Quo vaditis agriculture, forestry and society under global change?
Velké Karlovice, 02-04 October 2017

Economics and marketing of ecosystem services: experiences, challenges and opportunities

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Outline

- The general framework: a glance backward and the emergence of ecosystem services (ES)
- Instruments to ensure the provision of ES → Payments for ecosystem services (PES)
- PES and EU policies
- Barriers and challenges for PES development
- Final remarks

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- Intro: a glance backward and the emergence of ecosystem services (ES)
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A glance backward (1/2)

https://fhsarchives.wordpress.com

"*The first and foremost purpose of a forest growth is to supply us with wood material; it is the substance of the trees itself, not their fruits, their beauty, their shade, their shelter, that constitutes the primary object...*"

Fernow, B.E. (1902). Economics of Forestry (p. 86)

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A glance backward (2/2)

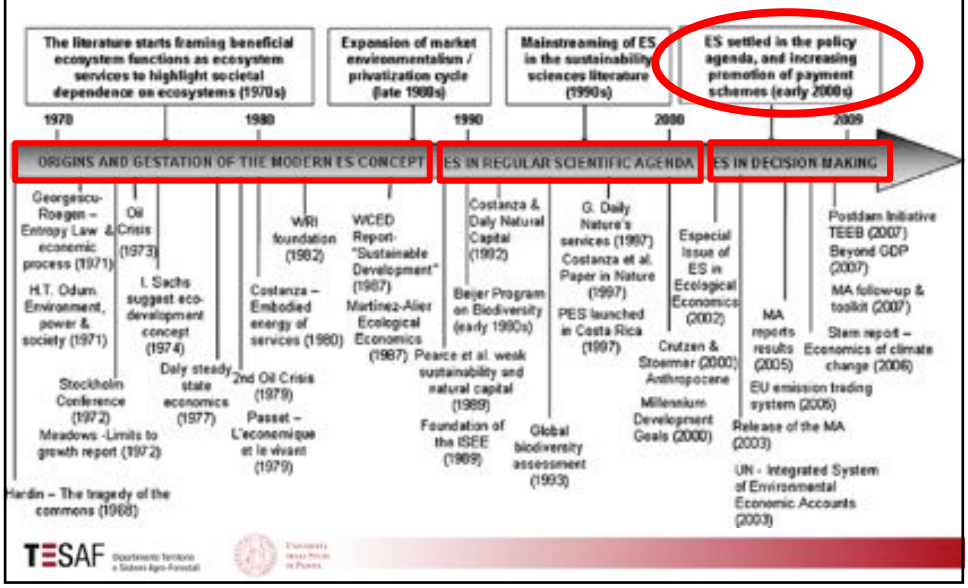
Wake (or back-wash) theory
[*Kielwassertheorie*] (Rupf, 1960)
Dominating forest management paradigm and politics until the 60s.

= Priority of wood production allows additional social and ecological benefits as byproducts of wood production

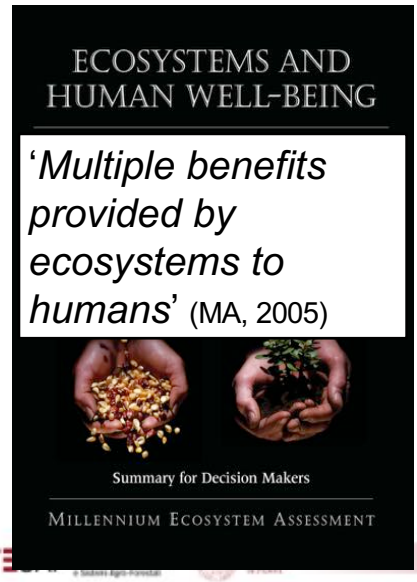
Multifunctional forestry and ecosystem services (ES)

- '*nachhaltigkeit*' permanent flow of products or products and services from the forest (von Carlowitz, 1704)
- Cc
- Multinfunctionality in forestry: 1990s

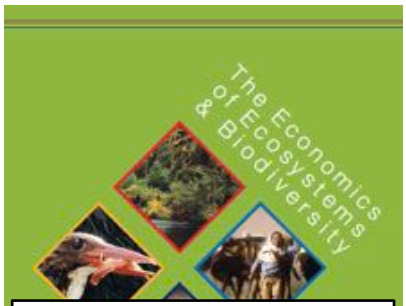
Stages in the modern history of ecosystem services (Gómez-Baggethun *et al*., 2010)



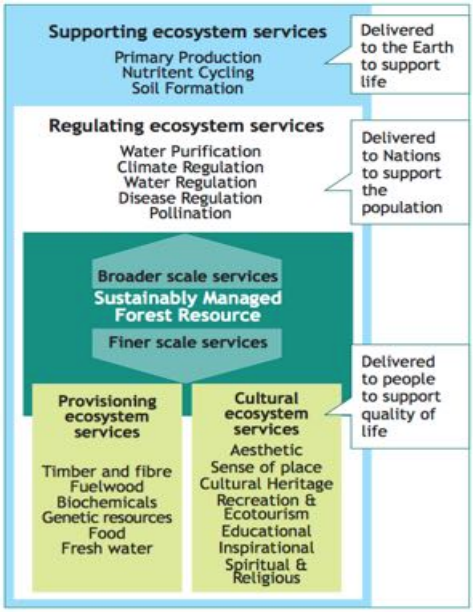
Ecosystem services (ES)



'*Multiple benefits provided by ecosystems to humans*' (MA, 2005)



'*Direct and indirect contributions of ecosystems to human well-being*' (TEEB, 2010)



Source: MA, 2005

ES classification

Other ES classification initiatives:

- **EU Environmental agency: CICES (v. 4.3)**
  1. Provisioning, 2. Regulation and Monitoring, 3. Cultural
- **TEEB (2010)**
  1. Provisioning, 2. Supporting/Habitat, 3. Regulating, 4. Cultural

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ES: some critical/challenging issues

- Defining ES
- Links between ecosystem functions and ES
- ES depending on multiple ecosystems
- Trade-offs/synergies among ES
- ES classification
- …
- Many (forest) ES are mixed public-private goods
- How to measure/value ES?
- How can ES flow be ensured/encouraged?
- How can ES be remunerated?

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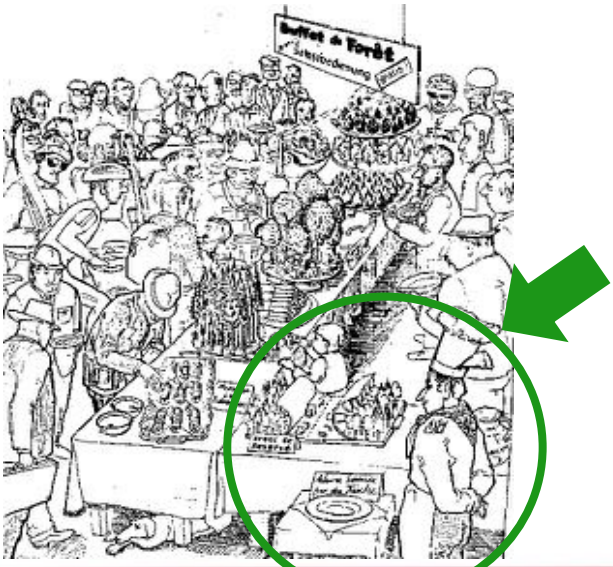
(Forest) ES: the problem

The "*forest buffet*" is often for free



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Policy instruments to ensure provision of ecosystem services (mod. from OECD, 2006)

Sticks
= Command and Control

- Prohibition bans
- Licenses/Permits
- Compulsory Standards (e.g. environmental, emission, process…)
- Liability/Damage compensation…

Carrots
= Incentives

Market-based instruments (MBIs)

- Subsidies
- Incentives
- Payments for environmental services (PES) and quasi-PES
- Direct markets
- Tradable permits
- Auctions
- Ecolabeling/Certification…

Sermons
= Information

- Awareness campaigns
- Extension services
- Information disclosure
- Research and development…

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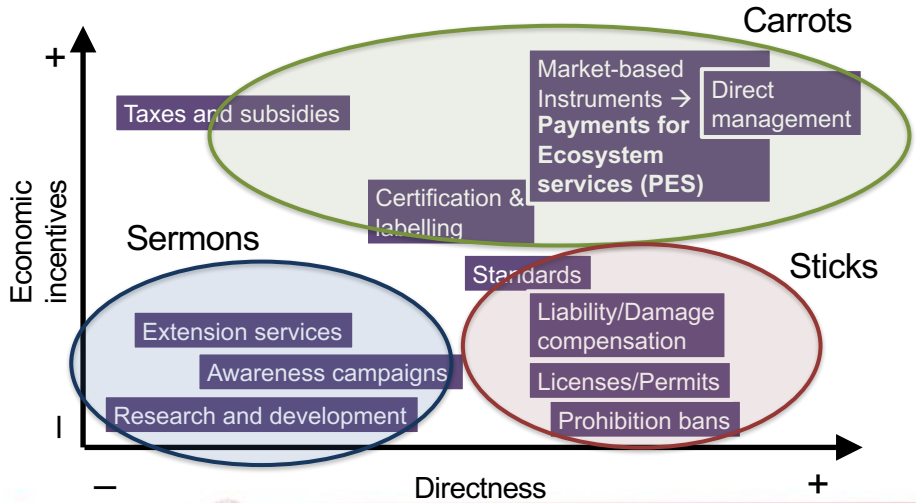
Policy instruments to ensure the provision of ecosystem services
(mod. from OECD, 2006 and Wunder, 2006)



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PES: definition

Many definitions over time: Wunder (2005 and 2015), Tacconi (2012), Sommerville *et al*. (2009), Porras *et al*. (2008, 2012), van Noordwijk *et al*. (2007), Swallow *et al*. (2009), Shelley (2011), Karsenty (2011), Muradian *et al*. (2010), Engel (2015)…

A PES is… (Wunder, 2005):

1. a **voluntary transaction** in which
2. a **well defined ES** (or a land use likely to secure that service)
3. is **"bought"** by a (minimum of one) **buyer**
4. from a (minimum of one) **provider**
5. if and only if the provider continuously secures the provision of the service **(conditionality)**

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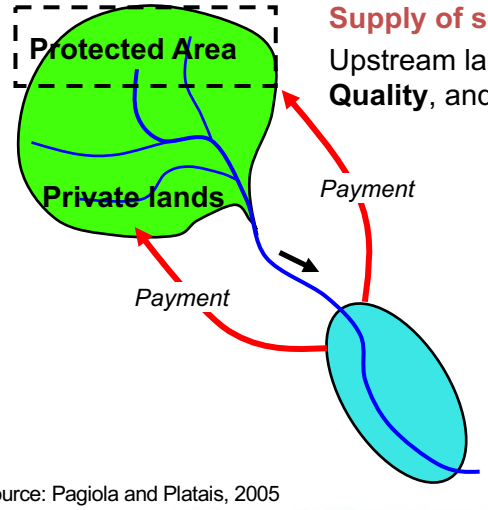
PES: the rationale (1/3)



Source: Pagiola and Platais, 2005

Supply of services:

Upstream land uses affect the **Quantity**, **Quality**, and **Timing** of water flows

Demand for services:

Possible downstream beneficiaries:

- Domestic water use
- Irrigated agriculture
- Hydro-power
- Fisheries
- Mineral water company
- Recreation
- Downstream ecosystems

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A "classic" example
Vittel Mineral Water
(Vosges, France)

30-year long contracts with all farmers within the watershed area to reduce the use of nitrates and enhance agriculture and forestry practices:

- **1 700 ha** converted from corn to set-aside or other crops
- **92%** of the area under some protection form
- About **200 €/ha/yr.** compensation to farmers for missed revenues
- About **25 M €** invested by Vittel in the first 7years (i.e. **1.52 €/m³** of bottled water)…**10-year long negotiation process!**

→ Similar initiative by Coca Cola in Southern Portugal: 17€/ha to FSC certified forests hosting and managing water-filtration areas

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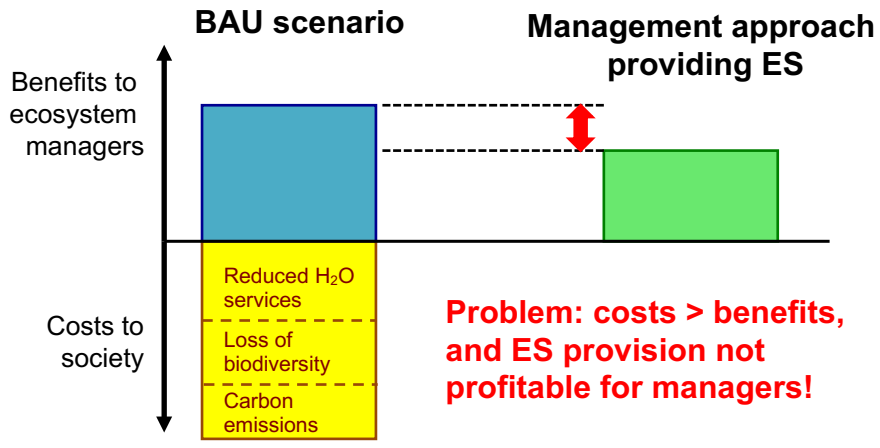
PES: the rationale (2/3)



Problem: costs > benefits, and ES provision not profitable for managers!

Source: Engel, Pagiola & Wunder, 2008

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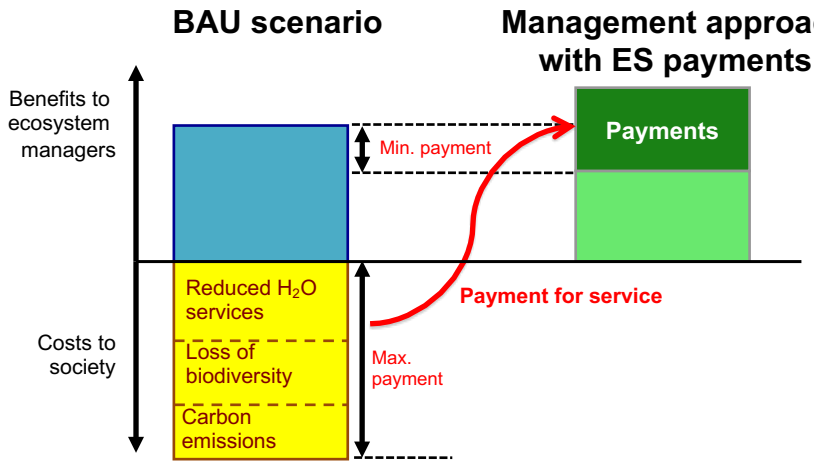
PES: the rationale (3/3)



Source: Engel, Pagiola & Wunder, 2008

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Different approaches to set-up policy tools to support ES provision

Environmental standards & constraints (e.g. CAP greening measures, limitation of harvesting operations, compulsory management practices…)

Costs for ES provision (totally or partly) compensated via **incentives** or **fiscal measures**

Public role for coordinating provision and controlling

Costs borne by society not by direct beneficiaries

Mixed situations are possible

Need for a given ES currently not provided on market is identified (e.g. carbon sequestration, clean water, increased biodiversity, recreation, wild forest products production and collection…)

1+ beneficiaries agree/deal with **1+ suppliers to remunerate** extra-costs associated **to ES provision**

Public body might support/facilitate the deal & monitor implementation

Costs borne by direct beneficiaries

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PES: a revised definition (Wunder, 2015)

A PES is…

1. a **voluntary** transaction
2. between **service users**
3. and service providers
4. that are **conditional on agreed rules** of natural resource **management**
5. for generating **offsite services**

Is a PES defined only by all these conditions met together?

Some PES pre-conditions

- **Conditionality** → service providers are to receive payments only when their efforts to produce detectable changes reflect in the quality/quantity of the service
- **Additionality** → payment should yield environmental benefits that would have not have been occurred without it
- **Permanence** → is the scheme able to be self-sustained? How long will it remain in place after public funding is finished?
- **Leakage** → avoidance/management of indirect negative effects and trade-offs occurring on the same ecosystem service or on the same ecosystem providing the service

Different kinds of PES

(Schomers & Matzdorf, 2013; Matzdorf *et al*., 2013; Viszlai *et al*., 2016)

PES type	Example(s)
Public schemes (or government-financed) PES (*Pigouvian-type*) **→Public entities pay**	Agri-environment-climate measures by EU Rural Development Program Water tariffs reinvested in managing catchment areas
Private schemes (or User-financed) PES (*Coasean-type*) **→ Beneficiary pays**	Mineral-water company paying farmers for adopting certain farming practices Downstream hydropower plant paying forest managers to reduce clearcuts intensity
Public-private PES schemes (*hybrids*) **→ Combination of the above**	Costa Rica's national PES program: a semi-public agency manages funds from different sources and pays landowners for forest conservation
Trading schemes and conservation banking/offsets	Voluntary carbon markets, Mitigation banking for biodiversity, Quotas for fisheries

Some PES types

	COMPLIANT/REGULATED MARKETS Driven by regulation and enforcement	GOVERNMENT-MEDIATED PUBLIC PAYMENT SCHEMES Public funding of stewardship	SELF-ORGANISED PRIVATE DEALS Driven by ethical and/or business case motivations
PES Schemes	**Cap and Trade programmes with production of debts and credits**	**Best management practice contracts, using public funds**	**Direct trade between providers and buyers, in voluntary markets**
PES examples	C-offsets Biodiversity offsets (USA)	Agro-environmental programmes (e.g. EU CAP) Water tariffs	Adventure Parks; environmental education services; C-credits voluntary markets; private agreements on best practices

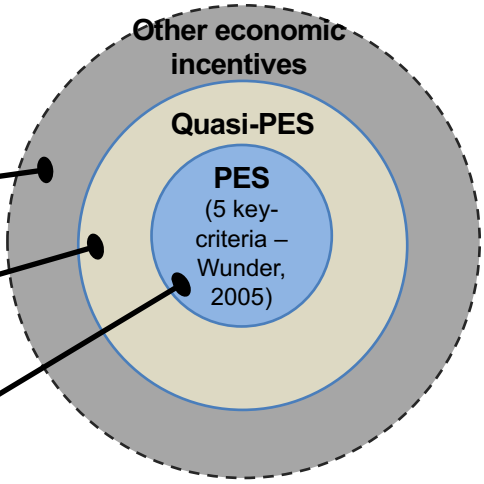
PES, quasi-PES and other incentives

- Are the 5 key-PES criteria always met?

Any payment for any environmental service by anybody (e.g. reforestation subsidies)

1 or more key-PES criteria missing (e.g. public agro-environmental schemes) → quite common

Theory and some cases (private PES)



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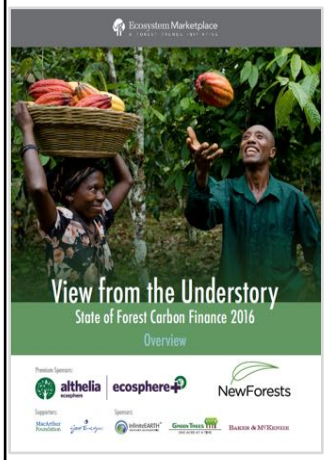
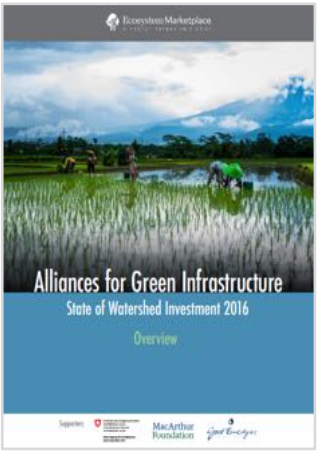
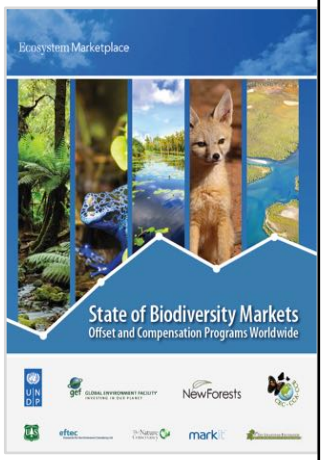
PES and ES markets at global scale







www.ecosystemmarketplace.com

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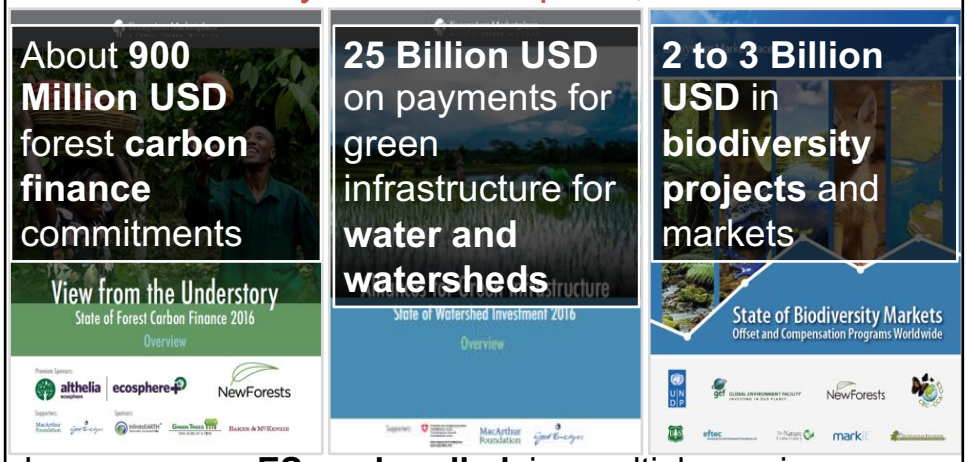
Markets for ES: global view

Source: Ecosystem Marketplace, 2017



In many cases **ES are bundled**, i.e. multiple services are offered together or combined in a single credit

PES and ES markets in Europe

www.ecostarhub.com
www.ecosystemmarketplace.com

Markets for ES: Europe

Source: Etifor & Ecosystem Marketplace, 2017

16.1 $MtCO_2e$, from renewable energy and forestry projects offsets by EU org. (2015)

In EU: **4.4M Euro** (forest projects)

5.7 Billion Euro on payments for **watershed protection in EU** (2015)

(mostly public finance)

62.7 Million Euro in **biodiversity offsets** and **compensation projects** in **EU** (2011-2015)

www.ecostarhub.com
www.ecosystemmarketplace.com

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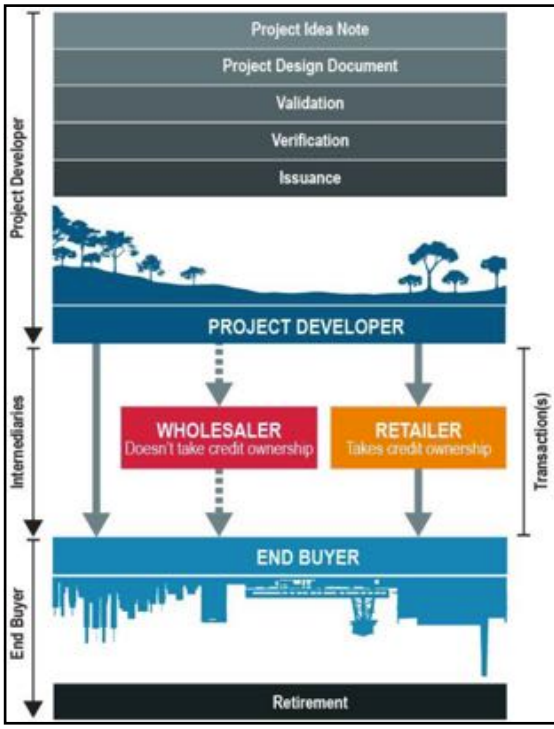

Example: carbon markets

An example: Voluntary carbon offsets

	Offsets from Projects Based Worldwide	Offsets from Forestry Projects Based in Europe
Volume	39.2 $MtCO_2e$	285 $KtCO_2e$
Value	€129.0M	€4.4M
Average Price	€3.2/t	€15.6/t

- Most of ***voluntary*** **forest carbon projects** remain in **Africa**, **Asia** and **Latin America**, fewer projects in EU
- **EU Emissions Trading System** does not account forest carbon offsets → only **voluntary market initiatives**
- Still **limited policy signals** have encouraged the growth of voluntary forest carbon projects in EU (e.g. UK Woodland Carbon Code)

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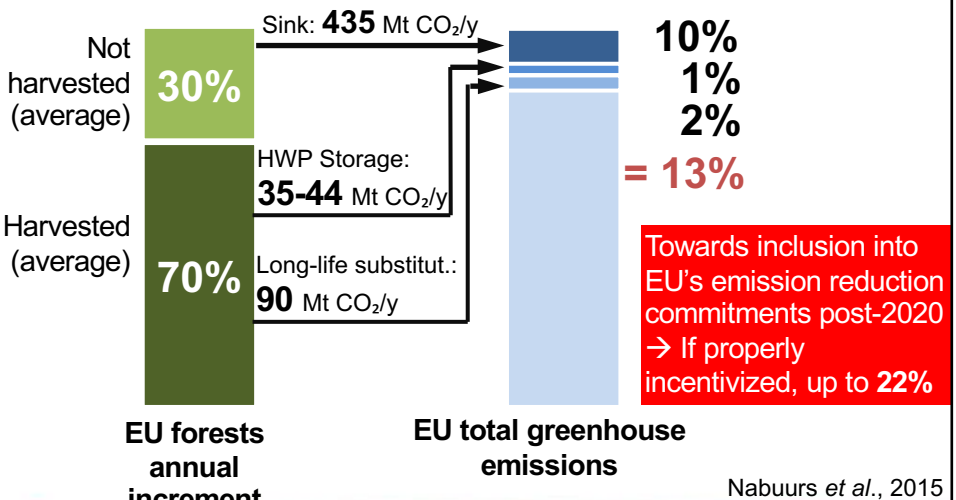
Does this mean EU forests do not contribute to climate mitigation?



Nabuurs *et al.*, 2015

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Project types

Table 7: Market Volume, Average Price and Value by Offset Project Types Based Worldwide, 2015

Project Types	Volume	Average Price	Value
Afforestation/Reforestation	1.9 $MtCO_2e$	€7.4/t	€14.0M
Wind	5.4 $MtCO_2e$	€1.5/t	€8.3M
Clean cookstoves	1.8 $MtCO_2e$	€4.3/t	€7.8M
REDD+: Avoided unplanned	1.5 $MtCO_2e$	€4.2/t	€6.2M
REDD+: Avoided planned	4.3 $MtCO_2e$	€1.1/t	€4.5M
Energy efficiency	283 $KtCO_2e$	€11.0/t	€3.1M
Fuel switching	233 $KtCO_2e$	€11.9/t	€2.8M
Landfill methane	371 $KtCO_2e$	€2.8/t	€1.0M
Run-of-river hydro	790 $KtCO_2e$	€1.3/t	€1.0M

Forest Carbon Offset Project Types Based in Europe, 2015:

Project Types	Volume	Average Price	Value
Afforestation/Reforestation	285 $KtCO_2e$	€14.7/t	€4.2M

Government-financed projects

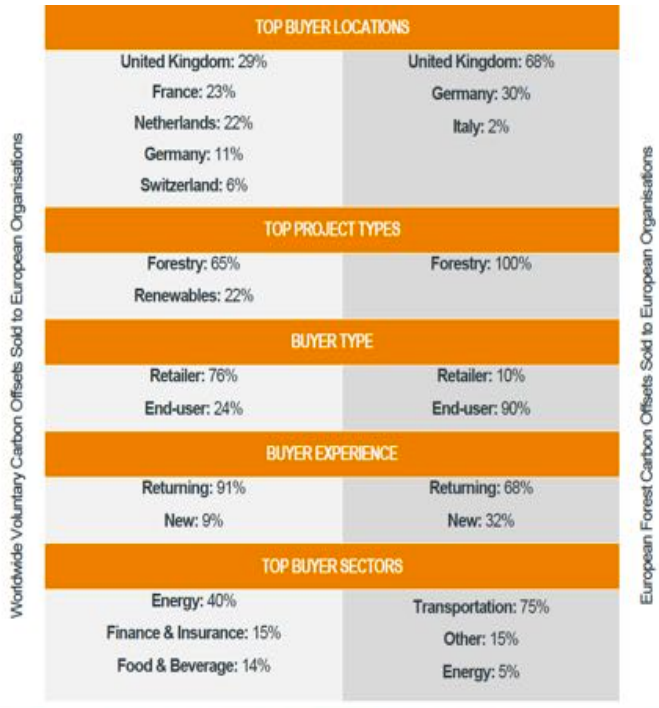
REDD+ Readiness Financing by European Countries, 2009-2014

EU governments took the global lead in financing REDD+ Readiness and paying for the subsequent emissions reductions. e.g. since 2009, NOR, GER and UK have committed over €1.5 billion for REDD+ Readiness in 13 tropical countries

Buyers

88% of buyers were influenced, in part, by project co-benefits (biodiversity, social impacts…)

Co-benefits as a key differentiator and marketing tool



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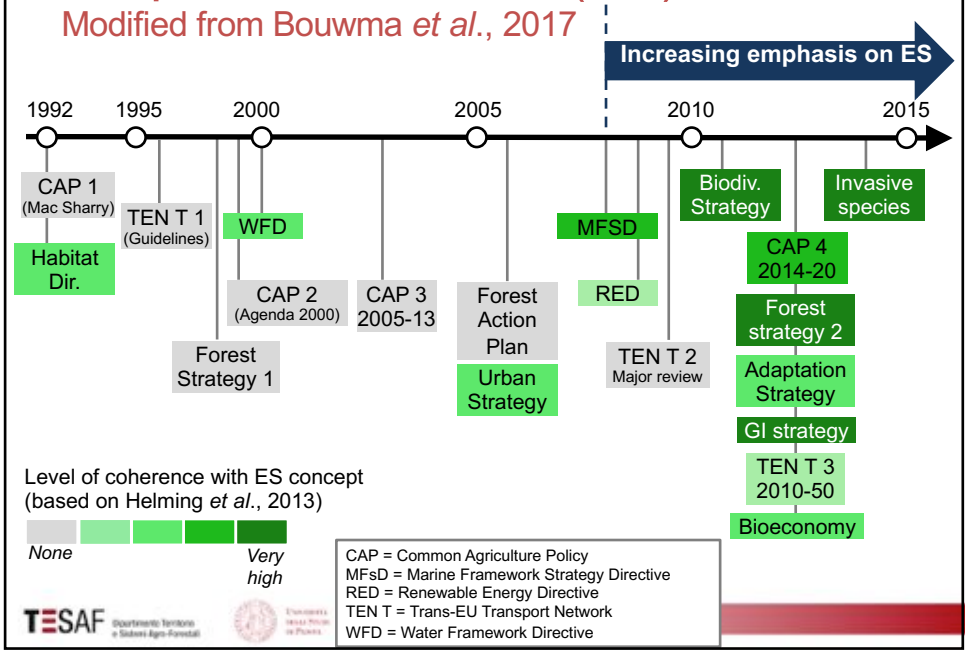
EU policies and PES (1/2)

Modified from Bouwma *et al.*, 2017



EU policies and PES (2/2)

Some examples linked to the forest sector

EU Forest Strategy (2013), Priority Area 4 → Protecting forests and enhancing ES

Multi-annual Implementation Plan of the new EU Forest Strategy (2015) (p. 19):

"*MS and the Commission will foster innovative mechanisms (e.g. PES) to finance the maintenance and restoration of ES provided by multifunctional forests*"

How?
Report + seminar (2016/17)
Link with MAES initiative

Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011)

Action 5: Improve knowledge of ecosystems and their services in the EU→ ES mapping, assessing, valuing accounting and reporting by MS

Action 11: Encourage forest holders to protect and enhance forest biodiversity

EU Bioeconomy Strategy – Commission staff working document (2012)

"*Work on land as a resource to develop the full range of ES, from crops to fresh water to climate change mitigation and adaptation*"

PES not mentioned

Focus on **"biomass"**, provisioning ES (p. 16)

"*The bioeconomy encompasses the **production of renewable biological resources** and their conversion into food, feed, bio-based products and bioenergy*"

EU Forest Strategy (2013)

EU Forest Strategy (2013), Priority Area 4 → Protecting forests and enhancing ecosystem services

Multi-annual Implementation Plan of the new EU Forest Strategy (2015) (p. 19):

"*Member States and the Commission will foster innovative mechanisms (e.g. Payments for Ecosystem Services) to finance the maintenance and restoration of ecosystem services provided by multifunctional forests*"

How?

Report + seminar (2016/17)

Links with Mapping and Assessment of Ecosystem Services (MAES) initiatives

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EU Bioeconomy Strategy (2012)

EU Bioeconomy Strategy – Commission staff working document (2012)

Work on land as a resource to develop the full range of ecosystem services, from crops to fresh water to climate change mitigation and adaptation

PES not mentioned

Focus on "biomass", provisioning ES (p. 16)

The bioeconomy encompasses the production of renewable biological resources and their conversion into food, feed, bio-based products10 and bioenergy

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A marginal role for regulating and cultural services with no market (some attention on potential negative impacts)

Table 1: The bioeconomy in the European Union[1,2]

Sector	Annual turnover (billion €)	Employment (thou-sands)	Data source
Food	965	4400	CIAA
Agriculture	381	12000	COPA-COGECA, Eurostat
Paper/Pulp	375	1800	CEPI
Forestry/Wood ind.	269	3000	CEI-BOIS
Fisheries and Aquaculture	32	500	EC**
Bio-based indus-tries			
Bio-chemicals and plastics	50 (estimation*)	150 (estimation*)	USDA, Arthur D, Little, Festel, McKinsey, CEFIC
Enzymes	0,8 (estimation*)	5 (estimation*)	Amfep, Novozymes, Danisco/Genencor, DSM
Biofuels	6**	150	EBB, eBio
Total	2078	22005	

EU Bioeconomy Strategy, 2012 p. 17

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EU Biodiversity Strategy (2011)

Our life insurance, our natural capital: an EU biodiversity strategy to 2020 (2011)

2050 vision
By 2050, EU biodiversity and the ES it provides […] are protected, valued and appropriately restored for biodiversity's intrinsic value and for their essential contribution to human wellbeing and economic prosperity

2020 headline target
Halting the loss of biodiversity and the degradation of ES in the EU by 2020

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EU Biodiversity Strategy (2011)

How?
20 actions under the strategy
The most important in connection with ES and PES are:

Action 5: Improve knowledge of ecosystems and their services in the EU → ES mapping, assessing, valuing accounting and reporting by Member States

Action 11: Encourage forest holders to protect and enhance forest biodiversity.
→ Member States and the Commission will foster innovative mechanisms (e.g. PES) to finance the maintenance and restoration of ES provided by multifunctional forests *(note: from EU Forest Strategy)*

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Some barriers in the development of PES initiatives (1/3)

Barrier category	Challenges
Informational	Lack of awareness among beneficiaries and providers
Technical	Scientific uncertainty, Baselines, Leakage, ES valuation, Excludability and free riding, Shortage of skills and experience
Spatial	Spatial variability of ES
Temporal	Permanence, Time lags, Different time horizons
Financial	Perceived risks, High start-up and Transaction costs
Institutional	Perverse incentives, Complex policy environment
Legal	Property rights and other issues
Cultural	Aversion to paying for ES, Lack of trust, Terminology
Equity	Perceived unfairness

Source: modified from DEFRA, 2011

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Some barriers in the development of PES initiatives (2/3)

- **Scientific/Technical barriers**, e.g. cause-effect links not always clear between ecosystem functions and ES (more direct for carbon, less evident for water-ES)
- How to **set ES prices** for the market?

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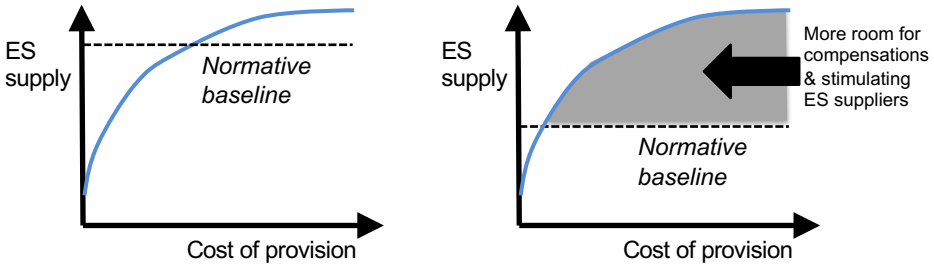
How to set ES prices for the market?

- For **incentives/compensation** → **cost of provision** (a robust framework adopted by EU Rural Development Program, EU WFD,…) high normative **baselines** might be a limitation



- For **pure PES** → **beneficiary's WTP** (might be higher than the cost of provision)

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Some barriers in the development of PES initiatives (2/3)

- **Scientific/Technical barriers**, cause-effect links not always clear between ecosystem functions and ES (more direct for carbon, less evident for water-ES)
- How to **set ES prices** for the market?
- A **consolidated perception**: ES given for granted → why should we pay (more) for them?
- Definition/reform of **property rights**
- Many actors, negotiation needed, several middlemen → Increased **transaction costs**, possible **conflicts**

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Some barriers in the development of PES initiatives (3/3)

- **Ethical issues:**

→ **financialization** and commodification of nature (Kill, 2014)

Financialization and commodification of natural resources (Kill, 2014)

A process whereby the natural functions and processes of forests, woodlands, meadows, mountains and other natural areas become treated as a range of 'ecosystem services' including biodiversity, regulation and filtration of water, carbon storage and sequestration, the economic value of which can be calculated and expressed in monetary terms. **Financialization** transforms both everyday perceptions and policy, **and involves not only the framing and valuation** of these natural spaces **in economic terms** via commodification, monetization, commercialisation, **but also their integration into financial markets as a tradable asset**.

Some barriers in the development of PES initiatives (3/3)

- **Ethical issues:**

→ **financialization** and commodification of nature (Kill, 2014)

→ market-based instruments and ethical motivations to manage public goods ("*I will supply an ES only if they pay me*")

→ **distribution** effects, **equity**

- **Institutional and governance issues** → a new role for public institutions (facilitators)

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- Great emphasis on ES and PES by policy makers, environmentalists, academia but a **limited number of pure PES initiatives** implemented so far
- WTP higher for small-scale, local initiatives, with well-identified, local beneficiaries
- **Several examples of quasi-PES (PES-like) initiatives**: border with ordinary financing mechanisms not always clear
- A **number of initiatives and experiences aiming to value ES** but lack of a systematic approach and common vision (technical/entrepreneurial competences & skills too?)

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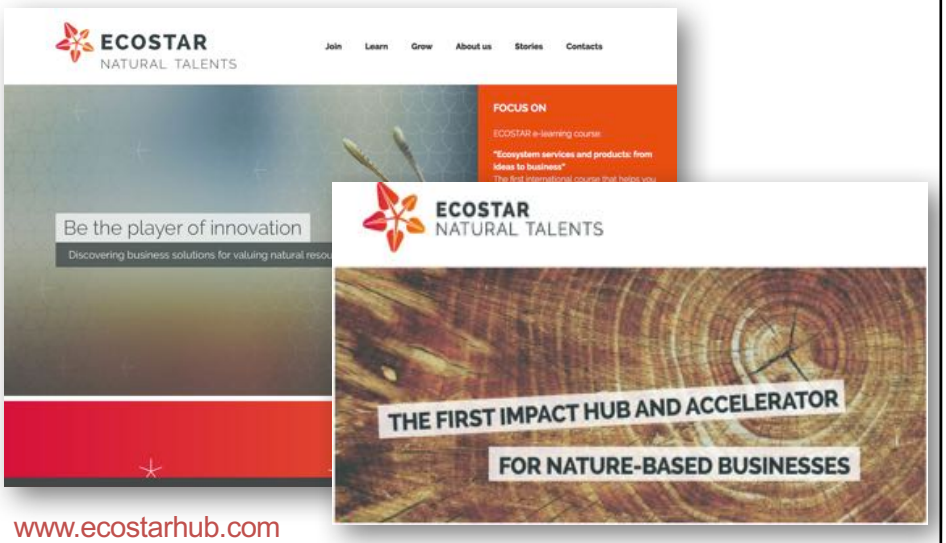
An ongoing initiative



www.ecostarhub.com

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A final remark

The broad set of tools to promote ES needs a new role and much higher level of **multi-level & multi-sectoral governance by public institutions**

…but public institutions are not always open and reactive to a rapidly changing world

Conclusions

… and change should also include investing adequate resources in research, innovation, dissemination and technology transfer

https://i1.wp.com/naswithnotepads.com/wp-content/uploads/2014/12/rear-view.jpg?fit=1000%2C655

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