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Ethical Considerations Regarding Valuation of Ecosystem Services

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I believe that the content of this presentation fits well the title you suggested to it, but I will transcend ethical considerations to address some political considerations as well. I have structured the presentation in five blocks. I will first talk about the divorce between ecology and economics to provide the background and the rationale behind the valuation of ecosystem services. Why do we value them? I will then expose three different levels of engagement with valuation of ecosystem services. Next, I will raise the controversies around the commodification of ecosystem services, and I will finish up with a discussion about the scope and limits of economic valuation.

The divorce between ecology and economics

I would like to start providing some historical background so that we can interpret how we ended up in the situation we are facing today. Ecology and economics are two words which share the same Ancient greek etymological roots, where ecology refers to the knowledge of the house and economy refers to the management of the house. How did they end up in the clash we are witnessing today, as two conflicting disciplines, when in principle they were handling the same type of subject?

One thing to note is that this is partly the outcome of a particular path along which economic theory and practice have developed over the last two to three centuries (figure 1). Not always were economics and ecology in conflict. Think for example of the first unified school of economic thinking here in France, the physiocrats. The physiocrats believed that all wealth came from land, from what we would call today **natural capital**. This was not because they were environmentalists, but because this was an agrarian economy, where most of the economic output came from agriculture.

Interestingly, the physiocrats had a physical understanding of the notion of **production**. When the physiocrats referred to production, something had to be **physically produced**, as in agriculture. This notion of production is very different from the one we use today in economics, where production simply means expansion of monetary aggregates. Nowadays, if I buy something that you have produced and I sell it to someone else with an added value, we call that production, even if no physical process is involved. This was not so with the physiocrats. They had a physical way of thinking, as you might see from the tableau de Quesnay. The laws of thermodynamics were unknown at that time. However, if the physiocrats had already known about these laws, they would possibly have developed an economic framework closer to what we know nowadays as ecological economics.

The **classical economists** kept paying a lot of attention to the importance of land (nature) in producing wealth. **Land, labour and capital** were the three production factors they emphasised. Land and nature still held distinct analytical positions, but already, the spotlight had started to shift from land to labour. This was already clear with Adam Smith, but it went into a more complete version with Marx and Ricardo's labour theory of **value**.

This process was completed with the so called **neoclassical or marginalistic revolution** in economics. In the late 19th century, neoclassical economics became the hegemonic school of thinking. This is a situation that has remained up to the present. Still today, in our universities, neoclassical economics is the dominant school of economic thinking. An important development in neoclassical economics is that land eventually disappeared from economic production functions. This is reflected for example, in the work of Solow, a Nobel Laureate in economics. From the 1970s, land had completely disappeared from the picture. Natural resources and nature were no longer part of mainstream production functions.

Why is this? A core assumption or belief in neoclassical economics is that there is **substitutability** between natural resources and capital, meaning that these two factors can replace each other. As a natural resource exhaust, technological innovations – the theory goods – allow for the substitution of that natural resource. That is, it adopts the premise that natural capital is replaceable with human made capital. This means that there are virtually no

physical limits to growth, according to this body of thinking. The concerns about physical scarcity that were an issue in classical thinking were sent into oblivion with neoclassical economics.

There are two moments to keep in mind with this historical development. The first one is what we could refer to as the **post physiocratic epistemological break**. This is when the economy shifted its focus from physical to monetary analysis. The second one is the so-called marginalistic revolution, after which economics finally got rid of the physical constraints to economic theory and practice.

What is the corollary of this historical process? Since the establishment of neoclassical economics, economic accounts are no longer concerned with all the environmental goods and services important for wealth or for human wellbeing. It is only concerned with a small subset of all those potentially important goods and services, namely those that fulfil the following conditions.

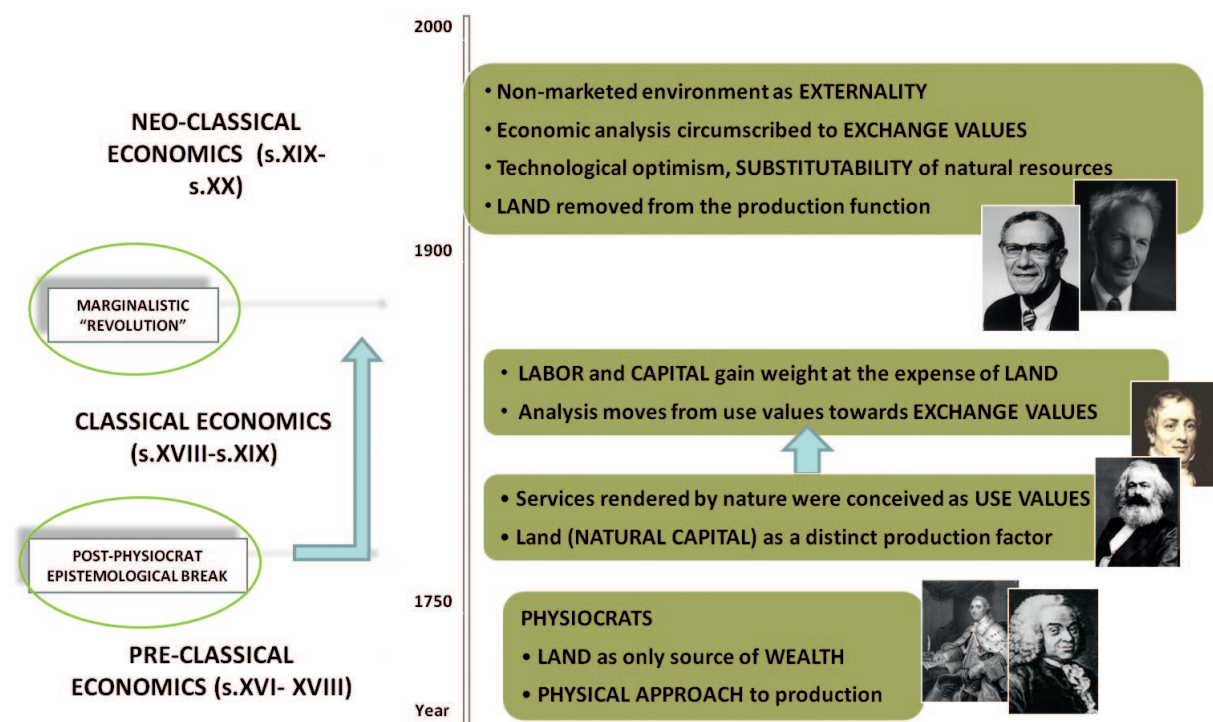


Figure 1. A brief historical background of ecology and economics (based on Gómez-Baggethun et al., 2010).

First, they must be **useful** (Ud) for humans (figure 2). Second, they must be **appropriable** (Uda), so there must be some clause of excludability that you can put in place. Otherwise, nobody is willing to pay for something you could access for free – the arguments goes. The third one is that you should be able to express them as **exchange or monetary values** (Udav). This is the scope of conventional economic analysis. Everything which is outside the inner box of figure 2 is what economists call ‘externalities.’ These include negative **externalities**, such as the unaccounted costs of pollution or resource depletion, and positive externalities, such as unaccounted benefits we get from nature, including those ecosystem services that are not mediated by markets.

An important thing to note is that, against what conventional economists seem to believe, there are many more externalities than internalities. This is crucial to keep in mind most economists think of externalities as accidental market failures etc. In reality externalities are pervasive and systemic parts of the economic process. What is the solution proposed by the advocates of market based conservation? It makes the case that we must ‘get prices right’ by putting economic values into these negative and positive externalities. If we can then design institutional devices or economic incentives to turn these theoretical values into real cashflows, we will be able to align market forces with sustainability goals. This is how the theory goes. This is an approach which is getting very strong, and I will come back to it further in this text.

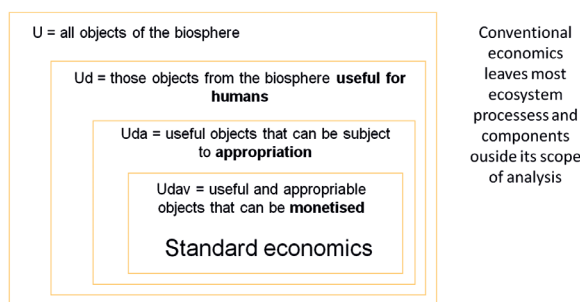


Figure 2. The scope of conventional economic analysis: the COMMODITY (Naredo, 2003).

A prominent example of a negative externality is pollution, whereas a prominent example of a positive externality are non-market ecosystem services, i.e. benefits we get from nature and for which we do not pay money. When the ecosystem services metaphor was introduced in the 1970s, the hope was that it would help to communicate human dependence on our endangered life-support systems. Initially, the concept was not introduced by economists but by ecologists like Odum, Mooney, etc. These are radical ecological thinkers. The hope was to come up with a metaphor that visualised societal dependency on natural ecosystems. Eventually the concept became increasingly used by economists to illustrate the importance of externalities in economic valuation.

Figure 3 gives you an example, based on an empirical study in Thailand, of how different decisions can be when we take externalities into account. We live in a market society where money plays a very important role in the way we take decisions. Planners and decision makers in a tropical countries are often faced with land use change decisions of whether mangroves should be converted to shrimp farms. On the one hand we have a multifunctional mangrove forest with ecological integrity. It delivers diverse ecosystem services to local communities, but renders little direct economic output. On the other hand we have the shrimp farm, which provides few ecosystem services but higher economic output. A cost-benefit analysis is conducted and if there are more benefits than costs, they will go for this land use cover change from mangrove forests to shrimp farming. A conventional cost-benefit analysis would indicate that there are benefits to gain from the shrimp farm, which creates a strong incentive for land use change, as it has been happening in tropical countries over the last decades.

However, what happens if we take into account all the positive and negative externalities, which I referred to before? If you take into account positive externalities, i.e. the non market ecosystem services it provides such as carbon sequestration, coastal protection, biodiversity refuge and so on, the

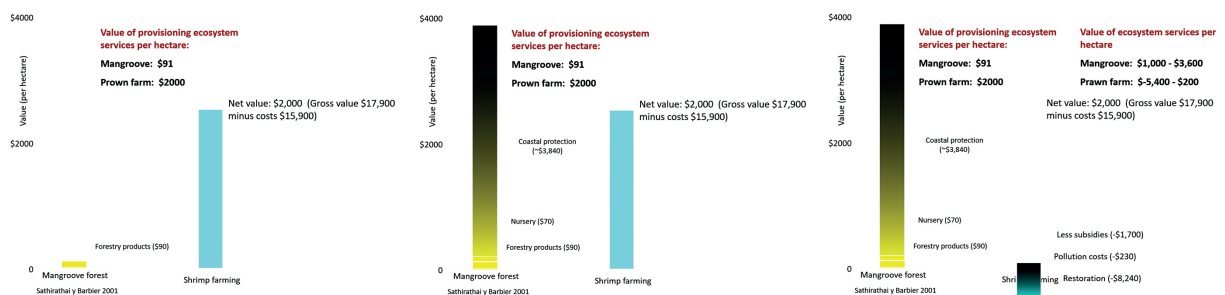


Figure 3. A cost-benefit comparison of a mangrove and a shrimp farm (Sathirathai and Barbier, 2001), without valuing externalities (left), valuing positive externalities (center), and valuing both positive and negative externalities (right). When externalities are taken into account the value of the mangrove becomes higher than the value of the shrimp farm.

benefit balance already changes in favour of the mangrove forest. That is, the one that keeps the multifunctionality and the ecological integrity. For instance, one of the services which is most highly valued is coastal protection. figure 3 shows how mangroves, coral reefs, wetlands and other types of coastal ecosystems can act as natural barriers to climate extremes. This becomes especially important in the face of increased intensity and frequency of environmental extremes that come with climate change.

What happens if we also take into account the negative externalities? If we take into account negative externalities like the ecological restoration costs that private economic activities simply outsource to society at large, the authors suggest that the shrimp farm values can be net negative in social terms. There is an important point to note here. In many private activities that are apparently very profitable, profits are privatised, whereas many social and environmental costs are socialised.

The Millennium Ecosystem Assessment (MEA) showed that this pattern could be observed across a wide range of biomes, from wetlands to mangroves and tropical forests. In a nutshell, the main conclusion of the MEA, pointed to the bias in the way we value nature and account for the importance of nature. In terms of the four main categories of ecosystem services (provisioning, regulating, cultural and supporting services), the MEA showed that over the last 50 years, we have increased enormously our capacity to provide provisioning services (physical goods which we extract from the environment) at

the expense of nature's capacity to provide all other types of services which have all been declining dramatically. Two thirds of ecosystem services, according to this report, have been degraded worldwide over the last 50 years (figure 4).

Interestingly, it should be noted that provisioning services are mostly traded in markets, and therefore have an explicit economic value in decision making processes. In contrast, supporting and habitat services, regulating services and cultural services, are mostly delivered outside markets (we do not pay for them) and hence have no explicit economic value and risk not being into consideration in economic analysis. Hence, the conclusion reached by the Millennium Assessment, but also the report on The Economics of Ecosystems and Biodiversity (TEEB) was that ecosystem services are neglected in decision making, because they are not explicitly valued. This was identified as a core driver behind the loss of ecosystems and biodiversity. The case was made that if we could give explicit values to the ecosystems services that conventional economic accounts render invisible, then ecosystem services would be given more weight and importance in planning and decision making processes.

Recognizing, demonstrating, and capturing value

That said, there are different levels of engagement with valuation of ecosystem services. Using the jargon of The Economics of Ecosystems and Biodiversity (TEEB) report, I will talk about recognising,

Service	Sub-category	Status	Notes
Provisioning Services			
Food	Crops	▲	Substantial production increase
	Livestock	▲	Substantial production increase
	Capture fisheries	▼	Declining production due to overharvest
	Aquaculture	▲	Substantial production increase
	Wild foods	▼	Declining production
Fiber	Timber	+/-	Forest loss in some regions, growth in others
	Cotton, hemp, silk	+/-	Declining production of some fibers, growth in others
	Wood fuel		Declining production
Genetic resources	▼	Lost through extinction and crop genetic resource loss	
Biochemicals, natural medicines, pharmaceuticals	▼	Lost through extinction, overharvest	
Fresh water		▼	Unsustainable use for drinking, industry and irrigation; amount of hydro energy unchanged, nut dams increase ability to use that energy
Regulating Services			
Air quality regulation		▼	Decline and ability of atmosphere to cleanse itself
Climate regulation	Global	▲	Net source of carbon sequestration since mid-century
	Regional and local	▼	Preponderance of negative impacts
Water regulation		+/-	Varies depending on ecosystem change and location
Erosion regulation		▼	Increased soil degradation
Water purification and waste treatment		▼	Declining water quality
Disease regulation		+/-	Varies depending on ecosystem changes
Pest regulation		▼	Natural control degrade through pesticide use
Pollination		▼	Apparent global decline in abundance of pollinators
Natural hazard regulation		▼	Loss of natural buffers (wetlands, mangroves)
Cultural Services			
Spiritual and religious values		▼	Rapide decline in sacred groves and species
Aesthetic values		▼	Decline in quantity and quality of natural lands
Recreation and ecotourism		+/-	More areas accessible but many degraded

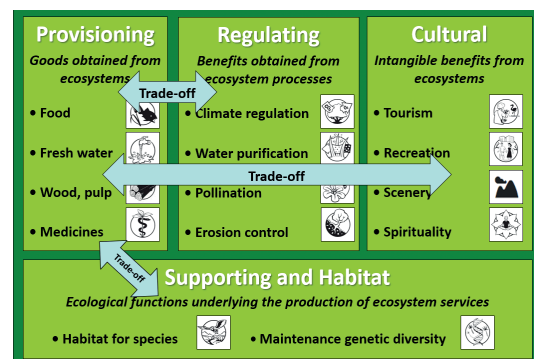


Figure 4. Left: Global trends in ecosystem services (MEA 2005); Right: Trade-offs between provisioning and all other types of ecosystem services (Erik Gomez-Baggethun et al., 2013. Icons by Jan Sasse for TEEB).

demonstrating and capturing value. In what policy contexts can economic valuation of ecosystems services be useful? (Gómez-Baggethun and Barton, 2013).

- › First, the most widespread use is for awareness raising purposes. Many people use economic valuation just as a way of rendering visible the ‘hidden’ costs of losing ecosystem services. As already mentioned, conventional economic accounts render these costs invisible.
- › Second, it is increasingly also used for accounting purposes. There is growing consensus, although there is still a long way to go, that Gross Domestic Product (GDP) is a very bad measure of human prosperity, progress, etc. Organizations like the European Union and the OCDE (Organisation de coopération et de développement économiques) are working towards correcting GDP by accounting for the hidden costs of development and hidden benefits from ecosystem services.
- › Another use is priority setting. Increasingly, ecosystem services valuations are articulated into cost-benefit analysis, multi criteria analysis and cost-effectiveness analysis to allow policy makers to compare different options.
- › Finally, valuation is increasingly used for instrument design, such as the offsetting mechanisms and payments for ecosystem services. These new policy instruments like habitat banking, biodiversity offsets etc. coming originally from the United States, are now entering Europe. Valuation data can feed into the design of these types of instruments.
- › There is still another application of economic valuation that is vastly under researched, and yet may be the most interesting one, namely the use of valuation for environmental justice purposes. For example, indigenous communities in Ecuador sued Chevron Texaco years ago for an oil spill with catastrophic effects in the livelihood and resource base on which these indigenous communities depend. Using data for economic valuation of ecosystem services in courts, they managed to win the court case against Chevron-Texaco.

Remember now the three levels of engagement with economic valuation mentioned before, because the rest of this presentation will mostly be organised around these three elements: recognising, demonstrating and capturing value (figure 5). The notion of recognising value is the lightest level of engagement. It is when we just use valuation at a qualitative level. For instance, this is what the Millennium Ecosystem Assessment did, as it was more concerned with biophysical assessment and less with valuation.

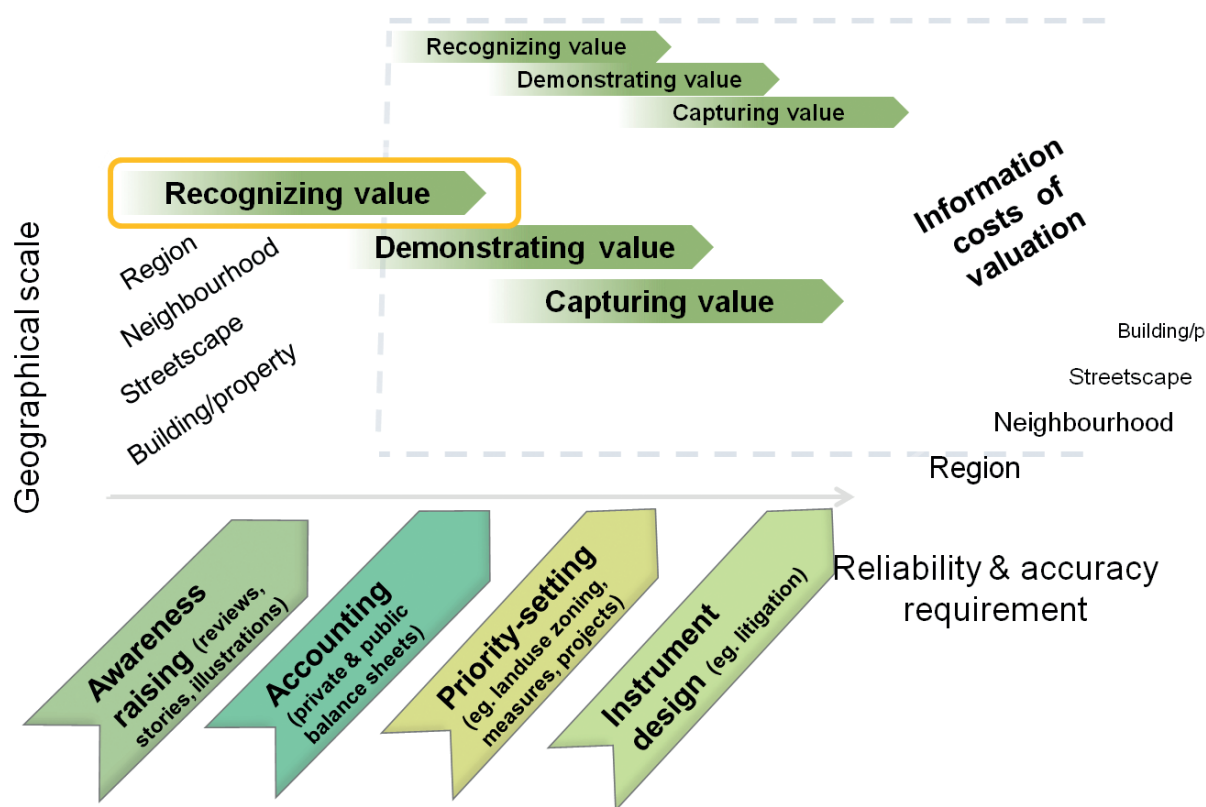


Figure 5. Purposes of ecosystem service valuation from theory (recognizing values) to practice (capturing values through their articulation in economic and other policy instruments).

Recognizing value

The MEA showed through the metaphors of natural capital and ecosystem services that nature was not just a matter of ethics and aesthetics, but the very material foundations of human societies. It showed that ecosystem services had a direct or indirect impact on all components of human wellbeing, including safety, basic material needs, health, good social relations etc (figure 6). The MEA only made a qualitative recognition of the societal value of nature, but it did engage so much with economic calculations. However, it already adopted the economic metaphor that portrays ecosystems as capital and their functions as services. The Pandora's box was opened and, as we shall see in the remaining of the presentation, we do not know any longer if we can get the genie back to the bottle.

Demonstrating value

The second level of engagement with valuation is what we call demonstrating value in the TEEB report jargon. Around 2007-2008, during preparations for the celebration of the Nagoya meeting of the Convention on Biological Diversity in 2010, the community in environmental science and policy reviewed state of the art knowledge on biodiversity loss to assess progress towards the objectives of the Convention on Biological Diversity, signed in 1992.

The Convention on Biological Diversity had set us a goal to break down or reverse biodiversity loss by 2010. However, scientific data showed that the attempt to reach this objective had been an absolute failure. Not only had we failed to break down

the pace of biodiversity loss, but biodiversity loss kept accelerating. Some estimates suggest that biodiversity is being lost at a rate that is 1,000 times faster than in pre industrial times.

In these years, something happened in the environmental policy and conservation community, which Spash (2009) has referred to as the 'new environmental pragmatism'. New environmental pragmatism stems from a reflection among environmentalists that makes the case that 'We have failed to protect nature with ethics and aesthetics. If we want to make a difference, we have to be far more pragmatic. We have to adopt valuation languages that resonate more strongly with the language that is used in decision making circles'. Since we live in a capitalist economy, the valuation language that is deemed most powerful in decision making processes is obviously money.

At this point, there was a decision to emulate the approach of the Stern report. Stern led an influential report in 2007 (Stern and Stern, 2007) that assessed the costs of inaction to stop climate change, coming up with some eye-opening figures on how this would affect GDP. The report, The Economics of Ecosystem Services and Biodiversity (TEEB) emulates this approach to show what the cost of inactions would be in relation to biodiversity loss.

The TEEB process was a complicated one, because it involved ecologists, social scientists, environmental economists, and ecological economists. We were clashing with each other, especially when it came to defining the core concepts that would guide the report as a whole.

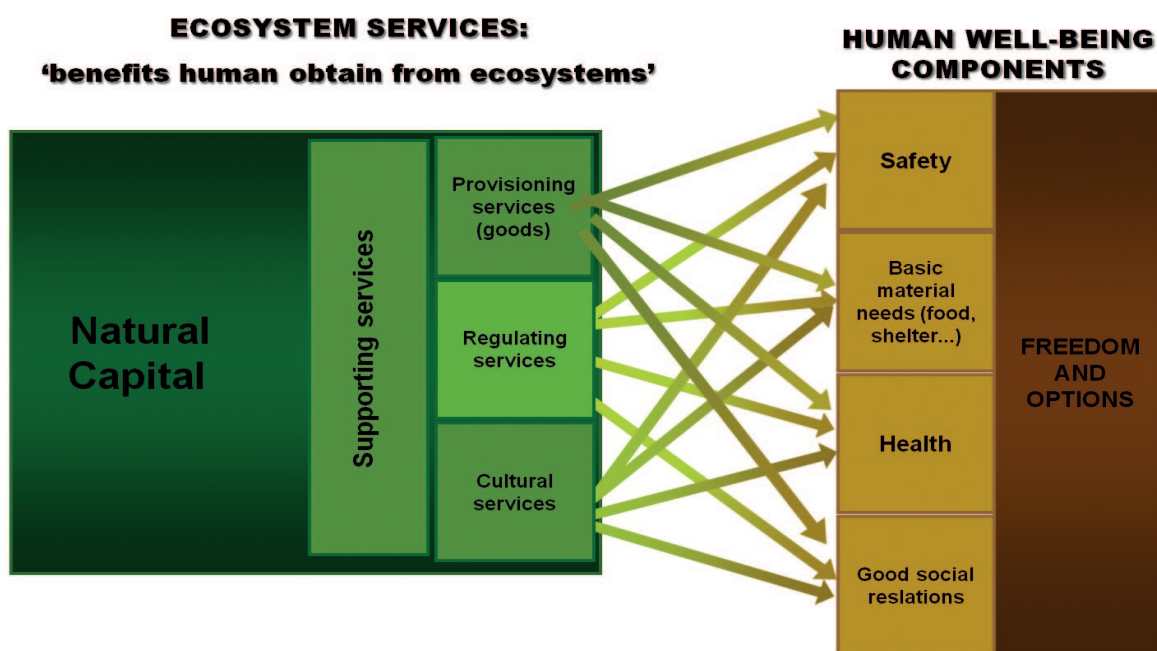


Figure 6. Impacts of ecosystem services on human well-being (MEA, 2005).

A key point of contention in the TEEB process was the following: What is value? When I ask my students every year 'What is the first idea that comes into your mind when you think of value?' Between 99 and 100% of the times, the answer I get is 'money'. Actually, within the discourse of ecosystem services, value is very often misread as merely denoting monetary value. This is prominent among economists, who often reduce value to money, but also among the critics of the ecosystem service approach, who very often taken for granted this sort of framing.

What if we check what the authorities of language have to say on this? For instance, if we look at the Oxford Dictionary, it defines value as the regard that something is held to deserve, or the importance, worth or use of something. Yes, money definition comes too, but only as the third or fourth definition of value. The keyword here is importance, but there is another important thing. I did not check the French ones, but in both Spanish and English dictionaries, you will also see values defined in the sense of 'held values'. This means that we are not just considering values in terms of individual preferences that we express in our choices in markets. Held value is understood as the principles and convictions regarding what we believe is the right thing to do and the right way to behave towards nature and other people. This is a fundamental component of value that for some time has been vastly overlooked in the ecosystem services literature. However, we are promoting this broader meaning of value in the Inter governmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

I want to stress the idea that values do not emerge from preferences only, but also from principles, convictions and notions of virtue. Finding the common substance of value has been a philosopher's stone that economists have been looking for for centuries. The physiocrats tried to find it in land, neoclassical economist in utility, Marx and Ricardo (building on Ibn Khaldun) in labour, and some ecologists in ecological footprints or energy. There was always this attempt to find a common substance or value. However, in a broad sense, value is about how people attribute importance and meaning, and if we want to get a comprehensive picture of the societal importance of nature and the services it produces, we need to acknowledge different valuation languages. This is core foundation of ecological economics. We will possibly never find a common denominator that captures all values of nature.

How to measure the economic value of the environment?

As we said, most ecosystem services are not mediated by markets. If we want to find the economic value of a provisioning ecosystem service, such as food, for example, we can use prices as a proxy of its economic value. However, most ecosystem services are not mediated by markets and thus do not have any explicit price.

Does that mean that they do not have a value? Obviously not, as Lord Darlington, a character in a book by Oscar Wilde's, puts it bluntly "*a cynic is a man who knows the price of everything and the value of nothing*". In Spain, Antonio Machado said, "*todo necio confunde valor y precio*". It translates as something like every fool conflates price and value. Apparently, the importance of differentiating of price and value can be found in popular sayings and literature across different languages.

In the TEEB report, I tried to map out what sort of valuation languages we might have to deploy in order to obtain a broad picture of the importance of nature. There are two ways of approaching it. One way of looking at values rests on the idea that value only exists in the mind of the valuer and that values only emerge from people's subjective preferences, principles and convictions. On figure 7, we have, on the one hand, the valuation toolset of environmental economics, where you often look at shadow prices or parallel markets from which you might derive some proxy calculation of the value of ecosystem services. Not without resistance from some of fellow economists, we managed to include here the idea of non monetary valuation or social and cultural valuation (Pascual *et al.*, 2010). Interestingly the use of this approach has expanded in recent years. Jasper Kenter (Kenter *et al.*, 2015) is among the people that are working with this approach, but there is a growing community opening up this box.

Another way of looking at value is from the perspective that there is some sort of objective importance in things. I believe there is some objective importance in things, because we physically depend on ecosystem services. We need 2 3,000 kilocalories per day in order to live. There are toxicity levels in air, water, and food that we cannot exceed, otherwise we will die or lose health. Therefore, ecosystem services are also objectively important for us. This is why biophysical accounts are an important valuation language too.

There are different values to be considered from a biophysical perspective. First, insurance values, which I also included in the report to deal with the value of resilience. It rests on the idea that it is not

only important to have a rich flow of ecosystem services, but actually, we want to make sure that the system is resilient enough to be able to buffer disturbances so that this flow of services can be maintained over time. With this notion, we try to stress this temporal perspective. On the other hand we have the family of biophysical valuation instruments that are widely used in ecological economics and industrial ecology. These are based on carbon, water, material, energy footprints etc.

In recent years, we have pushed the notion of integrated ecosystem service valuation, which explicitly integrates ecological, socio cultural and economic values. The divide in these three values is just a convention. It is only one possible way of classifying values, so these have to be understood as ideal analytical categories in the Weberian sense. The core message is that each of these valuation languages is more strongly or weakly attached to particular types of ecosystem services. Each of them relies on their own logics, metrics and methodologies (figure 8).

It is interesting, for instance, when my ecologist colleagues tell me, 'We do not deal with valuation. It is something economists do'. I say, 'No, ecology has been dealing with valuation for decades'. It deals with things like species richness, rareness, diversity and vulnerability. This is the valuation language of ecology. They are criteria that are used in order to rank importance. For instance, we take decisions about which places we want to protect, and this is valuation at its core.

Capturing value

There is a third level of engagement with valuation. Some people claim, especially among environmental pragmatists, that it is not enough to 'demonstrate' value. It is not enough to put in money figures or other types of numbers to quantify values. Unless you design some form of institutional device or economic incentive to turn these theoretically demonstrated values into real cash flows –the argument goes, you will not make a difference in people's actual behaviour. The case is made for designing novel institutions that can turn these theoretical values into cashflows or other kind of incentives to change behavior.

How could this be done? In principle, with a whole range of institutional approaches. We could use public policy regulations, community based management, or economic instruments. However in the spirit of the times, the approach that has been privileged for capturing value has been the development of the so-called market based instruments for ecosystem services.

With my friend Roldan Muradian, we published a special issue in Ecological Economics that we called 'In Markets We Trust?' (Gomez-Baggethun and Muradian, 2015). We trace back how the discourse on market based conservation is elaborated. Documents published in the 1980s and 1990s crafted this discourse by attacking the so called 'first generation of environmental policy instruments' based on public policy regulations, mostly implemented in the 1970s.

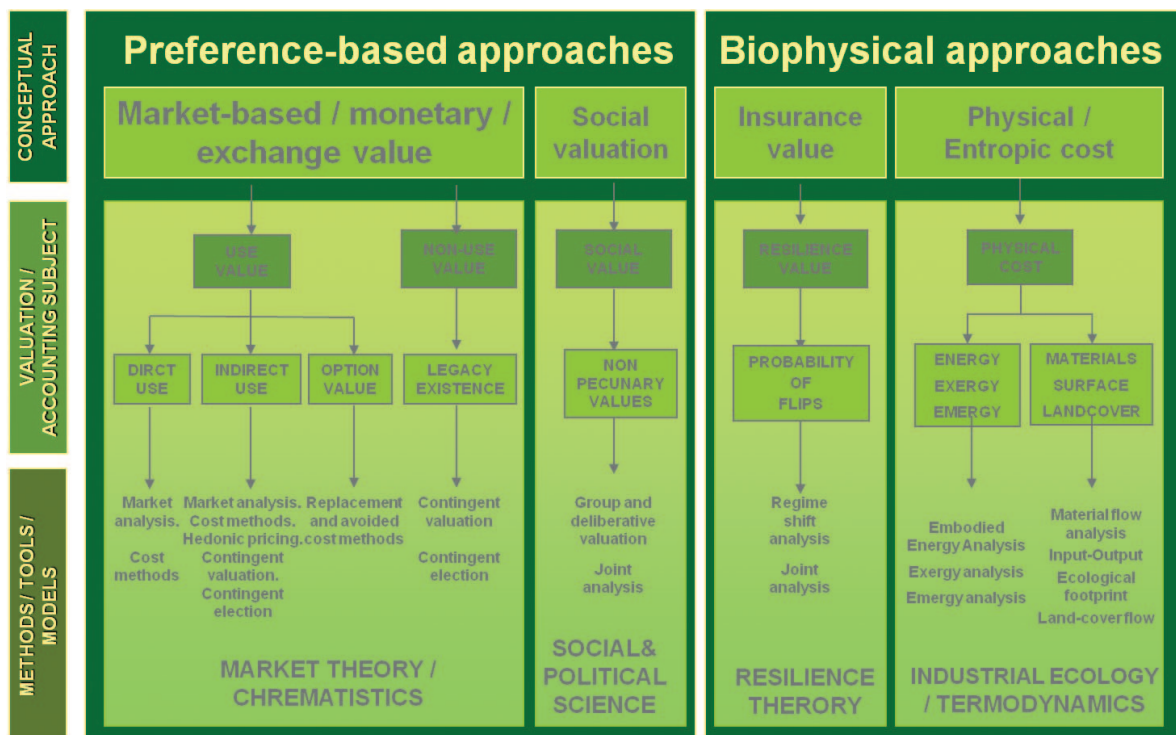


Figure 7. (Gómez-Baggethun and de Groot 2010).

The discourse portrays these instruments as authoritarian, top down, state driven command and control types of mechanisms and makes the case that we have to find more flexible, adaptive, voluntary based mechanisms to align market forces with conservation objectives. Much of the early literature comes from lawyers and economists from top US universities. It had a strong effect in the United Kingdom and eventually started to make its way into continental Europe as well. The clearest example is the development of the carbon market in Europe. Before Kyoto, European environmental policy did not pay much attention to the market as a core institution in environmental governance and the focus remained in public policy regulations.

In the early 1990s Clinton's Advisory Board on Sustainable Development made a case against public policy regulation and in favour of market based instruments. Eventually, a whole set of inter governmental organisations started advocating this approach, from the World Bank to different United Nations organisations that embraced the idea that economic growth and free trade should be key drivers of sustainable development. The Brundtland Report (Brundtland *et al.*, 1987) portrays growth as beneficial for the environment. We can see this advocacy for growth also through the Green Economy Report that the United Nations Environment Programme (UNEP 2011) and in all

major Earth summit declarations. These makes a very clear case for free trade and growth in environmental policy, despite the empirical evidence that shows there is a correlation between economic growth and resource use.

What are the two main families of policy instruments used to implement this approach? On the one hand, markets of environmental degradation, which are to some extent based on the 'polluter pays' principle. They are designed mostly to minimize negative externalities. On the other hand, we have payments for ecosystem services, based on the 'steward gets' principle and designed to reward people contributing to produce positive externalities, or ecosystem services.

I guess you are familiar with biodiversity offsets and payments for ecosystems services. The controversy is served. There are heated debates in the literature. We have proponents of market based instruments saying that they are more cost effective, flexible and capable of collecting resources from the private sector, and that they are more likely to create win win solutions between development and conservation goals. Critics on the other hand, make the case that external payments can erode intrinsic motivations for conservation and can promote unequal access to land and resources by privileging those with ability (rather than willingness) to pay.

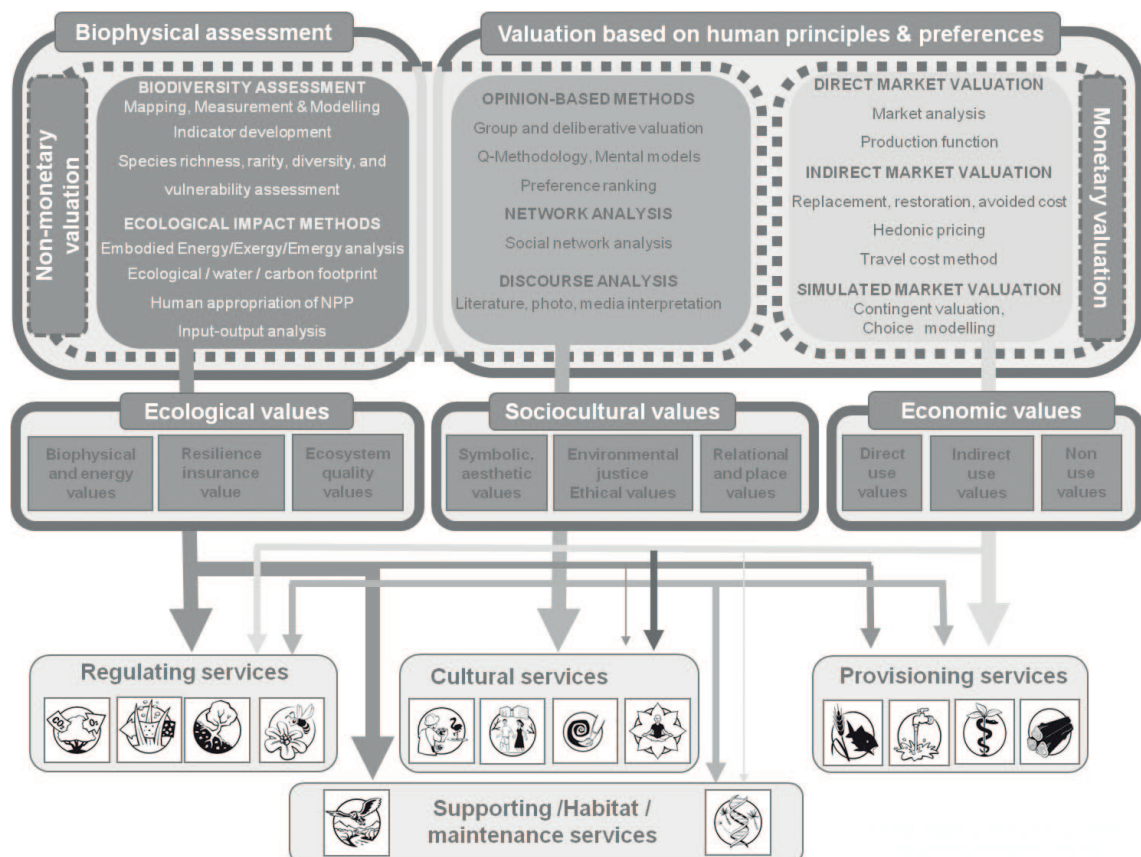


Figure 8. Ecological, socio-ecological and economic values, their methodologies and the type of ecosystem services they are the most attached to. From Gómez-Baggethun *et al.*, 2016.

Economic valuation and the commodification of nature

Critics further note that market valuation and instruments contribute to undesirable commodification of human nature relations. This is something I would like to discuss in a bit more detail. The commodification of nature is now a heated debate in the environmental science and policy agendas. Concerns about commodification are based on historically grounded observation that it changes the relationships between people and between people and nature. For instance, in France, Marcel Mauss was one of the early observers of the effects of commodification processes within social relations. Ecologists and some environmentalists fear that commodification of human nature relations can have detrimental effects on how we manage nature.

Commodification refers to the expansion of markets into previously non-market areas and to the treatment of things and processes as if they were tradable objects. It does not start at the point we set up a market to exchange things. In fact, the commodification process starts earlier, with symbolic and discursive transformations that leads us to perceive things as saleable or tradable.

But why is there so much fuss about commodification of nature when it is not a new phenomenon at all? Provisioning services like food, timber etc. have been traded in markets for centuries or even millennia. So why is there so much controversy about commodification of other types of ecosystem services such as regulating services or habitat services? There could potentially be many reasons, but one important reason is that actually, when we buy and sell tomatoes, we are not commodifying the tomato itself. It is the human (and animal!) labour

involved in the production of that tomato what we are commodifying.

Differently, when we commodify supporting and regulating services, for instance through carbon offsets, we are not paying someone for the work he or she does. We are allowing someone to appropriate nature's work, the work that nature does for free, just by putting property rights on it and allowing that person to derive a rent. This is often at the expense of the ecological commons that become enclosed. This is the type of reasoning that led Pierre Joseph Proudhon in the 19th Century to portray property as theft. It was also a situation in which property was encroaching upon the ecological commons.

The idea that ecosystem services can be privately appropriated, monetised and sold in markets is relatively recent in economic thinking. The classical economists recognised ecosystem services *avant la lettre*. Although they did not use that word, they referred to contributions from natural forces, etc. They always believed they did so as use values, not as exchange or money values. In the early 19th century Jean Baptiste Say² wrote *'The wind which turns our mills and even the heat of the sun works for us. 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"'*. It is an interesting sentence to pick up at a time when payments for ecosystem services are becoming an increasingly important piece of environmental policy. Likewise, David Ricardo (1772-1823) wrote that "Natural agents are serviceable to us by adding to value in use; but as they perform their work gratuitously, as nothing is paid for the use of the air, of heat, and of water, the assistance which they afford us, adds nothing to value in exchange" (1817 [2001], p. 208)

Tentative period	Stage	Conceptualization	Action	Value	Influential publications
1960s- 1990s	Utilitarian framing	Ecosystem functions as services	Ecosystem functions framed in utilitarian terms	Use value	Daily, 1997 De Groot et al. 2002 MA, 2003
Starting in 1960s, boosts in the 1990s	Monetization	Ecosystem services as valuable / monetizable	Refinement of methods to value ecosystem services in monetary terms	Exchange value	Costanza et al., 1997 Stern, 2006 EC, 2007
Starting in 1970s, boosts in the 2000s	Appropriation	Ecosystem services as appropriable	Clear definition of ecosystem property rights (e.g. land titling)	Exchange value	Coase, 1960 Hardin, 1968
	Exchange	Ecosystem services as exchangeable	Institutional structures created for sale / exchange (PES and MES)	Exchange value	Wunder, 2005 Engel et al., 2008

Table 1. The four main stages of commodification.

Stages in this commodification process (table 1)

The first stage in the commodification process takes place in the domains of language and of symbolic change and it consists of the **utilitarian framing of nature**. It starts when we reframe ecosystem functions (a concept traditionally used in ecology to refer to processes that operate in an ecosystem irrespective of whether they were useful for humans) as ecosystem services, thereby attributing them a **use value**. This may be seen as relatively unproblematic in that it is a fact that nature is useful for people. However, it has implications in terms of framing as it involves a shift from the ecocentric perspective used in ecology to the anthropocentric perspective used in economics.

The second stage, monetization, takes place when we do not only say that ecosystem services have a use value but also a potential **exchange value**.

In the controversies that followed the publication of its famous paper (figure 9), Costanza said, 'We should not commodify nature, but we should put economic values on nature'. However, what I have referred to elsewhere as 'the tragedy of well intentioned valuation' is that you cannot put monetary values on ecosystem services and expect that nothing will happen afterwards. You are creating discursive framings and metrical technology that paves the way for commodification to happen. There are different agendas out there. While, Costanza with the best of intentions tries to make nature's value visible,

others use these values to further their agendas of creating new fresh space for accumulation through the creation of new markets.

The third stage in the commodification process, **appropriation**, involves institutional changes. Ecosystems that were in a situation of public or common property, or sometimes simply open access, are given clearly defined property rights, very often private ones. Coase, in 1960, made an influential contribution in this regard by making the case that if we want to deal with externalities in an effective way, we need clear property rights on these externalities. Adding to this is the infamous tragedy of the commons by Hardin in 1968, which made an important mistake by conflating the notion of public access with that of the commons. This problem framing has been frequently picked up by the World Bank and others to promote the privatisation of natural resources and land.

The fourth stage in the commodification process, **exchange**, is when you turn ecosystem services into actual commodities. When you set up a market where these ecosystem services can be bought and sold, as with carbon markets. Nowadays, there is a growing number of markets and payments for ecosystem services that are already implemented worldwide (table 2).

SERVICES	\$ ha ⁻¹ yr ⁻¹
✦ GASES REGULATION	1.341
✦ CLIMATE REGULATION	684
✦ DISTURBANCE BUFFERING	1.779
✦ WATERSHED REGULATION	1.115
✦ WATER SUPPLY	1.692
✦ EROSION CONTROL	576
✦ SOIL FORMATION	53
✦ NUTRIENT CYCLING	17.075
✦ WATER PURIFICATION	2.277
✦ POLLINATION	117
✦ CONTROL OF ALIEN SPECIES	417
✦ HABITAT / REFUGEE	124
✦ FOOD PRODUCTION	1.386
✦ RAW MATERIALS	721
✦ GENETIC RESOURCES	79
✦ RECREATION	815
✦ CULTURAL SERVICES	3.015
TOTAL	33.266

17 ECOSYSTEM SERVICES FROM 16 BIOMES ESTIMATED TO HAVE HIGHER VALUE THAT THE WORLD'S GDP IN 1994


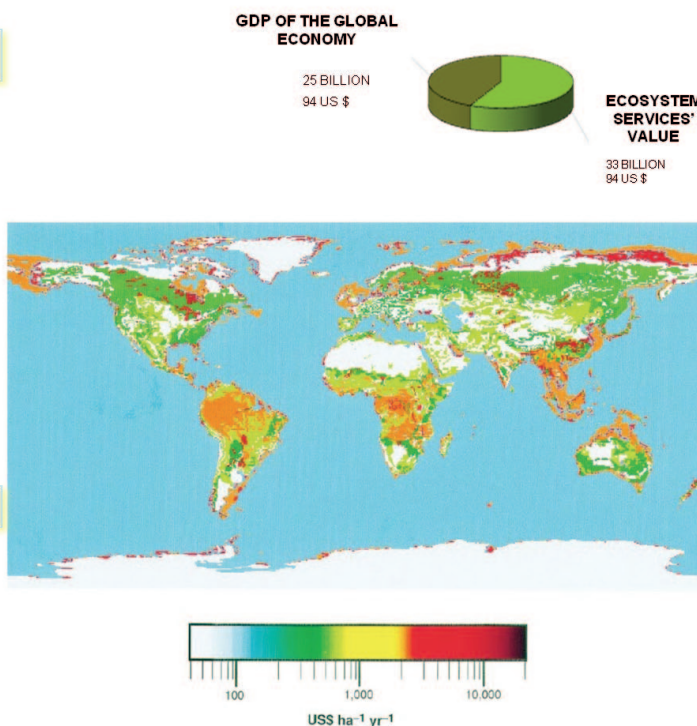



Figure 9. Estimation of the world's natural capital and ecosystem services (Costanza et al., 1997).

Scope and limits of economic valuation

Why do I believe the market approach to the governance of ecosystem services will fail in the attempt to secure the sustainable use of the ecological commons? I believe there are at least four to five important types of limits to the effectiveness of the market instruments in the governance of ecosystem services, in particular those with public good character.

The first concerns **physical limits**. We may use the metaphor of ecosystem services to break down ecological complexity into a limited set of functions and services for analytical purposes. However in reality, we know that ecosystems are complex, intertwined

systems of functions, structures and processes. It is very difficult to isolate one ecosystem service and create a discrete, tradable unit. Hence, for their very physical nature, it is complicated to commodify ecological processes.

The next type is about **institutional limits** (table 3). Markets are effective in governing objects with private good character. However, we know that it is usually states that have historically taken responsibility for the governance of public goods. Markets are usually not an effective governance mechanism in this case because of problems of free riding, excludability etc. Most ecosystem services are public goods in nature.

Mechanism	Commodified ecosystem service	Sites of application	Reference
Markets for Ecosystem Services	Emission trading of greenhouse gases (atmospheric sink functions of CO2)	European Union	Barker et al., 2001
		United Kingdom	Bayon, 2004
		Chicago	Bayon, 2004
	Sulphur dioxide emission trading (atmospheric sink functions of SO2)	USA through the US Clean Air Act of 1990	Stavins, 1998
	Wetland mitigation banking	USA	Robertson, 2004
Payment for Ecosystem Services	Watershed protection	Central America	Corbera et al., 2007
		Ecuador	Wunder and Alban, 2008
	Carbon sequestration	Costa Rica	Pagiola, 2008
		Ecuador	Wunder and Alban, 2008
	Habitat conservation / wildlife services	Bolivia	Asquith et al., 2008;
		Zimbabwe	Frost and Bond, 2008
	Bio prospecting	Costa Rica	Pagiola, 2008
	Agro environmental measures	European Union	Dobbs and Pretty, 2008
US		Claassen et al., 2008	

Table 2. Markets and payments for ecosystem services (Gómez-Baggethun et al., 2010)

	RIVALRY	Low	High
EXCLUDABILITY	Difficult	Public	CPRs
	Easy	Club	Private

Table 3. Institutional limits: Public good nature of most ecosystem services makes exclusion technically difficult and economically expensive (Farley and Costanza 2010; Muradian and Gomez-Baggethun 2013).

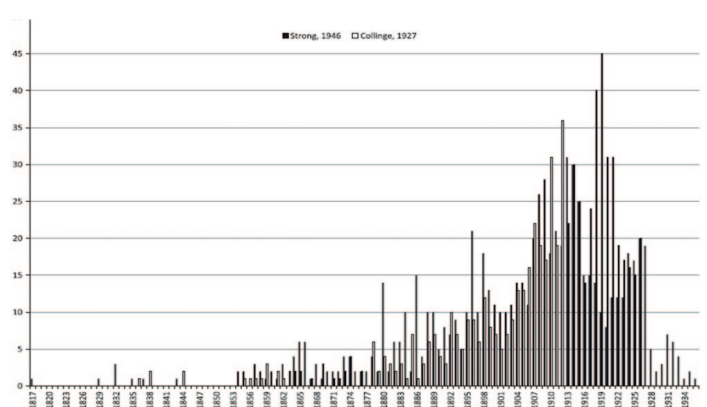


Figure 10. Number of publications on economic ornithology published per year, 1817-1936 (Kronenberg, 2014. based on Collinge, 1927; Strong, 1946).

Then there are **technological limits** (figure 10). Note this trap of short term pragmatism. If you make the case that we should conserve ecosystem services because it is profitable, you get into a very risky domain. What you see in this graph is the rise and fall of economic ornithology about a 100 years ago, a body of literature that made the same profit-driven case for conservation that is often made today with ecosystem services. We should protect birds because they prevent pests, insect outbreaks, etc. The rise and fall of economic ornithology came with the invention of pesticides, when humans found a cheaper way to cope with plagues. Then interest in economic ornithology collapsed. The lesson to be learnt here is that if environmentalists put all the eggs in one basket and concentrate their discourse in the instrumental value of nature, their arguments may fall apart as soon as a technological innovation allows to replace the benefit produced by an ecosystem service at lower cost.

There are also **political limits**. Commodification processes and expanding markets have always encountered social contestation, which is what Karl Polanyi, in 'The great Transformation', refers to as the 'double movement' (Polanyi, 1957). Some indigenous people in Latin America and other regions see REDD³ and payments for ecosystem services as schemes that encroach on their customary rights of access to land and resources. Sometimes, societal opposition to commodification of ecosystem

Finally, there are ethical limits. Every society has accepted that some things should not be for sale. Sometimes, we have not only banned specific forms of commodification, but also de-commodified things, turning market internalities into market externalities. Examples include the abolition of slavery and the abolition of the practise of selling spiritual indulgences in the Middle Ages. As you know, in Catholic countries, we were buying and selling spiritual indulgences. You could buy your way to Heaven if you had the ability to pay the price of your sin.

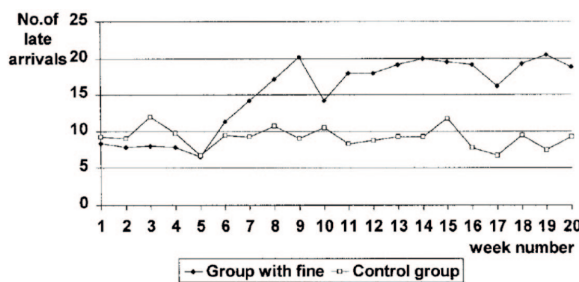


Figure 11. Average number of late-arriving parents each week in a kindergarten, with or without a fine (Gneezy and Rustichini 2000).

The Protestants finished this practise. Interestingly, however, in our post modern society we do no longer buy and sell spiritual indulgences, but we increasingly buy and sell environmental indulgences. We believe that as long as you can pay for your pollution and resource depletion, you are allowed to destroy nature and to pollute. This is important, because we are mixing the domains of prices and rights, which is something I would like to discuss afterwards.

I am finishing with one final observation that also has important implications for economic valuation and the use of payments as incentives for conservation. Many economists expect that an external incentive, for instance a payment, will always reinforce the pre existing intrinsic motivation to conserve nature. We know from experimental economics that this is not always the case and that external and intrinsic motivations interact with each other in much more complex ways than often assumed in conventional economic thinking. Note the following classical example. In a kindergarten in Israel parents were arriving late to pick up their children. The kindergarten decided to issue a fine to those parents arriving late, with the counter intuitive effect that parents started to arrive even later (figure 11). Why is this? We may find the answer in the difference between fines and prices. A fine has the moral connotation of being punished for doing something wrong. However, prices are widely seen to be morally neutral. Once a society accepts that something can be bought and sold, this is mostly left to the domain of individual choice. The problem is that the parents in our story took the fine as a price, namely the price for their right to arrive late. They may have thought, 'If I pay for arriving late, then I am released from my responsibilities'.

This may also happen with payments for conservation. For example a study conducted by colleagues of mine in Chiapas, Southern Mexico, showed that payments were eroding the intrinsic motivations for conservation (figure 12). Another paper we published

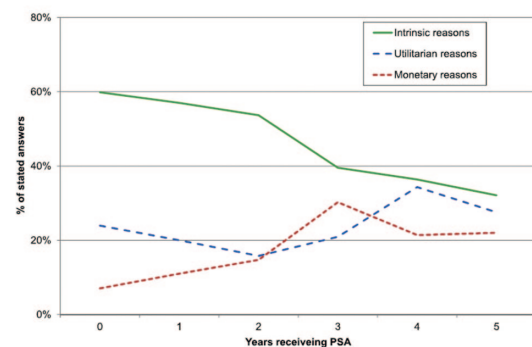


Figure 12. Percentage of reasons for conserving nature in the future in relation to number of years receiving PSA (Rico Garcia-Amado et al., 2013).

shows there is increasing empirical evidence of motivation crowding effects. As figure 13 shows, this has happened mostly in Southern countries, even though these instruments have been designed in Northern countries. As Hannah Arendt puts it, “the problem with modern theories of behaviour is not that they are wrong but that they could come true”⁴. Incentives shape behaviour and change logics.

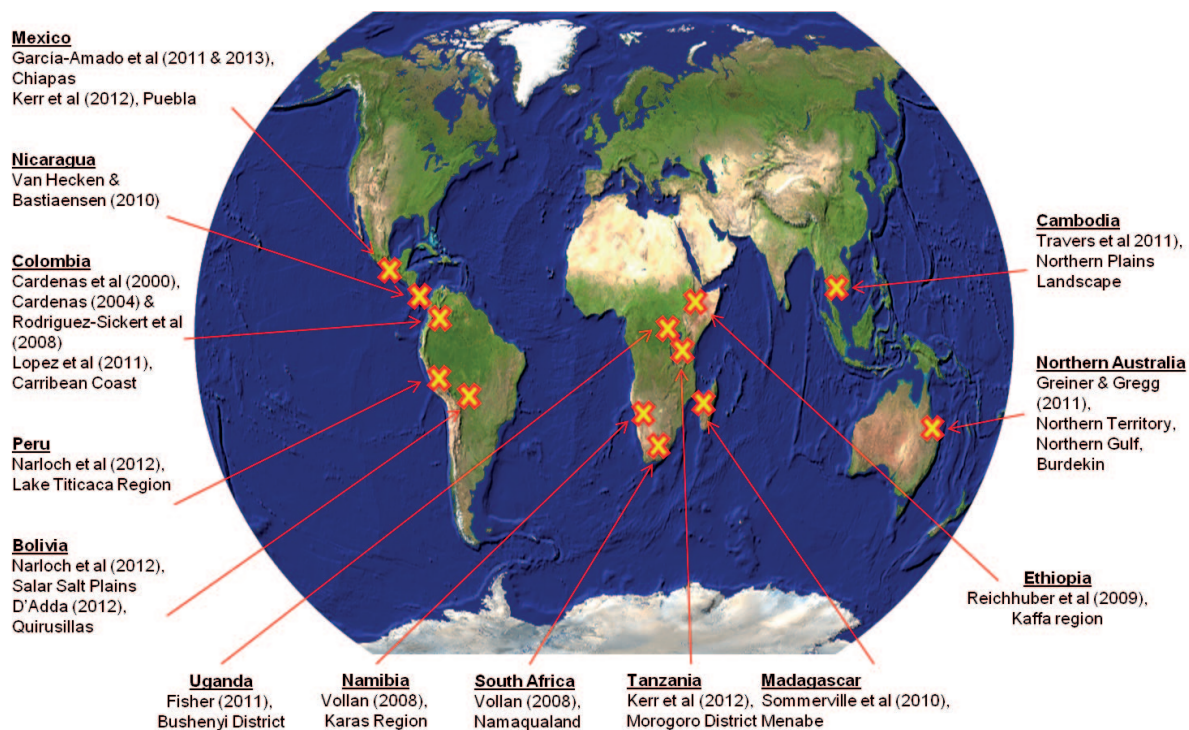


Figure 13. Examples of motivation crowding with payment for conservation (Rode, Gomez-Baggethun and Krause, 2015).

FOOD FOR THOUGHT

Let us finish by summarizing some of the key messages.

Value is about importance. If we want to understand the importance of nature, we need to use different valuation languages. The economic values of nature are obviously important, but we also have to acknowledge the symbolic, cultural and ecological and other types of values related to the environment, and the fact that these cannot be captured with a single rod of measure because they are incommensurable with one another.

Economic valuation of ecosystem services can be a powerful tool for awareness raising. It helps revealing how some economic actors impose costs on future generations or other people. However, I make the case that, used beyond its adequate scope of application, it leads to what I have referred to as the tragedy of well intentioned valuation. However good your intention may be, if you put economic values on ecosystem services that we may not want to be governed by market values and norms, economic valuation will be counterproductive because, as I said before, it will create discursive framings and metrical technology that paves the way for undesirable commodification of nature.

Hence, to value or not to value? Well, as I have argued elsewhere with my Greek colleagues Kallis and Zografos (2013), this is not the question. We need to democratically decide the separation between ecosystem services we believe may be governed by markets and those which may not. What we believe is ethically and politically acceptable to be governed by markets and what is not. When Kant said 'In the kingdom of ends, everything has a price or a dignity', he was pointing to the importance of this question, that we are not discussing in enough depth. If we want to delineate what should be inside and outside markets, technical criteria (such as the physical and institutional characteristics of goods) matter, but ultimately, it is fundamentally a political and ethical dilemma. We need to decide which ecosystem services or externalities we want to internalise and which internalities we may want to externalise from markets.

For the reasons stated above, I believe that in taking up the challenge of governing the ecological commons in the 21st century, the market approach has a limited scope of application and limited chances to succeed. I believe we will need higher levels of public policy regulation, strategic planning and international cooperation. There is a need for an institutional architecture that we are lacking nowadays and that we will have to build in the coming decades if we are to tackle effectively our global environmental challenges.

Notes

1/ In *Lady Windermere*, Oscar Wilde (1854-1900)

2/ 1829, p. 250. Revised in Gómez-Baggethun *et al.*, 2010, *Ecological Economics* 69: 1209-1218.

3/ The Reducing Emissions from Deforestation and Forest Degradation initiative

4/ Arendt, H (1958). *The Human Condition*. Chicago

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