÁTA KITTI FODOR

University of Szeged

Hungary, 6723 Szeged, Budapesti Boulevard 2/A 2/6

Hungary

fodor.r@eco.u-szeged.hu

Abstract

In the 1970s, the ecosystem functions as services began the utilitarian draughting, according to the attention of the public opinion at biodiversity and the environment protection.

With the passing of some decades, the literature of the ecosystem services applied different estimates to the economic value of the single natural components.

An international gathering was the result of this process (Millennium Ecosystem Assessment), where the participations reached an agreement about that the ecosystem services are necessary to deal with on a daily level. 24 pieces of ecosystem services were defined in the course of the synthesis, which content of consider only 4 (!) show an improvement, 15 services decline seriously, while 5 ecosystem services show stability.

In the 2000s ecological services came into the foreground, through economic decision making until the maintenance of devices with a market basis entirely, and then – in its logic so – was born the Payments for Environmental Services.

In my study I inform the story of ecosystem services, deviating to the important stations and the different prevailing economic views. It's important to recognize that the concept of ecosystem service show took shape and manifested itself in its today's form.

In the next chapter I inform the PES conceptual definition, because a number question arises defining a concept with itself: Wunder's definition appeared in 2005 rather can be considered for a general guiding, what the representatives of the different directions modify according to their own taste in the mouth.

I discuss the scope of problems of the efficiency, equity and poverty on the end of the study, because these three topics are some economic, indeed ecosystem service and in connection with PES all the time recurring phenomenon.

Key words: ecosystem services, environment, PES

JEL Classification: O13

1 Introduction

The classical economists found the natural resources in analytical treatment, because the services are free (Gómez-Baggethun et al. 2009). Besides labor, land remained as a separate factor in production function, which reflected in Ricardo's law on diminishing returns on land or in Malthus' concerns on population growth (Constanza-Daly 1992, Turner et al 1994).

Some classical economists explicitly recognized the „services” as natural forces.

Physiocrat belief that land was the primary source of value, this also reflected in Adam Smith's 1776 Wealth of Nations. Say said free gifts of nature as follows: „*the wind which turns our mills,*

and even the heat of the sun, work for us; but happily no one has yet been able to say, the wind and the sun are mine and the service which they render must be paid for” (Say, 1829, p.250.).

By the fall of the classical economics period some economists kept paying attention to natural resources. Stanley Jevons in his book *The coal question* (1865), raised concerns about the coal stocks. After the marginalist revolution the neoclassical economics restricted its analysis to exchange values. Pigou wrote: *„The one obvious instrument of measurement available in social life is money.”* (Pigou (1920) 2006, p.11.). So the monetary analysis was expanded beyond the limits of markets as a way to tackle the economic externalities (Gómez-Baggethun et al. 2009).

Neoclassical economic theory – between the 1910s and the 1930s – had started to elaborate on how technological innovation would allow for increased substitutability, between production inputs (such as capital, land) (Georgescu-Roegen 1975). In Solow’s contribution to the theory of economic growth (Solow 1956), land removed from the production function and then Solow stated: *„If it is very easy to substitute other factors for natural resources, then there is in principle no problem. The world can, in effect, get along without natural resources, so exhaustion is just an event, not a catastrophe”* (Solow 1974, p. 11.).

In the second half of the 20th century, economic started to address shortcomings to analyze environmental problems. In the early 1960s, Environmental and Resource Economics (Environmental Economics as well) expands of neoclassical economics by developing methods to value and internalize economic impacts on the environment into decision making (for example cost-benefit analysis) (Constanza et al 1997). The non-marketed ecosystem services are seen as positive externalities, so that can be more explicitly incorporated in economic decision-making. After all, environmental economics literature has developed since the 1960s, and there were a range of methods to value external environmental costs and benefits (Gómez-Baggethun et al. 2009).

We have to see that there were different types of economic value, that are neglected identify. Since Krutilla’s publication (1967 about the economic value to the loss of landscape and a service from nature), economic value divided in use and non-use values and added up to the so-called Total Economic Value (Heal et al 2005).

In the late 1980s, heterodox economists concerned with human-nature interaction (Georgescu-Roegen 1971, Odum 1971, Daly 1977). The part of the society started to formalize Ecological Economics (Ropke 2004, Kocsis 1999). While environmental economics operates neoclassical economics (such as perfect information, theory of consumer choice), that ecological economics conceptualizes the economic system (!) as an open subsystem, which it co-evolves with social and ecological systems (Daly 1977). Ecological economics have advocated the so-called strong sustainability (opposite environmental economics, which advocated weak sustainability), it means that natural and manufactured capital are in a relation of complementarity rather than one of substitutability (Constanza-Daly 1992). That was challenged economic growth models where natural resources absent on the basis. So the capital can’t reproduced without inputs from natural: *„every material process consists of the transformation of materials by specific agents”* (Georgescu-Roegen 1986, p. 97-98). So environmental decision making tools reducing ecosystem services and values to a measuring rod (Martínez-Alier 1987, 2002).

2 Protect the Environment

In the second part of my study I will show some tools. Firstly, I will introduce a new tool, the Payments for Ecosystem Services. When the environment's degradation is too big, when governments are not do anything to stop the pollution (see the Kyoto protocol, the biggest polluter has not written until today!), the PES can be an option to protect the environment. I will also show other tools and I try to figure out the connection between efficiency, equity and poverty.

2.1 About PES

First of all, you have to see that ecosystem services are essential, non-substitutable and poorly understood. Nowadays, there are real costs to their protection and provision. Therefore someone must pay those costs. But however, payments don't require commodification.

The basic idea behind PES is that those who provide ecosystem services should be paid for doing. So when we go to the hairdresser, we pay for it. PES provides an opportunity to put a price on previously un-priced ecosystem services for example climate or water quality regulation.

PES arises from its focus on the beneficiary pays principle to the polluter pays principle. The last 15 years there were already more than 300 PES or PES-like programs in the world at national, regional and local levels (International levels for example Reducing Emissions from Deforestation and Degradation (REDD), where developing countries are willing and able to reduce emissions from deforestation and forest degradation, which are paid by developed countries. National such as the Environmental Stewardship Program. Local or neighborhood for example a scheme where residents collectively fund an environmental organization to manage local green space for biodiversity, recreational value and so on), too (Lawton 2013). PES is only one instrument among many for ecosystem degradation. There are a lot of tools for the economics policy to do something for the environment, such as (Jack et al 2008):

- Regulation
- Voluntary efforts by business, communities, individuals
- Incentive or market-based mechanisms
 - Charges for example user fees or taxes
 - Tradable permits for example markets for pollution reduction
 - Certification schemes for example eco-labels
 - Payments for Ecosystem Services – PES.

There are lots of description for PES, but the most widely is Wunder's definition (Wunder 2005):

1. a voluntary transaction, where
2. a well-defined ecosystem service (or a land-use likely to secure that service)
3. is bought by a (at least one) ecosystem service buyer
4. from an (at least one) ecosystem service provider, if and only if
5. the ecosystem service provider secures ecosystem service provision.

A key dimension of PES is the requirement for additionally, that means services must show that payment causes the benefit to occur where it would not have done otherwise, so that is „what would have happened if there had been no intervention?“ (Ferraro – Patanayak 2006).

For illustration, if we planting new woodland, it helps in slowing down the rate at which rainfall reaches rivers, so therefore helps in reducing the risk of rivers bursting their banks or flooding homes and businesses. But if the risk of flooding is high, those householders and/or businesses may be willing to pay for new woodland planting to assist in reducing the risk. If it is clear, where trees need to be planted to slow rainfall, it may be possible for householders and/or businesses to establish a PES deal. And then, where payment is made to the landowner(s) in question for tree planting (Lawton 2013). In my opinion, it can fully work in my town, Szeged, where – because of the Tisza river – the risk of flooding is high (in spring and in autumn usually floods the river) and both the government and the citizens can collaborate in a PES scheme to reduce the damage and prevent the misery.

There are at least three distinct perspectives on PES. Two of these are parallel the conflicts between environmental and ecological economics. In this Tab. 1 you can see three views of PES:

Tab. 1 Perspectives on PES

	Environmental economics (ENVEP)	Ecological economics (ECOLEP)	Largely rejects PES
Authors	Engel et al. (2008) Wunder (2005)	Muradian et al. (2010) Noorgard (1994)	Kosoy-Corbera (2010), McCaluey (2006), Robertson (2004), Gómez-Baggethun et al. (2009)
Focus	Prioritizes economic efficiency	Focuses on the multiple goals of ecological sustainability, distribution, economic efficiency and favors a variety of payment mechanisms	Even the notion of ecosystem services, as the improper commodification of nature
Tool	Try to force ecosystem services into market model	Market and non-market too	
Theorem	Coase		

Source: Based on Farley-Constanza (2010) own structure

Engel et al. (2008) said in their article that the ideal PES schemes should integrate ecosystem services into markets. So these PES schemes should be like any other market transaction such as „attempt to put into practice the Coase Theorem” (The Coase Theorem says that if private property rights are clearly defined by enforceable contracts, then the generator and recipient of an externality can, voluntarily exchange and potentially reach an agreement which maximizes social welfare. So therefore the ultimate level of externality generating activity, which will not be affected by initial assignment of property rights (Coase 1960) (p.665). Wunder et al. (2008) said that private sector PES schemes are more effective than public sector ones, because of this approach do accept some role for government intervention, defining property rights and creating enforceable contracts, so reducing transaction costs. They thought that using PES schemes can also alleviate poverty and reduce the economic surplus and future scale of PES.

The authors of ecological economics said that transaction costs for environmental problems are typically enormous, wealth effects extremely important (Muradian et al. 2010). Coase also himself argued and said „...the world of zero transaction costs has often been described as a Coasian world. Nothing could be further from the truth. It is the world of modern economic

theory, one which I was hoping to persuade the economists to leave” (Coase 1988, p.174). From this perspective the ECOLEP see that Coase Theorem applies only a very narrow subset of ecosystem services. It helps to understand that the standards which proposed by Wunder, in real life very few PES schemes achieve. Therefore Muradian et al. (2010) defining PES as a „*transfer of resources between social actors, which aims to create incentives to align individual and/or collective land use decisions with the social interest in the management of natural resources*” (Muradian et al. 2010, p.1205).

From ENVPEP’s perspective Wunder’s PES definition may be not only unattainable, but inappropriate. Resources or ensuring are just a distribution of payments, which can require non-voluntary approaches such as taxes or charges, which are frequently the case in real life PES schemes. It also means that services dominated by private good characteristics, which are amenable to voluntary payments, while services with public good characteristics aren’t (Farley-Constanza 2010).

Everybody could see that all of ecosystems and services are really complex and it may be appropriate to pay even for poorly defined services. Porras et al. in their 2008 article said that in real life there is considerable concern concerning the water regulation services provided by forests, dozens of schemes nonetheless pay for these services. One of the best defined service is carbon sequestration. Transaction costs may increase are more explicitly defined. While one buyer is required for PES definition, the carbon cap scheme require payments to the regulating access to the service rather than service provider.

The ECOLEP approach stands near to me, because I think that it is wider and more usable approach than the ENVPEP. The ECOLEP view focuses both economic and social interests, and – of course – nature. I believe that PES can be a world-saving tool, only we have to wish better protect the environment and to strive the cooperation with people, firms and governments equally.

2.2 Efficiency, Equity and Poverty

In the publication of Muradian et al. (2010) ENVPEP was criticized. First of all, because it sees that PES as primarily an instrument for improving the efficiency of natural resources management. In the second place, it is not necessarily to alleviating poverty (Pagiola et al. 2005). The problem is that efficiency and equity are usually closely linked. Therefore practitioners will face the challenge to link PES with rural development programs. Just because of this, the interest displayed towards PES by governments or NGOs is in part due to the expectation that PES will become a win-win mechanism for poverty alleviation (Engel et al. 2008).

The ECOLEP view is that there are two inter-related questions, which are how equity is defined in relation to PES (Pascual et al. 2010) and whether there are any reasons for efficiency or equity to prevail (Muradian et al. 2010, Pascual et al. 2010).

Pascual et al. (2010) in their article focus on the allocation of outcomes and several fairness criteria. So they focus a distributive justice approach to equity and the equity effects on those participating in PES schemes.

ECOLEP needs attention to whether the provision of incentives is appropriate, given that in some cases it may have a negative impact on the provision of ES. In that incentives may weaken intrinsic motivations for providing the ES.

There are other equity aspects. First, a PES scheme may implicitly recognize a right to pollute which can have equity implications. That means if those polluting are richer than ES users, it may be argued from an equity perspective, so PES should not be used to address the ES provision problem. Second, the PES may affect local non-participants (Pagiola et al. 2005). By limiting their access to resources which were managed as open access. So the PES schemes has to take it into account, evidence that it has not taken place so far doesn't mean it can't occur (!). Third, equity between generations needs to be addressed (Norgaard 2010) and also related to the relationship between efficiency and equity.

A cost-effective PES delivers the max. amount of ES possible given a certain amount of funding. This has a positive environmental implications and it can also have positive equity implications, too. This means two important things. First, the larger amount of ES maintained, the better off future generations would be. And the second, while individual ES suppliers may not receive in the case of a less cost-effective scheme (as much per unit of ES), more ES suppliers could be allowed to participate.

The interest in PES in the policy arena of developing countries is due in part to the expectation it can be a win-win mechanism, so both efficiency and equity need to be considered (Muradian et al. 2010). We know that equity and poverty alleviation are different concepts. May be found, that a PES scheme could be equitable but might not be able to reduce poverty. The poverty, livelihood impacts of PES are determined by a lot of factors. There are other mechanisms which specifically designed to reduce poverty such as direct payments for the poor. But when it compared to a PES scheme that adopted a criterion such as the maxi-min which maximizes the benefits to the poorest (Pascual et al. 2010).

Obviously, the best solution would be design a cost-effective PES scheme and it would free up resources for the most appropriate pro-poor program to complement the PES.

2.3 Other interesting alternative tools

I would like to see that PES is not a perfect tool, but it can be one of the best tool nowadays. Nowadays, when the sources are given out. Nowadays, when the population dramatically growing. Nowadays, when there are a lot of problems, which are world-wide.

In the 1990s, interest has grown to create economic incentives for conservation about Market Based Instruments. That was leading to instruments with this logic are Markets for Ecosystem Services (MES). You can see at the summary Tab. 2.

Tab. 2 Summary table about MES

Mechanism	Commodified ES	Sites of application
MES	Emission trading of greenhouse gases	EU, UK, Chicago
	Sulphur dioxide emission trading	US Clean Air Act in the 1990

Source: Based on Gómez-Baggethun et al. (2009) own structure

From the table visible, that there are lots of commodified ecosystem services which have a a MES schemes. It also means that many ecosystem services have been bought and sold in markets, but the relation was often indirect and weren't called ecosystem services. For several decades in Europe or the United States, agricultural practices, to protect water, soil and biodiversity have been in place (Dobbs-Pretty 2008), not only in 2000s. The formal framing of Market Based Instruments like MES a widespread promotion, which an integrated conservation tool and mainly developed in the last few decades (Gómez-Baggethun et al. 2009).

I consider it important to mention, that the first MES experience at the international scale is probably the emission trading system in the European Union which launched in 2005. The goal was established a trading mechanism for the six major greenhouse gases (carbon-dioxide, methane, nitrous oxide, Hydrofluorocarbons, perfluorocarbons, chlorofluorocarbons) (European Climate Exchange 2008).

In the Clean Air Act (1990) the US Congress put limits to sulphur dioxide emissions. It issued tradable permits to large scale emitters of this gas. Then it leads to the another early experience, which called the Wetland Mitigation Banking in the US, too. The Clean Water Act gave the power to the developers with permits to allow the damage of wetlands. So it exchange to commitment to create/restore larger wetlands. In the 2000s carbon markets were born. In the UK the Emissions Trading Scheme (ETS) involved some companies in an agreement (Climate Change Agreement) with the government. Trading participants because they can use emission trading to meet the greenhouse gas emissions targets (Bayon 2004). Due to this in 2003, the Chicago Climate Exchange was launched by a private company, and created a trading scheme based on voluntary targets. We have to see that one of these examples are perfectly match in PES schemes, so – as I mentioned – defined as voluntary, conditional transactions over well-defined ecosystem services between at least one supplier and one user (Wunder 2005).

The basic idea behind MES (and PES, also) is that the beneficiaries of service provision have to compensate the providers. From the table also visible that all of ecosystem services included most in market schemes so far include, such as:

- carbon sequestration in biomass, soils
- protection landscapes
- provision habitat
- various hydrological functions related to quality, quantity, timing of freshwater flows from upstream areas to downstream users.

In 1997 Costa Rica pioneered a country-wide program called Pago por Servicios Ambientales (PSA). In this program they used of formal PES mechanisms in developed countries by establishing. Its aimed to reverse the severe deforestation rates (Pagiola 2008). In Meso- and South-American countries in the 2000s, lots of PES like mechanisms have spread. After the Kyoto protocol scenario, trade programs such as Reduced Emission from Deforestation and

Degradation (REDD and now REDD+) are being discussed as a vehicle to international PES schemes.

The concept of PES is using alternative labels such as Compensation for Ecosystem Services (CES), Compensation and Rewards for Environmental Services (CRES) and the Payment for rural Landscape Beauty Services (PaLBeS) (Marangon-Troiano 2012).

PaLBeS provides compensation for landscape in according to produce aesthetical and recreational benefits to tourists, hunters, fishers or citizens, who be able to derive from landscape other services, including religious, spiritual or existence (World Resources Institute 2009). Landscape and its services have distinct values linked or not to direct use, and we should see however that there is a growth demand and a willingness to pay (WTP) for the provision of ecosystem services.

PES and these alternative tools are aimed at the conservation, the improvement of the ecosystem services.

3 Conclusion

Environmental decisions are often put within the framework of cost benefit analysis. Several authors posed the logic of valuation as a pragmatic tool. The search for short term policy action to halt ecosystem services loss, where traditional narratives for conservation have failed. The institutional economic structures, the market-based policy design has been in an advantaged position to reach decision-making.

The framing of ecological concerns in economic terms involved important qualitative implications. The perception of ES functions as exchange values could be subject to monetization and sale.

The Coasian-based analysis is used to pose the logic of PES. Summary, PES is a mechanism to translate non-market values of nature into real economic incentives, well-defined property rights, absence of intermediaries and PES is emphasizing the economic efficiency advantages of sheer market transactions. Payments could change the logic from doing and to start thinking what is individually best to do.

Policy design based on economic incentives which signal self-regarding behavior as a response can undermine the moral sentiments for conservation. A potential threat of market-based mechanisms relates to potential changes from ethical obligation or regulation to economic self-interest.

The ENVEP has over-emphasized the role played by Coasian transactions. Considers some of the schemes funded by governments and other intermediaries. The ECOLEP has over-emphasized the reliance of the ENVEP on the Coasian Theorem. We need to develop an improved definition, therefore its possible in the provision of environmental services and rural development.

A well structured system is required to implement PES. Conditionality, additionality, transparency are also important characteristics. The voluntary participation of the ES providers at least should be preferred. The design of PES needs to consider both intra- and inter-generational equity and relationship with cost-effectiveness. The equity and cost-effectiveness are linked and they need to be considered.

A PES scheme is a transparent system for the additional provision of environmental services and conditional payments to providers. It includes schemes at various geographical levels from international to local and involved individuals and businesses. Its importance in relation to cost-effectiveness, Paretian efficiency and individual ES providers, the right to choose.

The Coase Theorem has added arguments to the ECOLEP. It limited applicability of Coasian transactions to the provision of ES. If a market for the ES can be created, it's likely to lead to a more efficient allocation of resources than Coasian transactions. The operations of the market should therefore be regulated through physical measures and the resources and the flow of services.

The use of PES systems is not the same as a letting the free market decide on the provision of ES. The PES is not only a decision to conserve nature on the basis of economic valuations. PES schemes are essentially instruments to maintain or recreate the supply of ecosystem services.

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