

# Ecological economics and ecosystem functions – a focus on actors and institutions in payment for ecosystem services (PES) schemes

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## Introduction

"If the core problems of the environment are in great measure ecological, their causes are largely anthropogenic. This means that appropriate solutions need to involve partnerships, not only between ecologists and economists, but also from a broad range of disciplines." (Dasgupta et al., 2000)



- Ecosystem services as a conceptual framework links ecology (by referring to ecosystem functions) and socio-economics.
- Ecological economics as a discipline has similar roots in so far as the environment and the economy are both addressed by the discipline; science, assessment and policy are at its core. Thus, an ecological economics analysis of ecosystem services and payments schemes is of relevance.

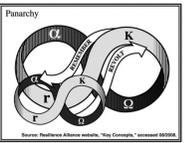
- Payments for ecosystem services - a voluntary scheme for the conservation of ecosystem services, see the table below for a definition - are presented as new means to prevent further ecosystem degradation and biodiversity loss, providing a development perspective for the local communities at the same time. However, the current literature lacks a focus on ecology, actors-based approaches and institutional settings – a lack which results in neither sufficient protection of biodiversity, nor in development perspectives.

## Ecosystems and Ecosystem Services

**Ecosystem ecology:** "An ecosystem consists of plants, animals, and microorganisms that live in biological communities and which interact with each other and with the physical and chemical environment, with adjacent ecosystems, and with the water cycle and the atmosphere (Odum 1989)." (Folke et al., 1998)

**Ecosystem services:** "benefits people obtain from ecosystems" (Millennium Ecosystem Assessment, 2005) → Anthropocentric definition

- Supporting
- Provisioning
- Regulating
- Cultural services



→ Adaptive cycle of ecosystems (Gunderson and Holling, 2002)  
→ Application to socio-ecological systems

## Economic instruments for Sustainable Development

- Policy instruments developed for sustainability have evolved towards market-based policy instruments (Goodstein, 2005).
- This shift has been presented by neoclassical economists as more efficient and cost-effective.
- Instruments based on financial incentives for behavioural change have increasingly attracted policy-makers.

- Regulatory instruments
- Command-and-control
- Voluntary agreements
- Market-based instruments:
  - Pigouvian taxes (and subventions)
  - Coasian negotiation
  - Cap-and-Trade
  - Payments for Ecosystem Service



The environment as a challenge for economic science (Beckenbach, 1992)

How to link democracy and ecological sustainability?

Ecosystems and Economics

## Ecological Economics

Evolutionary thinking in economics & ecology

How to live within planetary boundaries, assuring eradication of poverty?

Ecological consideration: scale of economic activity = our planet's carrying capacity

Beyond the assumptions of individual rationality, market equilibrium and neoclassical allocation-economics

Interdisciplinary approach

What kind of institutions for sustainable development?

## Payments for Ecosystem Services

- Amongst the instrumental tool box of market-based instruments, the concept of payments for ecosystem services (PES) has become popular (Jack et al., 2008).
- Milder et al. (2010) estimate that by 2030 payments can benefit 120-163 million low-income households in developing countries.

According to Wunder (2005) a payment for ecosystem services is:	Critical assessment:
1. „a voluntary transaction where	Voluntary?
2. a well-defined Ecosystem Service [ES] (or a land-use likely to secure that service)	„Well-defined“ ecosystem service?
3. is being 'bought' by a (minimum one) ES buyer	Buyer-seller relationship?
4. from a (minimum one) ES provider	Provider = landowner = relevant actor?
5. if and only if the ES provider secures ES provision (conditionality)."	Sustainability criteria?

### Literature overview on PES:

- Lots of case studies on various ecosystem functions and payment schemes
- Sparse theory development
- Pro-market advocates vs. Criticism of commodification of nature

### What is missing?

- Critical evaluation of PES schemes (empiricism & theory)
- Focus on institutional settings
- Inclusion of modern ecosystem ecology
- Actors-based approaches
- Ecological economics and Evolutionary economics
- Dynamic, complex adaptive systems perspective



## Actors-based approaches

Beckenbach and Briegel (2010) state that economic analysis too often concentrates on aggregates, which masks different actor constellations and different types of actors:

→ Possibilities and constraints of political regulation of complex adaptive systems

→ Realistic perspective on the actors and their motivations

→ PES schemes:

- Different **actors** (private, public, corporate, NGO)
- Different **roles** in different contexts, actors can serve as buyer, provider/seller, landowner, legislator, etc.
- Different **communities** and **scales** (geographical & temporal)

## Institutions

Economic actors are embedded in institutional settings, which influence choices at all levels of society (Vatn, 2005):

- Conventions – coordination through regularity
- Norms – value level
- Externally sanctioned rules – sphere of law

We can understand institutions as **regulative mechanisms** for collective choice problems. They also structure our perception of nature and the environment and thus impact possibilities and opportunities for environmental policy (Scott, 1998; Luks, 2005).

The **problem of "fit"**: interaction between human and ecological dimension.  
→ Are PES schemes fit for regulating complex adaptive socio-ecological system?

## Socio-ecological interactions

- Sustaining the biosphere via PES schemes is an **integrated combination of ecological, social and economic problems**.
- "Panarchy" describes **complex adaptive systems** that evolve in adaptive cycles of exploitation (r), conservation (K), release (Ω) and reorganization (α).
- Holling (2001) concludes: "ecosystem management must build and maintain ecological resilience as well as the social flexibility needed to cope, innovate and adapt."

Ecosystem ecology	Explanation and relevance for institutional design	Finding institutional matches
• Complexity	Complex adaptive systems, various parts interact in non-linear dynamics	• Sustainability criteria : efficiency & adaptability within ecosphere limits
• Self-organisation	Ordering patterns in ecosystems are present	• Institutions for: adaptive change, innovation, learning and renewal
• Diversity	Biodiversity, functional diversity, spatial and temporal diversity	
• Hierarchy	Exchange of information or quantity of material from one level to another	
• Resilience	Ability of a system to keep structure and function after disturbance	

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## Conclusion

While payment for ecosystem services appear as a new instrument for biodiversity conservation and human development, a critical analysis of the sustainability effectiveness is necessary. Focusing on actors in different institutional settings provides key findings for institutional design, which also has to integrate modern ecosystem ecology findings.

### What comes next?

- Case studies
  - Geographical diversity: UNESCO Biosphere Reserves, EU, Germany, ...
  - Different PES schemes
  - Relating financial transfer to behavioural change and not to ecosystem commodification
- Further theoretical development of PES assessment

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