Methods, approaches and mechanisms for valuing ecosystem services

What is this factsheet about?

This factsheet provides an overview of different methods, approaches and mechanisms for valuing ecosystem services.

Problems to be solved

A major problem is that most services that are public goods are under pressure because there is no financial value in the marketplace. This factsheet gives i) an overview of methods for evaluating the value of different types of ecosystem services, ii) guidelines for effective organizing of funding mechanisms for ecosystem services and iii) practical examples of valuing of and payment for ecosystem services.

Introduction

Ecosystem services are the diverse benefits we derive from the natural environment. They are ecological characteristics, functions and processes that directly or indirectly contribute to human wellbeing (Costanza et al. 2017). Examples are the supply of food, water and timber (provisioning services), the regulation of air quality, climate and flood risk (regulating services) and opportunities for recreation, tourism and education (cultural services) (AECOM, 2015). Most provisioning services refer to private goods. Most regulating services are public goods and most cultural services consist of a mix of private and public goods. Public goods are non-excludable and multiple users can benefit from using them (Constanza et al. 2017). Supportive services like soil formation, nutrient cycling and provisioning of habitat contribute indirectly to human well-being by maintaining the processes and functions necessary for provisioning, regulating and cultural services (Constanza et al. 2017). The majority of ecosystem services have been degraded in previous decades while food production has increased (MEA, 2005). While some ecosystem services like food and timber have a financial value in the marketplace, others that are also vital to our wellbeing are not. Ecosystem managers (farmers, loggers or protected area managers) often receive fewer benefits from land uses preferred by the community than they would receive from alternative land uses that produce negative externalities.

Payment of Ecosystem Services

Payment by the service users can help to make conservation the more attractive option for ecosystem managers. Payment of Ecosystem Services (PES) has gained a lot of attention. PES seeks to internalize what would otherwise be an externality (Pagiola and Platais, 2007). Payment for ecosystem services was defined as a voluntary transaction between service users and service providers that are conditional on agreed rules of natural resource management for generating offsite services (Wunder 2005; 2015). In practice many PES like schemes were realised that did not meet the exact definition of PES (Prokaflieva, 2016). Therefore broader definitions emerged like: the 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 (Marudian et al. 2010)

The thinking of valuing ecosystem services has been shaped mainly by economics. Economic value is often defined in strict economic terms as "aggregate willingness-to-pay for the stream of services or to accept compensation for their loss" (Constanza et al. 2017). Within the group of economic techniques , contingent valuation is the most frequently applied method, followed by market price approaches and the

travel cost method. Other methods are hedonic pricing, benefits transfer and choice experiment and deliberative economic valuation (Pröbst-Haider, 2015).

Figure 1 gives an overview of the economic oriented approaches to value ecosystem services (Pröbst-Haider, 2015).

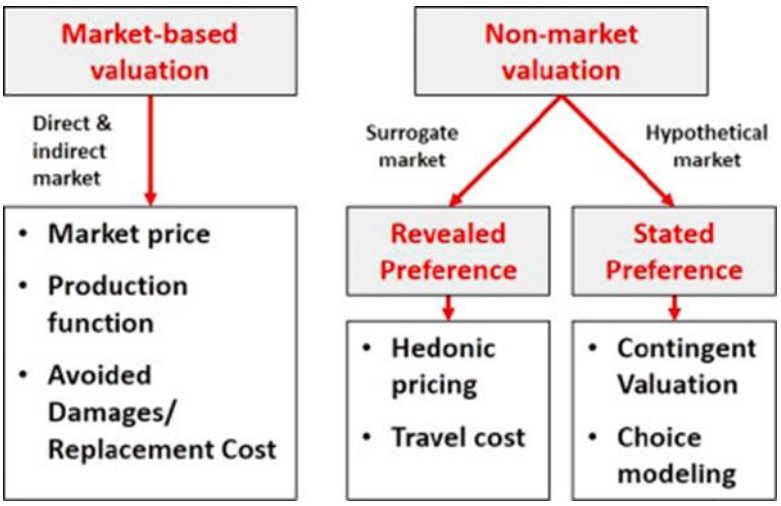

Figure 1. overview of the economic oriented approaches to value ecosystem services

Table 1 gives an overview of the recommended method to valuate different types of cultural ecosystem services including a short explanation of the different methods.

Table 1. Overview of recommended methods to valuate cultural ecosystem services (after Farber et al. (2006), Pagiola, von Ritter, and Bishop (2004) and Bell et al. (2009)).

	Proposed methods for evaluation				
Ecosystem service	**Contingent valuation**	**Choice experiment**	**Travel cost**	**Hedonic pricing**	**Amenability for economic valuation**
	Service demand may be elicited by posing hypothetical scenarios that involve some valuation of alternatives, e.g. willingness to pay	Service demand may be elicited based on the ranking, rating or selecting of alternative choice-sets which have different combination attributes	Service demand may require travel, the costs of which can reflect the implied value of the service (e.g. recreation areas for distant visitors who are willing to pay for the journey)	Service demand may be reflected in the process people will pay for associated goods, such as housing prices near attractive green spaces	
Recreation	x	x	x	x	High
Aesthetics	x	x	x	x	High
Education	–	–	–	–	Low
Spiritual	x	x		–	Low

Issues to take in consideration are (Engel et al. 2008)

- payment offered to ecosystem managers must exceed the additional benefits they would receive from the alternative land use and must be less than the value of the benefit to ecosystem users;
- for payments to be conditional it must be possible to verify the existence of the service and to establish a baseline against which additional units provided can be measured;
- ideally payments must be based on ES provided (output based); in many cases this is not possible and payments are directed to adoption of particular land uses. (input based payment programmes

In practice there are user financed programs where the service buyers are the actual service users - like water quality, watershed protection, financed by a municipality, electricity consortium, urban water users (by a fee) and government financed programs where service buyers are a third party (typically the government) like conservation of forest area financed by a central government or state agency and user financed programs

Examples of user financed program are i) Vittel (Nestlé waters) that initiated a watershed program with payment to all 27 farmers in a watershed to assure good water quality and ii) Northeim project for agrobiodiversity in Germany; payments to farmers for changed land uses. A private foundation pays farmers to reduce agricultural intensification and to adopt practices that favor species richness. (Wunder et al. 2008).

Alternatives for the strict economic oriented approaches

Some researchers stress that pricing is a reductionist approach to our understanding of ecosystem goods and services and they are more worth than a predefined price (Kosoy et al. 2010; Small et al. 2017). Ecosystem services are the direct and indirect contributions to sustainable human wellbeing which is more than only the sum of individual, self-assessed welfare (Constanza et al. 2017). Ecosystems have mixed groups of beneficiaries. Therefore it is crucial that ecosystem goods and services are valued differently by multiple stakeholders and that these values will not be captured by market prices alone (Small et al. 2017).

There is also an intrinsic value of ecosystems. Davidson (2013) distinguished two types of non-use values: warm glow value related to the satisfaction people may derive from altruism towards nature and existence value related to the satisfaction people may derive from the knowledge that nature exists and originating in the human needs for self-transcendence.

Other authors pointed at other values for ecosystem services based on the the sub-goals for sustainability wellbeing: the fairness of distribution of services at the community scale and the sustainability goals for whole systems (Constanza and Folke, 1997; Constanza et al. 2017).

To include these issues, alternative to the strict conventional economic oriented approaches have been developed. Non-economic techniques for valueing have been proposed like consultative methods, questionnaires, in depth interviews, citizen juries. They are participatory methods and valuations where combinations of valuation methods are used involving many stakeholders with different perspectives (Christie et al. 2008; Constanza et al. 2017).

Classification systems

Different frameworks have been developed to link ecosystem services to societal benefits, like the Millennium Ecosystem Assessment (MEA) linking ecosystem services and constituents of wellbeing (Braat and Groot, 2012), The Economics of Ecosystems and Biodiversity Project (TEEB), the Common International Classification of Ecosystem Services (CICES), the Final Ecosystem Goods and Services Classification system (FEGS) and the National Ecosystem Services Classification System (NESCS).

The frameworks of MEA and TEEB are presented below.

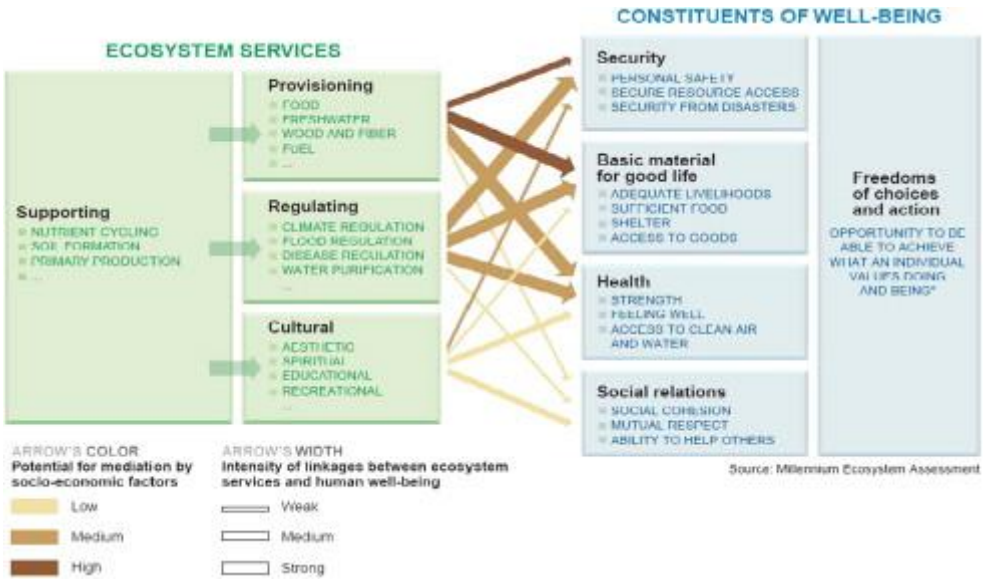

Figure 2. Overview of the MEA Framework (Braat and Groot, 2012)

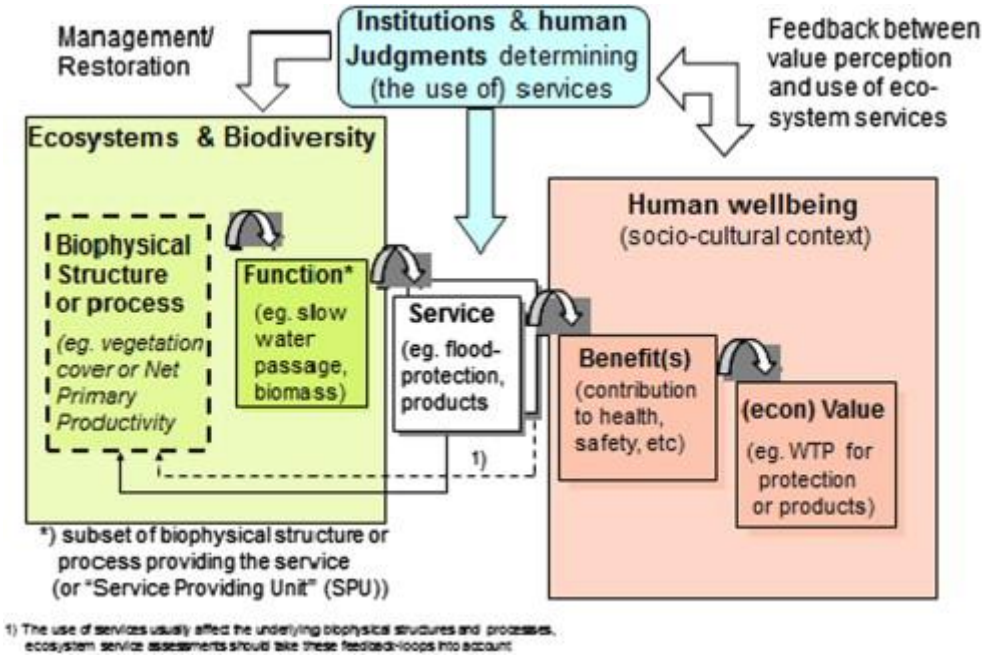

Figure 3. Framework of linking ecosystems to human well-being in the TEEB framework (Braat and Groot, 2012)

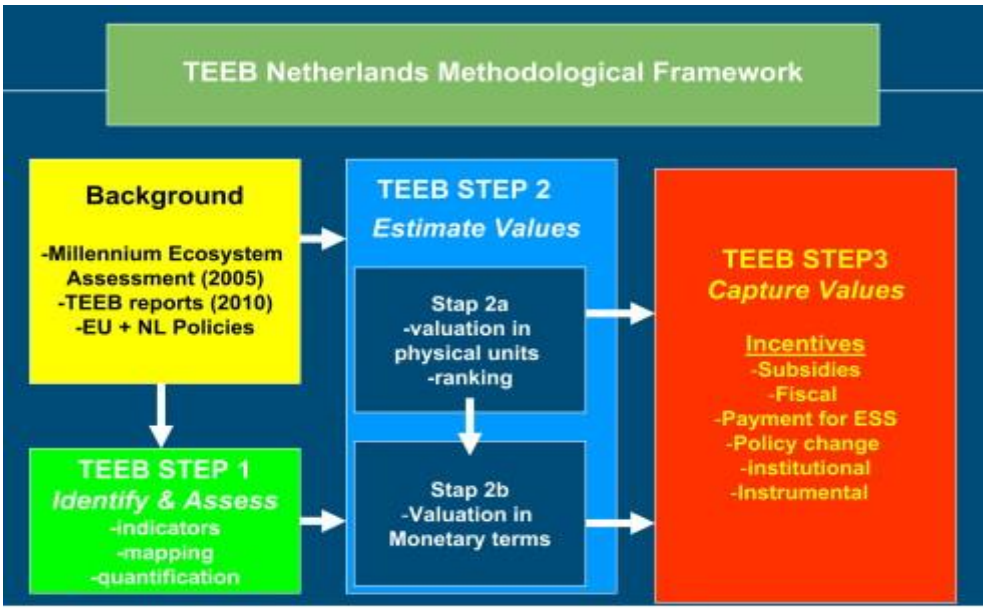

Figure 4. Steps in the TEEB framework procedure (Braat and Groot, 2012)

The largest global effort in establishing a framework for ecosystem services is that of IPBES: the Intergovernmental Platform on Biodiversity and Ecosystem Services. It's aim is to develop assessments matched to policy needs and support capacity building across scales and topics (Diaz et al. 2015). The key elements are nature and the benefits people derive from nature and a good quality of life. It highlights the central role of institutions and governance and decision-making and includes multiple knowledge systems. It uses a pluralistic valuation integrating biophysical, socio-cultural, economic, health, and holistic valuations, integrated into policies based on shared responsibilities (Pascual et al. 2017; Costanza et al. 2017).

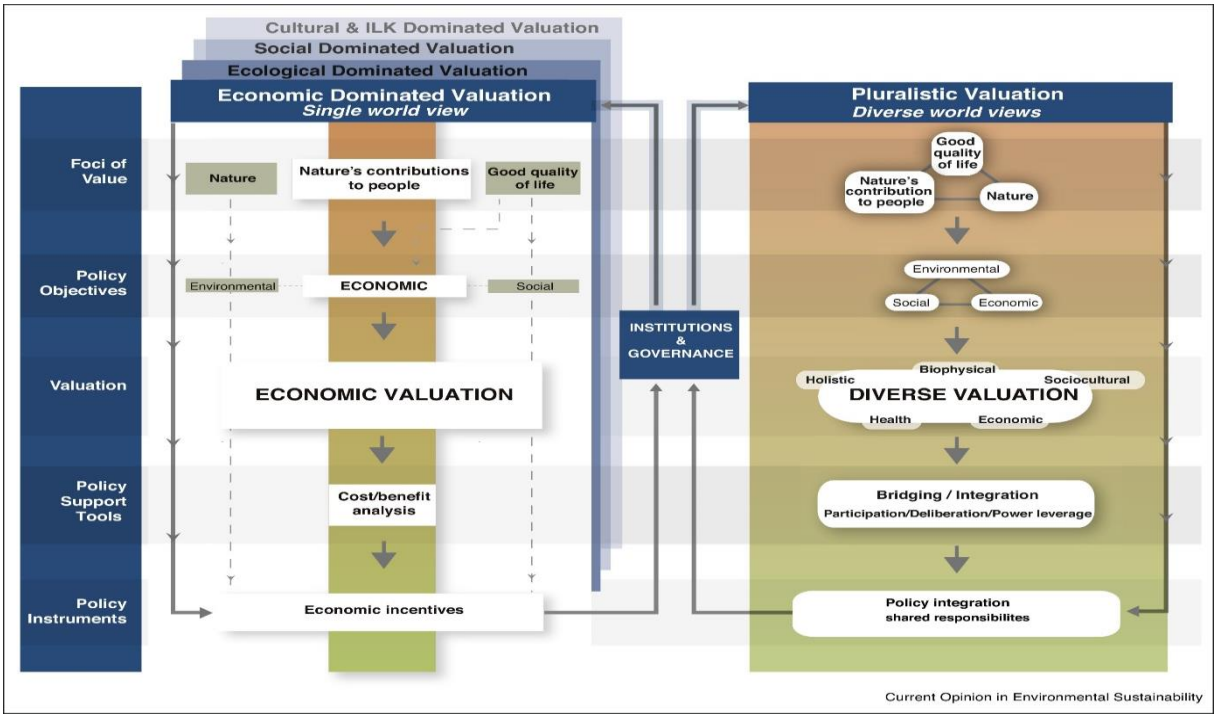

Figure 5. Pluralistic valuation in the IPBES framework (Pascual et al. 2017)

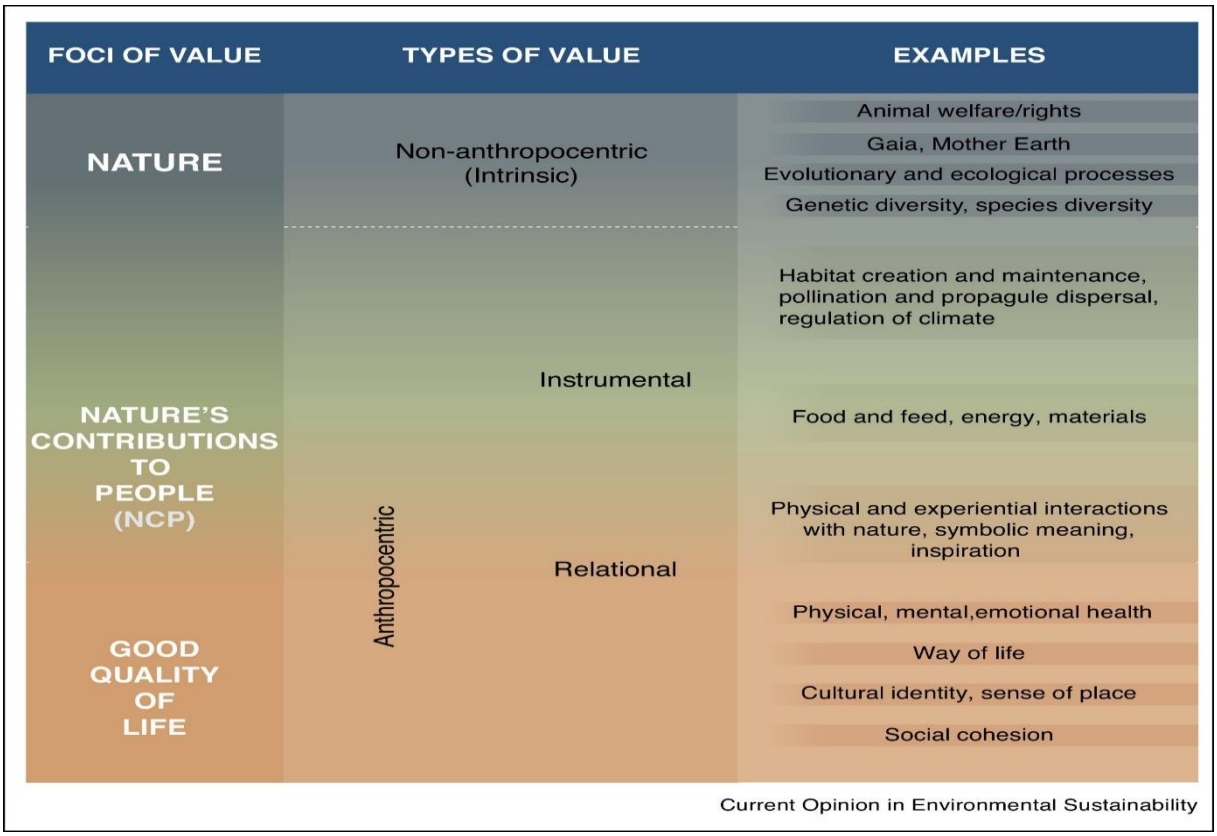

Figure 6. IPBES framework. The divers values related to nature, nature's contribution to people and a good quality of life (Pascual et al., 2017)

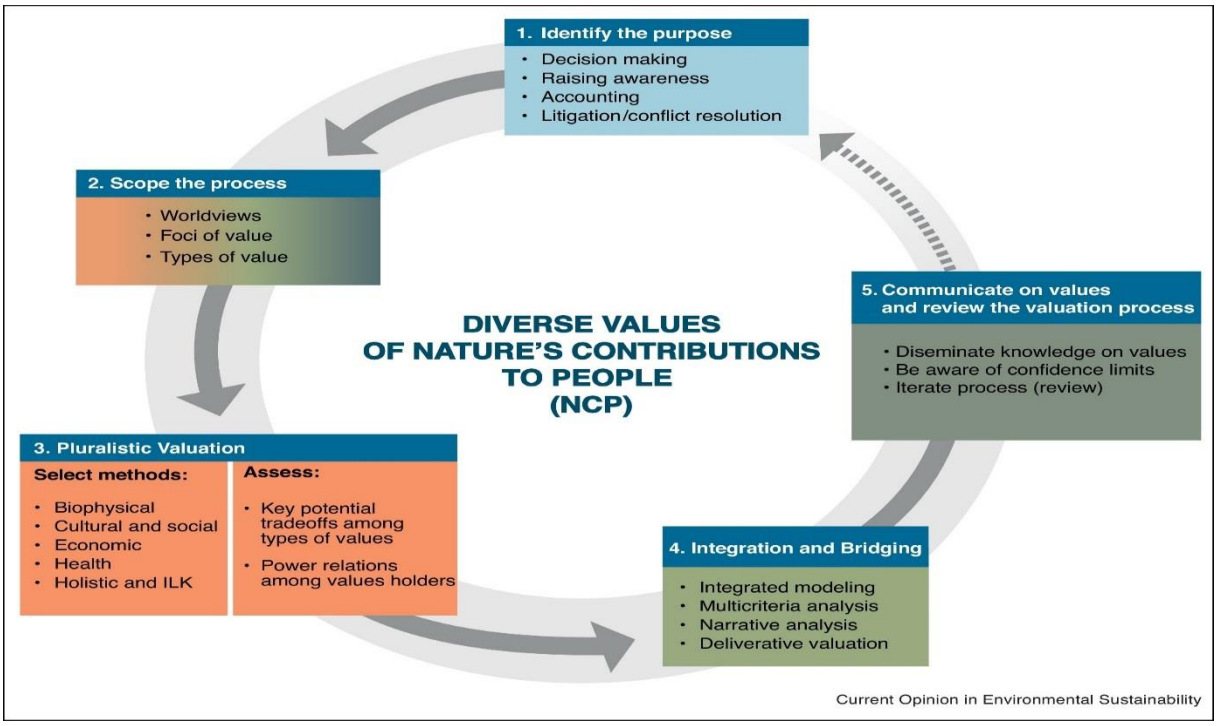

Figure 7. The IPBES approach for assessing values and conducting valuation studies. This five step approach gives structure and transparency to the accountability of the valuation process. It may be used at a community, landscape, bioregional and national level for raising awareness, decision making, or conflict resolution (Pascual et. al. 2017).

Governance systems

Given the public goods nature of many ecosystem services, well-functioning institutions and governance systems are needed that can deal with the perspectives of different stakeholders in the valuation of different types of services. They have to employ an appropriated combination of private, state, and common property right systems (Costanza et al. 2017). Successful funding mechanisms require a thorough design and a well-functioning governance system. Mechanism design issues are issues like what the payments are made for, how the funds are collected and distributed, identifying the recipients of the funds and issues like contract length, payment type, frequency and timing (Prokofieva, 2016).

Generally, three main types of governance structures can be identified: hierarchies, markets and community management (Vatn, 2010). Hierarchy: the power of decision rests with a top level like the government. Market: This is a system of voluntary exchange. The final allocation of resources is determined by the largest willingness to pay. Individuals, firms and governments may be agents in markets. Community management: this is based on cooperation. Individuals formulate both individual and common goals. Community allocation seems to rest to a large extent on a general rule of reciprocity. In reality there are asymmetries in power and access making additional specific rights concerning access and withdrawal necessary.

Several issues have been identified that need consideration for developing well-functioning and fair governance systems for ecosystem services Wunder et al. 2008; Vatn, 2010, Carius, 2012; Constanza et al. 2017)

- It asks efforts to create a market; service and rights, groups of users and providers must be specified. Often an intermediary is needed to define goods and establish group of sellers and buyers and the price. An issue is the transition costs.

- User based systems are generally more efficient than government financed systems. However when the number of agents involved increases, using markets becomes more costly and public bodies can much easier raise the necessary funding through taxes or fees.

- One should be careful that payments do not crowd out normative obligations based on sophisticated cultural process of regulating interconnection. The distinction between payment as an incentive and as a compensation is important.

- For administrative or contracting purposes, PES tend to separate ecosystem services. Yet ecosystems usually provide multiple benefits. The joint consideration of bundling of various functions could generate synergies and co-benefits.

- The effectiveness of PES schemes may be reduced by leakage that occurs when the provision of ecosystem services in one location reduces ecosystem services in other sites. This should be addressed in contracts

This leads to several recommendations for policy makers (Vatn, 2010; Braat and Groot, 2012; Carius, 2012; Constanza et al. 2017)

- We should use integrated measurements, valuations and decisions support, ideally using transdisciplinary teams and strategies in close collaboration with ecosystem stakeholders.

- We need to better understand how payment of ecosystem services can be formulated to strengthen not ruin cooperative will.

- We should examine the potential to contribute to sustainable development of principles such as ‘polluter pays’, beneficiary pays and full-cost-recovery’; we should develop tools to facilitate principles of no net loss and net positive impact to make them normal business practice; we should focus more energy on involvement of stakeholders in ecosystem services management.

- We should pay sufficient attention to the design phase of PES schemes. Expertise of governmental and non-governmental organizations, research teams or consultants should be used for the central technical and coordinating tasks.

Practical examples of valuing of and payment for ecosystem services

In different reports concrete examples of payments for ecosystem services have been described (Eustafor, 2011; Matzdorf et al. 2014; DEFRA, 2016; Viszlai et al. 2016)). Buyers of services can be water companies, recreational visitors, local tourism business, local authorities, industry, developers, central governments and consumers and local communities (DEFRA, 2016).

In practice three broad types of PES have been identified (AECOM, 2015):

- **Public payment schemes** through which government pays land or resource managers to enhance ecosystem services on behalf of the wider public
- **Private payment schemes**, self organized private deals in which beneficiaries of ecosystem services contract directly with service providers and
- **Public-private payment schemes** that draw on both government and private funds to pay land or other resource managers for the delivery of ecosystem services.

They have been developed at a range of spatial scales: international, national, catchment and local.

Examples of Private-public schemes for provisioning and cultural ecosystem services (Matzdorf et al. 2014; Eustafor, 2011)

Recreational Ecosystem Service. Westcountry Angling Passport UK: Initiated by the Westcountry Rivers Trust and private landowners. Recreational anglers are granted access to private fishing grounds for a fee. Beforehand, the owners invested in the unkeep of the waters and the riparian zones to increase the recreational value for the paying guests. Overall ecological condition of the water bodies is being improved. Tokens which can be purchased and redeemed through the environmental organization serve as a means of payment.

Biodiversity. Blühendes Steinburg, Germany: The Stiftung Naturschutz Schleswig-Holstein and the local farmers' association are testing two innovative mechanisms for PES as part of the pilot project. Farmers are paid output-based for the extensive management of grassland, whereby they must show evidence of indicator species on their fields. The farmers themselves determine the amount of the payment to be received in advance following a tendering process.

Water ecosystem services. Upstream Thinking with Westcountry Rivers Trust, UK: A water company finances various projects in South West England to improve the water quality in key watersheds. Farmers receive payments if they reduce nutrient and pollutant discharge into waters by improving their land management. This in turn reduces the company's water treatment costs.

Multiple ecosystem services. Pumium Project UK: Initiated by the Montgomeryshire Wildlife Trust, the PES aims to provide ecosystem services in combination with social and economic benefits. Farmers are encouraged to change their current land management to provide ecosystem services. In order to avoid double funding with government agri-environmental programs, the farmers are paid to maintain the infrastructure that the Trust has implemented.

Water quality for companies. In France and Poland arrangements are in place where businesses are paying land managers, farmers and foresters to maintain the water quality.

Recreational Ecosystem Services. Finland: A partnership is established with the Scouting organisation for developing permanent outdoor and camping facilities.

Visitor giving schemes. UK. Visitors and businesses can contribute directly to specific projects in the area they visit using mobile digital technologies (apps). (Visit England, 2014)

Payment of Dairy company to farmers for sustainable farming methods. Netherlands. Under the Foqus program of Friesland Campina, farmers are required to perform sustainability measures like outdoor grazing and management of the landscape. Farmers receive a bonus on the milk price by the dairy company. All members of the dairy company pay for this bonus.

Examples of (Voluntary) governmental payments (Matzdorf et al. 2014; Defra, 2013; Eustafor, 2011)

Biodiversity. Naturschutzgerechte Bewirtschaftung von Grünland in der nordrhein-westfälischem Eifel Germany: Since the mid-1980's, farmers in the Eifel region have been paid to maintain and extensively cultivate environmentally valuable land. It has now been in operation for 30 years and is today a governmental program coordinated by the biological stations in cooperation with the district landscape agencies.

Multiple ecosystem services. The English Woodland Grant UK: This Grant scheme was introduced in 2005 with the key aims to sustain and increase the public benefits derived from existing woodlands and investing in new woodlands for public benefit. It consists of grants for the management of woodland in accordance with the UK Forestry Standard covering habitats across England. It is funded by the UK government.

In some cases demand results from regulatory requirements like the case below.

Biodiversity. 100 Äcker für die Vielfalt. Germany: The goal of the project, initiated by scientists, landscape conservationists and a nature protection foundation, is to establish a national network of conservation fields for wild arable plant species. Funds for financing land purchases and for paying farmers tending the land are acquired through a regionally specific mix of payments for compensation measures, agri-environmental programs, and state and foundation resources.

Carbon markets. There are several voluntary projects to sequester forest carbon. Forest carbon trade is gaining more interest and several forest carbon credit projects are initiated.

Forest diversity services. Forest Diversity Program METSO: Finland. This program is a collaboration between the ministries of environment, agriculture and forestry, the Finnish Environmental institute and the forest development centre Tapio. Conservation agreements are either permanent or temporary. Landowners get financial compensation for conserving areas and tax-free for permanent protection. Compensation is based on opportunity costs, which means compensation for lost timber income. There is no direct payment for nature values.

Development of nature and landscape. European and provincial subsidies for conservation and development of nature and landscape: Netherlands. In the Netherlands, regional organizations of farmers have obtained the responsibilities to perform conservation of nature and landscape measures to realise the international obligations of the Netherlands. Farmers interested in providing nature and landscape services are member of one of these regional organizations. The regional organizations are contracted by provinces and financed by a mix of EU and national funding.

Social services integrated in the social, re-integration and healthcare framework

Some of the cultural ecosystem services have been incorporated in the financial frameworks of the social, re-integration and healthcare sector. Some examples are presented below.

Care services provided by farmers

Netherlands. In the Netherlands farmers providing care services are financed by national and local funding regulations for social and health care services. They have access to these social care budgets

when they are accepted by local authorities or health insurance companies as care providers. The can be contracted as individual farmers or as a member of one of the regional organisations of care farms. In order to be contracted they need to meet some quality guidelines (Hassink, 2017).

Flanders. In Flanders a regulation has been developed for supporting farmers that provide care and educational services to drop outs from schools. The funding originates from rural development funds. The Flemish support organization Groene Zorg takes care of the regulation (DiIacovo and O' Connor, 2009).

Social services provided by farmers

Italy. In Italy social farmers and social cooperatives are supported by local and regional authorities. There are specific financial support structures for social farms and social cooperatives (DiIacovo and O' Connor, 2009; Dell'olio et al. 2017). They can also benefit from tax relief. In addition social farmers have a preferred position in the tendering processes of local and regional authorities, like selling of their products to public canteens. In addition funding is available for the re-integration process of vulnerable citizens.

Educational services.

In various countries farmers offer educational services to school classes.

Netherlands. In the Netherlands they are financed by different mechanisms. They can be contracted by local nature, environmental educational organizations to provide these services. In some cases they are paid directly by school organizations (www.boerderijschool.nl) or financed by agricultural companies (like dairy industry) as part of the public relations of the agricultural sector (Hassink et al. 2009).

References

AECOM, 2015. Payments for Ecosystem Services: A best practice guide. AECOM, London.

Bell, S., Simpson, M., Tyrväinen, L., Sievänen, T. and Pröbstl, U. (Eds.), European Forest Recreation and Tourism. A Handbook, Taylor and Francis, London (2009)

Braat, L.C. and Groot, R. de. 2012. The ecosystem service agenda: bridging the worlds of natural sciences and economics, conservation and development, and public and private policy. Ecosystem Services 1, 4-15.

Carius, F. (Ed.) 2012 ed. Payments for ecosystem services. Towards an implementation strategy. Report of the International Expert Workshop 13-16 December 2010. International Academy for Nature Conservation Isle of Vilm, Germany. Bfn-Skripten 326.

Christie, M., Fazey, L., Cooper ea. 2008. An evaluation of economic and non-economic techniques for assessing the importance of biodiversity to people in developing countries. Defra, London.

Constanza, R. and Folke, C. 1997. Valuing ecosystem services with efficiency, fairness, and sustainability as goals. Nature's services: societal dependence on natural ecosystems. G.C. Daily. Washington D.C. Island Press: 49-69.

Constanza , R., de Groot, R., Braat, L., Kubiszewski, I., Fioramonti, L., Sutton, P., Farber, S. and Grasso, M. 2017. Twenty years of ecosystem services: how far have we come and how far do we still need to go? Ecosystem Services 28, 1-16.

Davdison, M.D. 2013. On the relation between ecosystem services, intrinsic value, existence value and economic valuation. Ecological Economics 95, 171-177.

DEFRA. 2013. Payment for ecosystem services: a best practice guide. Annex Case studies.

DEFRA. 2016. Defra's payments for ecosystem services pilot projects 2012-15. Review of key findings.

Dell'Olio, M., Hassink, J. and Vaandrager, L. 2017 The development of social farming in Italy: A qualitative inquiry across four regions. Journal of Rural Studies 56, 65-75.

Diaz, S. ez 2015. The IPBES conceptual framework – connecting nature and people. Current opinion in Environmental Sustainability 14, 1-16.

Di Iacovo, F. and O'Connor, D. 2009. Supporting policies for Social Farming in Europe. Progressing multi-functionality in responsive rural areas. SoFar Project: Supporting EU-agricultural policies. Arsia, Firence, Italy.

Engel, S., Pagiola, S. and Wunder, S. 2008. Designingn payments for environmental services in theory and practice: An overview of the issues. Ecological Economics 65, 663-674.

Eustafor and Patterson, T. 2011. Ecosystem services in European State Forests. European State Forest Association. Brussels. Belgium.

Farber, S. et al. 2006. Linking ecology and economics for ecosystem management Bioscience, 56 (2), 121-133

Groot, R.S. de, Wilson, M.A., and Boumans, R.M.J. 2002. A typology for the classification, description and valuation of ecosystem functions, goods and services. Ecological Economics 41, 393-408.

Hassink, J. 2017. Understanding care farming as a swiftly developing sector in the Netherlands. PhD thesis. University of Amsterdam.

Hassink, J. et al. 2009. Levende boerderij, lerende kinderen. Beschrijving en effecten van verschillende vormen van educatie op de boerderij. Rapport 257. Plant Research International. Wageningen, the Netherlands (www.edepot.wur.nl).

Karousakis, K. 2009. Promoting biodiversity co-benefits in REDD. OECD Environment Working Papers, no 11, OECD Publishing, Paris.

Kosoy, N. and Corbera, E. 2010. Payment for ecosystem services as commodity fetishism. Ecological Economics 69, 1228-1236.

Matzdorf, B., Biedermannn, C., Meyer, C., Nicolaus, K. Sattler, C. and Schomers, S. 2014. Paying for Green? Payment for ecosystem services in practice. Successful examples of PES from Germany, the United Kingdom and the United States. Muncheberg. 208 pages.

Milennium Ecosystem Assessment (MEA). 2005. Ecosystems and Human Wellbeing: Synthesis, Island Press.

Muradian, R., Corbera, E. Pascual, U. Kosoy, N. and May, P.H. 2010. Reconciling theory and practice: an alternative conceptual framework for understanding payments for environmental services. Ecol. Econ. 69, 1245-1252.

Pagiola, S., von Ritter, K. Bishop, J.T. 2004. Assessing the economic value of ecosystem conservation, TNC-IUCN-WB, Washington DC.

Pagiola, S and Platais, C.G. 2007. Payments for the Environmental Services: From Theory to Practice. World Bank Washington.

Pascual, U. ea 2017. Valuing nature's contributions to people: the IPBES approach. Current Opinion in Environmental Sustainability 26, 7-16.

Pröbstl-Haider, 2015 Cultural ecosystem services and their effects on human health and well-being – A cross-disciplinary methodological review. Journal of Outdoor Recreation and Tourism 10, 1-13.

Prokofieva, I. 2016. Payments for ecosystem services – the case of forests. Current Forestry Rep 3, 130-142.

Small, N., Munday, M. and Durance, I. 2017. The challenge of valuing ecosystem services that have no material benefits. Global Environmental Change 44, 57-67.

Vatn, A. 2010. An institutional analysis of payment for ecosystem services. Ecological Economics 69, 1245-1252.

Visit England. 2014. Case study. Payment for Ecosystem Service Scheme.

Viszlai, I. Barredo, J.I. and San-Miguel-Ayanz, J.S. 2016. Payment for Forest Ecosystem Services. SWOT analysis and possibilities for implementation. European Commision. JRC Technical Reports.

Wunder, S. 2005. Payments for environmental services: some nuts and bolts. Occasional paper no 42. Bogor, CIFOR.

Wunder. S., Engel, S. and Pagiola, S. 2008. Taking stock: a comparative analysis of payments for environmental service programs in developed and developing countries. Ecologicial Economics 65, 834-852.

Wunder, S. 2015. Revisiting the concept of payments for environmental services. Ecology Economics 117, 234-243.