Reframing the value of nature: biological value and institutional homeostasis

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Abstract

The importance of the economic valuation of nature is frequently propagated by arguing that more and better economic valuation will avoid the undervaluation and thereby the degradation of nature. In the approach considered 'economic', the assumptions on rationality, human interaction and the nature of the good remain unchanged although human-nature relationships need to change and biological and neurophysiological aspects of human nature need to be considered for well-being and survival. I discuss the shortcomings of economic valuation in that respect and suggest scenarios depicting pathways of change in a matrix of socio-ecological connectedness and integrative capacity of institutions.

Introduction

Calculating economic values for systems of supply and demand of environmental goods and services is argued to be necessary if we do not want the market system approach to fail (Balmford et al. 2002). However, doubts remain about whether this approach will be sufficient for the conservation of biodiversity when seen as a highly complex and uncertain life-regulating system. These doubts are supported by the discourse over the legitimacy of market-based valuation. Market-based approaches for the valuation of nature have long been recognized as being inappropriate and even disallowed (see U.S. Court of Appeals, Washington D.C. 1989, cited in Eberle and Hyden 1991). In the USA the courts ruled against the dependence on market-based methods in environmental damage assessment but allowed continued use of the Contingent Valuation Method (CVM), despite the fact that the CVM attempts to impose market valuation on nature. Eberle and Hayden (1991) demonstrate that CVM surveys are based on the same conceptual neoclassical foundations and come to the conclusion that "Their continued use will mislead valuation attempts and frustrate policy intended to restore a viable environment." (ibid:

683). The question then arises as to what such values represent if they are divorced from economic theoretical justifications and how they are being manipulated and employed as pragmatic devices (Spash, 2006, 2008a, 2008b).

The authors of "the Economics of Ecosystems and Biodiversity" (Kumar 2010) also state that the (total) economic value of biodiversity and its goods and services is only a part of nature's total value (Gowdy 2010: 272) and that therefore, there are '...no purely economic guidelines available for valuing essential and irreplaceable features of the natural world...' (Gowdy 2010: 278). Nevertheless, TEEB study leader Pavan Sukhdev argues that nature is lost because many natural goods and services are provided for free and thus invisible to economic systems. Markets do not provide incentives for sustainable use and conservation of many natural resources and services because they do not have an economic value. He says that '…economic incentives and disincentives are very powerful', that 'economics has become the currency of policy', and that economic valuation is necessary for supporting '…mother nature's back offices...' in order to get (her) invoices issued (Sukhdev 2011a,b). The message of that rhetoric is contradictory. On the one hand the total value of biodiversity is unknown implying that the total economic value is also unknown. On the other hand economic values are supposed to be generated as they help getting the accounts right and are the language of politics. Decisions need to be made on how to value biodiversity, on how relevant economic versus non-economic values are and on how to choose how to value.

The aim of the paper is to review the arguments concerning the economic versus the non-economic valuation of biodiversity and to map the evaluative space which frames the social and ecological context in which decisions on values and valuation are made. I provide examples for nuisance effects of economic valuation which indicate incomplete capabilities of market

institutions to integrate all costs and benefits arising from the use of nature. Further, I present the range of institutions for articulating value in the evaluative space. The shift to a concept of biological value emerged from the continuous failure of market institutions to capture all values of nature and the impossibility of answering the question of nature's total value. The shift from economic to biological value is explained by means of scenarios which describe the changing relationships between socio-ecological interconnectedness and the integrative capacity of institutions.

Nuisance effects of market valuation

Decision-making situations which are modelled according to assumptions rooted in Walrasian welfare economics (Gowdy 2010) are oversimplified and far removed from realities of interconnected and complex social and ecological systems. Spash (2010a: 170) terms this a '...divorce between the assumptions of economic theory and complex reality.' Although the ideal conditions for perfectly functioning markets can hardly ever be met, there are conditions in which markets work as theory predicts. This has been confirmed by economic games in the laboratory. After several rounds of transactions on a market for products, an equilibrium price emerges even when disturbances (like sudden changes in demand, or the number of actors in the market, financial barriers to markets, taxes, or extreme price fluctuation) were introduced (Ruffieux 2006).

However, applying these laboratory conditions to the carbon sequestration services of natural ecosystems would generate a sequence of difficult to answer and absurd questions: What is the carbon sequestration capacity of the earth's ecosystems? What benefits do fundamental life-support systems generate? What are people willing to sacrifice for one unit of the earth's carbon

sequestration capacity? How much sequestration capacity could be replaced with one unit of life-support function? How much satisfaction do we generate from knowing that natural ecosystem functions enable living organisms to survive?

Here, economic valuation is applied in order to create markets for nature components which are not suitable for being governed by the market because of their specific features and the values people actually hold for them. The establishment of carbon markets is a prominent example. Spash (2010a) explores the physical and institutional aspects of greenhouse gas control and carbon trading and how this reality violates the conditions of the theoretical economic model. These violations refer to the difficulty of creating boundaries and understanding complex system dynamics of greenhouse gases (CO_2 is only one of several), the uncertain effects of pricing, the difficulty of measuring carbon saved, calculating control costs and the interdependence of control costs and permit prices.

Further, the carbon trading system is criticized (Spash ibid: 14) for actually being more of a financial than a product market; similar to the financial derivatives market that eventually led to the collapse of the housing market in the USA (deGrace 2011). Such financial products are criticized for allocating financial capital to the most powerful players, lacking transparency, providing incentives to trade with emissions instead of reducing them, and creating powerful structures to protect this trade and prevent alternative regulatory mechanisms such as taxes or direct regulation.

Financial markets work very differently than product markets. Products on a financial market are not typically consumed and information asymmetry is much higher. Buyers can be sellers (and vice versa) and therefore, the efficiency in creating added value (producer and consumer rent)

cannot be measured. In a financial market nobody knows the fundamental value of a bond better than the market itself, so that it becomes impossible to know how efficiently financial resources have been allocated[1]. In a financial market the actors do not only behave according to the information they have about the fundamental value of a bond, but also they behave according to how others behave. It is the behaviour Keynes (1936) described in his beauty contest analogy where market agents choose on the ground of what they think the majority will choose, thereby making a choice not on one's own values. That has been described as a kind of swarm behaviour: if others buy, I also buy, assuming the market price will continue to climb, which is an incentive for me to buy more. Eventually the market value does not reflect the value of a firms bonds any longer. Instead, the price is created by the behaviour of the speculating actors and the market tricks itself by generating a price based on expectation (Noussair et al. 1998, Ruffieux 2006) and greed.

Spash (2010a) concludes that the high uncertainty and complexity of the problem, the opportunities for manipulation by vested interests and the undesirable ethical and psychological effects which discourage voluntary actions (Frey 1997, 2001), prevents the market mechanism from solving the problem cost effectively. In the discourse about creating new markets, there is much room for manipulation by corporate power to achieve financial gain and these interests rank higher than environmental or social consequences. The recent example of investigation against Deutsche Bank for tax fraud and money laundering related to EU carbon emissions trading, supports that claim (DW 2012).

[1] In economic games economists have created a fictional firm of which they know the fundamental value and let the market actors engage in transactions on an experimental financial market. They do not find the fundamental value of the firm. Typically in such experiments the actors trade the fictive bond throughout 15-30 phases (buying and selling transaction) and in each phase the bond generates a dividend, which is the only source of determining the fundamental value of a bond. Instead of remaining at the fundamental value (like the equilibrium price on a product market) of the bond the market value climbs and climbs, so-called speculation bubbles are created, until the market collapses.

Because more attention has been given to minimal reductions and creating gains from trade than to achieving effective targets, the focus on such markets is creating a distraction from the need for changing human behaviour, institutions and infrastructure. What is being overlooked is that the assumption of natures' services being for free is very limited to a particular worldview. A particular self-regarding rationality is assumed and used to justify the basis for regarding decisions as rational. Numerous other cultures and traditions of thought, including 'Western' cultures, have developed moral frameworks and institutions that regulate the relationship between humans and nature with different rationalities, ethical and epistemic frameworks (Gatzweiler 2013, Knorr Cetina 1999, Bergendorff 2009, Thorsby 2001).

These different rationalities and ethical frameworks, however, are frequently overlooked when newly created markets help to manifest power structures. This shows not only in the violation of indigenous people's traditional property rights, but also in the persistent propagation of the view that natural public services are for free (Lohmann 2006a,b,c). Being 'for free' however, only means being outside the governance of the market, not that these services are without value. Economic valuation methods and the respective incentive systems they create are not able to detect a broader range of values which emerge in social but also socio-ecological relationships. Douai (2009) therefore suggests rethinking the value of nature by questioning established social relationships, property rights and governance regimes by putting economics into its socio-political context. Although this is an important inclusion of the political sphere of life in which different types of values (which are not all commensurable) emerge, it can also lead to a stand-off of different normative convictions, e.g. that of the Capitalist vs. the Marxist ideology. My attempt in the coming sections is to include yet another fundamental biological sphere of life into

the discussion of value – a sphere of life immediately linked to human rationality, well-being and ultimately human survival.

In Walrasian economics (Gowdy 2010), decisions based on facts rank higher than those based on feeling although facts and feelings are closely related, and a disconnection of both seem to be very problematic, or even psychologically unrealistic (Kahnemann 2003). Especially when it comes to valuing nature's life support systems this separation is problematic. It is problematic, because the type of rational behaviour assumed in economics is closely associated with behaviour of individuals who suffer from brain damage, notably those areas of the brain required for making decisions in complex and uncertain circumstances, for social behaviour, interpersonal relationships and decision-making related to financial issues. Damasio (2009: 211) reports such '…abnormal decision making…resulted from a cognitive malfunction that was rooted in an emotional malfunction. In other words…the emotional malfunction altered the cognitive process.' Articulating values in the Walrasian rational choice tradition, regardless of the complexity of the decision making context is problematic because '…the scope of economic inquiry is … truncated in ways which restrict its explanatory power, policy relevance, and ethical coherence...' (Bowles 1998: 75), which means that recommendations for decision-making are less good. Bowles (1998) describes the framing and motivational effects of markets on preferences and behaviour by characterizing them as "powerful cognitive simplifiers, allowing radical reductions in the complexity with which one typically views an assortment of disparate goods"(ibid: 90).

The recognition that institutional settings influence behavioural and motivational outcomes is not new. Examples from the ultimatum game and the public goods game confirm that. What is worth emphasizing (again) is that institutions that rule over the articulation of values also have the

same effect. Compliance with rules or laws legitimises those rules in society, which is an important factor explaining behaviour (Tyler 1990). Paying people to perform environmentally friendly acts when their behaviour is actually more norm driven can lead to an unwillingness to actually perform desired actions (Frey 1992).

Defining rationality defines values: the evaluative space

Valuation of nature in the neoclassical tradition of economic thought assumes particular models of human behaviour, especially the axioms of rational choice. Value is elicited according to specific rules. The claim is that, 'The theory of rational choice that dominates economics derives from an everyday theory of human choice, which has been called folk psychology.' (Hausman and McPherson 2006: 46). According to rational choice theory the human actor makes decisions under the premises of a known set of alternative choices, completeness, transitivity, preferences being continuous, and choices being made in favour of preferred alternatives (Green 2002). However, the fallacies of rational choice have become evident. Simon (1979: 506, 1957) summarizes the situation as follows:

> '...in early studies, using extremely simple choice situations, it appeared that perhaps people indeed behave to maximize subjective expected utility. When even small complications were introduced into the situations, wide departures from the predictions of subjective expected utility theory soon became evident, the conclusion seems unavoidable that the subjective expected utility theory does not provide a good prediction –not even a good approximation- of actual behaviour. '

One of the assumptions of rational choice theory is that individuals make choices independent of their socio-cultural context, or independent from social institutions. Obviously behaviour can however also be driven by plural rationalities and by reasons other than maximizing or satisfying individual utility. (Vatn 2005:121, 127). The type of rationality applied thereby depends on the broader context in which the individual makes decisions: it can be defined by 1) the type of rationality (individual vs. social), 2) the type of human interaction (instrumental vs.

communicative), and 3) the character of the good or external world (simple vs. complex). All three dimensions define an allocative regime (market, community, or state) and the respective value articulating institutions (e.g. willingness to pay, multi-criteria methods, or deliberative social processes, see for example Zografos and Howarth 2008, Jacobs 1997), which can be chosen to protect certain values and to make and justify decisions.

Within this evaluative space '...individual rationality, instrumental behaviour and goods as demarcatable items are elements that consistently fit together...' and '...complex, common goods are equally linked to social rationality and communication. ' (Vatn 2005: 421). Values which are being articulated are linked to a particular institutional framing condition which supports or inhibits a particular type of human rationality and interaction. Figure 1 illustrates the evaluative space, which is defined by different social and ecological contexts which influence the choice of value articulating institutions. It shows that deliberative value articulating institutions, like roundtables or citizen juries, are used in circumstances in which people are communicative and social and ecological conditions are perceived as being complex, whereas market based valuation is applied in circumstances in which people apply individualistic rationality and interact instrumentally, and ecological conditions are perceived as simple and partitionable (which is a precondition for goods being private).

Figure 1 ABOUT HERE

From the above dispatch it would follow that it is not the absence of markets and market values but their exclusive presence which has adverse (polluting, depleting) effects on nature. As institutional arrangements of a very particular type, they do not have the capacity to integrate all costs and benefit flows related to the use of nature and their allocative regime is inconsistent with

the problem raised by Vatn (2005). Markets alone will not lead to the desired results and that is why the state and civil society are required as additional institutional structures[2]. Yet both are connected to and influenced by the fundamental biological level of live at which biological value emerges, as I will argue in the next section.

So far I have identified different evaluative spaces for deciding on which value articulating institutions are appropriate in order to produce less nuisance effects. By shifting the first order question of choosing among alternatives to choosing among allocative regimes and authority structures, we have created awareness that context matters and also that context creates the value. Changing contexts, will not only change rationalities and value articulating institutions. They are also likely to change the nature of value itself and consequently the importance of economic value (2005) in relation to non-economic values for maintaining the viability of socio-ecological (living) systems.

Biological value and institutional homeostasis

In this section I explain the importance of changing contexts for the shift from economic to biological value and I describe the process of changing institutions as regulators of the overall socio-ecological system. In that system people behave according to their values and their values change in response to changing bio-physiological living conditions. In that sense, considering the social-ecological system to be a living entity, I will refer to this process as institutional homeostasis – the regulation of the process of life in which institutions and values play an important role.

[2] Similar to Ostrom's three levels of institutional analysis: constitutional choice, collective choice, and operational level (Ostrom et al. 1994). Operational rules refer to day-to-day decisions, collective choice rules affect operational activities and comprise of the rules which are used to change operational rules, and constitutional rules affect the set of rules to be used in crafting the set of collective choice rules.

The mainstream concept of economic value has emerged under the context of an empty world – a world, according to Daly (1992, 2005) which is full of nature and its resources and relatively empty of human artefacts. That concept of economic value facilitated exchange and allocation of resources and increasingly contributes to the vulnerability of socio-ecological systems. Eventually the world changed from an empty to a full world. The increasing interdependence of human wealth and ecological health and the increasing connectedness of social and ecological systems (Costanza et al. 1992, Berkes and Folke 1998, Scheffer et al. 2002) became increasingly apparent. The mutual relationship is one in which human society can no longer prosper without an intact natural environment and in which natural environments require protection from societies that have managed to transform their institutions so that it became too costly to continue extraction and exploitation without restoration of nature. The concept of biological value emerged in circumstances when there was a need for appropriate societal responses to environmental degradation by human actors who realized that human wealth increasingly relies on environmental health. That kind of rationality extended that of the utility maximizing *homo oeconomicus*, induced a transformation of interaction patterns between humans and nature and consequently also perceptions of value.

In an increasingly connected world, cognitive responses to information about different socio-ecological contexts in which values are expressed should provide orientation for attitude and behaviour change in the evaluative space. That is one of the key messages from a study on the economics of ecosystems and biodiversity (Brondizio and Gatzweiler 2010) and supported by, e.g. Beratan (2007), which emphasize the importance of discourse and deliberation for

behavioural change. However, from cognitive-response and expectancy-value theory[3] (Toy 1982, Greenwald 1968, Eagly and Chaiken 1993, Fischbein and Ajzen 1975, Tversky and Kahneman 1986) we know that simply providing information about changing circumstances, no matter how life endangering they might be (Rogers et al. 2006), are not sufficient to change behaviour. Beliefs, attitudes and expectations also need to accompany this change.

What matters in distinguishing economic from non-economic values, within changing socio-ecological contexts, is not a choice for or against specific types of values, i.e. economic or non-economic values, rather it is the choice of belief systems which come with the assumptions of a particular rationality and type of human interactions, from which value emerges. In other words, values are emergent properties of complex human-nature interaction patterns, which cannot convincingly be chosen if the underlying behavioural patterns do not change.

The concept of biological value evolved from the recognition that social and ecological circumstances change to a degree that they are life-endangering and that assumed and observed human behaviour do not match. Damasio (2010: 46-60) argues that the human obsession to attach a value to virtually everything around them is because of their 'struggle to maintain life and the imperative needs that arise in the struggle.' Damasio (2009: 212) defines biological value as 'survival value' and it is defined by the homeostatic state of living organisms which strive towards optimal conditions for the continuation of life (Damasio 2005: 48). It applies to individual cells and more complex organisms and its quality is determined by the physiological

[3] Cognitive-response theory explains how thoughts are generated in response to a communication. Responses could be e.g. counter arguments (thoughts that express disagreement), support argunents (thoughts that express agreement), or source degration (thoughts that discount or attack the source of the message being communicated). Expectancy-value theory attempts to explain how attitudes form and change as a result of beliefs, values and knowledge about an issue and evaluations thereof, which eventually form expectations.

state of living tissue within a homeostatic[4] range. Physiological states within ranges compatible with life show a higher biological value, whereas physiological states with low biological value are aversive to life. Pleasure and pain or things which people refer to as 'good' or 'evil' are actually related to particular ranges of homeostatic regulation. "What we call good actions are, in general, those actions that lead to health and well-being… What we call evil,…, pertains to malaise, disease, or death…" (Damasio ibid).

Biological value not only applies to cells and organisms but also to cultures. Damasio explains that '…the valuations we establish in everyday social and cultural activities have a direct or indirect connection with (…) the processes of life regulation...'. The development of socio-cultural systems of norms, rules and laws (institutions) are manifestations of the same homeostatic impulse. Institutions aim at avoiding extreme behaviour which could cause social conflicts and endanger the viability of living systems. Damasio calls this socio-cultural homeostasis and hypothesizes that the same (homeostatic) impulse shaped the development of arts, myths and religions. (Damasio 2010: 293–5)

The process which I term "institutional homeostasis" refers to a regulation process by means of institutions and values within a broader socio-ecological system which behaves as an entity. The bio-physiological parameters change in response to the behaviour of the social system and the values and institutions which regulate the social system change as a response to changing bio-physiological parameters. Negotiating and agreeing on rules, monitoring outcomes, evaluating outcomes under changed social and ecological circumstances, responding to those circumstances

[4]Homeostasis refers to an organisms functioning towards keeping internal system conditions constant or striving towards an equilibrium, despite external disturbances and fluctuations, e.g. in temperature, facilitated by multiple adjustment and regulation processes (Cannon 1929).

by institutional re-design and re-negotiation, in short, by the constant process of improving living conditions in response to changing bio-physical conditions, can be regarded as a process of institutional homeostasis. A process which Dietz, Ostrom and Stern (2003) have also referred to as a constant ‘struggle’ with the aim of getting the institutions right.

The 'institutions of sustainability' framework by Hagedorn (2008) helps to explain how institutions change in the process of institutional homeostasis. In the institutions of sustainability framework transaction costs play a critical role. They do not only occur from transferring a unit of a good from one point to another but also from how involved stakeholders prepare for and respond to this physical change and thereby change social relationships. ‘Accordingly they could also be called interdependence costs. ’ (Hagedorn 2008: 30).

Two extreme types of transactions can be distinguished: atomistic-modular transactions and complex-interconnected transactions. Governing both types of transactions sustainably requires different types of institutions. These different types of institutions, be it value articulating or action governing institutions, can be associated with the two types of transaction along a continuum. The respective type of institutions are called segregative and integrative institutions, which differ in terms of creating different incentive structures and behaviour.

Segregative institutions include only a part of the transaction costs and provide incentives for actors to refrain from receiving all gains from beneficial effects, but also allow them to shift costs to others (positive and negative externalities). Segregative institutions cause the compartmentalization or commodification of nature (Costanza 2006, McCauley 2006, Gomez-Baggethun 2011). They lack a moral obligation of responsibility so that others carry the burden of some benefits and costs from a transaction (Hagedorn 2008).

Integrative institutions aim at establishing incentives which integrate these externalities. Actors are motivated to internalize negative and positive externalities so that actors can be sure that decisions made under these institutions will cause them neither harm nor gain (Hagedorn 2008: 33). Integrative institutional capacity refers to institutional arrangements which are successful in avoiding externalities by integrating negative or positive effects of transactions. The integrative capacity of institutions refer to rules which give the economic actor the right to capture rents and oblige them with the duty to clean up unwanted or damaging effects of their actions. Nuisance effects will be minimized. The logic of integrative and segregative institutions also applies to the articulation of values. Segregative value articulating institutions set the rules for expressing values which fit the assumptions of Walrasian economics, whereas integrative value articulating institutions account for value plurality, socio-ecological complexity and institutional diversity (Hagedorn 2008).

Externalities, in the process of institutional homeostatsis, do not need to be regarded as failures because markets and social institutions are almost always imperfectly enforced (North 2008, North et al. 2009) and 'norms of social behaviour, including ethical and moral codes, are reactions of society to compensate for market failure' (Arrow 1971: 3-25). For example, this can be regarded as applying to the norm that those who have created damage in the attempt to capture rents from economic exchange should pay the costs – a norm which is also an integrative rule. Therefore, externalities, in an institutional homeostatic context, can be seen as systemic by-products of functioning markets and not of failing markets, as the term 'market failure' misleadingly suggests (Kapp 1963, 1970, Franzini 2011, 2012). Further, 'failure,…is absolutely necessary for (renewal and) the health and vitality of the system as a whole.' (Ormerod 2005: viii). Change involves failure and success and therefore externalities can be seen as important

signals that require a feedback by valuation (Brondizio and Gatzweiler 2010). Valuation enables a society to reflect on the extent of damage (on environment and society itself) it is willing to tolerate.

Applying the instituions of sustainability framework to value articulating institutions confirms previous observations: market-based valuation methods have a segregating effects when applied to problem areas of high socio-ecological interconnectedness. This can be explained by their low capacity to integrate different types of values. Institutions of this type are not good at governing complex systems. High integrative institutional capacity depends on context and asset specificity and does not need to be achieved by one type of institutional arrangement alone. Universal institutions for regulating every aspect of social and ecological system interactions are therefore less likely to govern high socio-ecological interconnectedness and respective high transaction costs. Therefore, because of the high asset specificity of socio-ecological problem areas, a high integrative institutional capacity is usually achieved by higher institutional diversity or institutional complexity (Ostrom 2005).

In his review of the process of policy making and institution building in the context of greenhouse gas emissions, Schmalensee (1998: 137-58) gives an example of the process which I refer to as institutional homeostasis. He criticizes the Intergovernmental Panel on Climate Change for underestimating the difficulties which come with building effective and efficient instruments to slow greenhouse gas emissions and the view that policy is supposed to produce 'once and for all' and 'correct' decisions. Instead, policymaking should aim at crafting institutions which have the flexibility to make multiple midcourse corrections and adjustments, as new findings and insights evolve. Merely reducing emissions relative to a historical emission base does not provide for such necessary flexibility in the architectural design of institutions.

Figure 2 illustrates how the process of institutional homeostasis takes place within a 'sustainability corridor' .The centre of this corridor represents an equilibrium situation in which all external effects have been internalized by means of appropriate institutional design. Because of constantly changing ecological and social circumstances this equilibrium is hardly ever achieved for long, so that the process of institutional homeostasis fluctuates back and forth, creating more or less positive or negative externalities which signal, by means of valuation, that corrective institutional design needs to take place. The limits of the sustainability corridor can be, e.g. safe minimum standards, the absorption capacity of ecosystems or thresholds set by benchmarks or the precautionary principle.

FIGURE 2 ABOUT HERE

Figure 2 helps identify four scenarios, explained further below. These scenarios illustrate the process of institutional homeostasis which resembles the adaptive cycle described by Gunderson and Holling (2002) in which social and ecological system resilience changes in response to external parameters. Here, the adaptive cycle describes the process of institutional homeostasis and is defined by socio-ecological interconnectedness (SEC) and the integrative capacity of institutions (ICI). The interconnectedness of socio-ecological systems refers to states of the world which Herman Daly (1992, 2005) has referred to as 'empty' and 'full'. In the empty world there are few people, much space and little manmade capital. The capacity of ecosystems to absorb human impacts, e.g. wastes and reductions of biodiversity, is far from its limits. The health of human and ecological systems (Lackey 2001, Rapport 1995, Norton 1995) is hardly impacted as a consequence of pollution. The 'full' world is full of people and man-made capital. SEC is high. Population densities reach carrying capacities of ecosystems, conflicts over property rights emerge and pollution impacts on the health of social and ecological systems.

The empty and full world can each be governed under institutions (value articulating and resource allocating) which have either segregative or integrative effects (Hagedorn 2008). The higher their integrative affect, the higher is their integrative institutional capacity (ICI). The combination of socio-ecological connectedness and integrative institutional capacity leads to the following scenarios:

- Scenario A: Low ICI and low SEC. Few people live in the "empty world" which may be pictured by the early years of the Wild West of North America (Hill and Anderson 2004) or the colonization period. Because of low population densities, impacts on nature do not reach the limits of its carrying capacity. The capacity of ecosystems to absorb human wastes and destructions is high and people behave accordingly. There is no need for developing ecologically sound management practices or low impact management. The human struggle to make a living from the land and to survive justifies efficient ways to get the most from the Earth's resources, grow, become rich and live better lives. Ecological systems are exploited and transformed to facilitate flows of benefits that can be made use of by people. The costs of agreeing on rules to settle conflicts are low, apart from the conflicts with indigenous owners of the land which are mostly settled by force. Institutions like 'first come first serve' or 'survival of the strongest' facilitate the exploitation of the Earth's resources. In contrast with contract theory, in which the state provides a legal framework for economic transaction of private actors (North 1981: 20-27), extractive institutions are designed to serve the purpose of extraction or exploitation (Acemuglu and Robinson 2005, 2012).

- Scenario B: High SEC and low ICI. Population densities have increased, land availability has decreased and the limits of the ecosystems' carrying capacity are being reached. The shift

from an ‘empty’ to a ‘full’ world has taken place but the institutions in place still have a low integrative capacity. The majority of institutions remain extractive and segregative as under scenario A. As externalities produced in societies are no longer fully absorbed by the ecosystem, the links between social and ecological systems become more tangible, impact-response loops become shorter and faster and awareness increases as to the close connection between social and ecological systems and their dependence. People start suffering from the waste they produce. The situation can be pictured by the wild west in North America in its later periods, when conflicts among settlers increase and rule of law and property rights are increasingly called for to solve them (Hill and Anderson 2004).

- Scenario C: High SEC and high ICI. People live in a ‘full world’. Socio-ecological connectedness is high but the integrative capacity of institutions has improved in response to the conflicts and damages which have impacted on ecological and human health under institutions with low ICI. In this situation two paths of institutional change can emerge. The first and still predominant idea of institutional change does not fundamentally question the underlying rationalities and mental models of the previous stage. The presumptions of rational decision making are still more individual and less social. Nature’s values are appreciated by taking more of them into account and this can only be done by continuing the commodification of nature. Social and ecological systems are portrayed as two distinct systems in which people value ecosystem goods and services as a means to improve their quality of life – not in order to appreciate the values of nature or life per se. This type of institutional change happens predominantly under segregative institutions and continues to produce nuisance effects.

The second process of institutional change under this scenario is related to a more fundamental shift of values. The dichotomy of man and nature frame the way in which social and ecological systems are connected, as outlined in the previous section on biological value. Instead of seeking a common valuation language, a common goal for valuation is proposed: that of maintaining and improving the viability of living systems. Externalities are not portrayed as a consequence of market failure which needs to be corrected by more valuation of the same kind, rather they are a by-product of functioning markets under segregative institutions. This type of institutional change is driven by integrative institutions.

- Scenario D: Low SEC and high ICI. This stage is characterized by decay or collapse. External factors, e.g. climate change or biodiversity loss, are the dominating drivers of change and lower the degree of SEC. Institutional adaptations take place, which is why ICI is still high, but they cannot keep pace with environmental decline. The decrease in socio-ecological connectedness can be explained by failures to adapt institutions to the changing environmental conditions in the previous scenario and the resulting conflicts over natural resources. Human and ecological system health decreases and ecological and social systems can collapse as a result. The driving force behind changes taking place in this scenario are environmental changes. Many opportunities for pro-active institutional change, choices to take corrective action and technological adaptation have been foregone. The history of Easter Island is a well-known example (Good and Reuveny 2006). Reasons for not being able to cope with the early signals of collapse are failures to deal with the conflict between short-term interests of the elites and long-term interests for broader society. The gradual changes which

take place, the belief in technological solutions to resource scarcity and the failure to conceive and respond to the systemic nature of the problem are further reasons. Diamond (1995) explains: "Corrective action is blocked by vested interests, by well-intentioned political and business leaders, and by their electorates, all of whom are perfectly correct in not noticing big changes from year to year. Instead, each year there are just somewhat more people, and somewhat fewer resources, on Earth." The scenario which follows collapse is one of re-organization, new build-up of different forms of capital including social capital.

Conclusions

The theory of economic value has emerged from particular assumptions on the rationality of the human actor and the characteristics of nature. As these assumptions increasingly deviate from actual human behaviour and ecosystem dynamics in an increasingly complex framework of socio-ecological systems, market failures and nuisance effects become the rule rather than the exception to economic theory baring the question of whether economic value theory contributes more to the creation or the solution of the problem of environmental degradation.

Putting the valuation of nature into a changing socio-ecological context, changes the parameters from which a new concept of value emerges. The changing parameters define a socio-ecological system which is complex and in which humans show different interaction patterns and apply social and communicative rationality. The concept of biological value originates from an evolutionary and neurophysiological perspective and places value and valuation per se into a context of living systems.

Understaning value as an emergent property of human-environmental interactions, one would expect values to change in response to changing socio-ecological context, especially when the viability of human and ecological systems is threatened. Unfortunately the link is not that immediate. The viability of a system is determined by its ability to recognize changes as consequence of its own actions and its ability to adjust to changing circumstances. Cognitive-response and expectancy-value tell us that knowledge about the linkages, are not sufficient to change behaviour. Beliefs, attitudes and expectations also need to accompany this change. This cognitive response failure in making use of an appropriate value theory may be explained by the tendency of clinging to established belief systems, the attachment to established power structures and property right systems which are beneficial and costly to give up, and the unwillingness to give up positions and roles in established societal interaction patterns.

Nevertheless, changing relationship between social and ecological systems reframes the question of the value of nature and draws attention to the concept of biological value - not only because the process of life is biological and may be endangered but also because it explains the neurobiological grounding of human values and thereby establishing a link between different ways to articulate value and being part of a system of dynamic life regulation in which the valuation process works as a societal feedback mechanism. I have shown how, in that framework socio-ecological connectedness and the integrative capacity of institutions could define a process I have termed 'institutional homeostasis' – a process by which the institutions and values constantly adapt to changing bio-physical environments, in which failure is a signal for reorganization of interactions and in which equilibrium is seldom and only temporarily achieved.

What seems to be an important lesson here is that market failure is understood as a signal for the reorganization of socio-ecological interaction patterns by changing institutions. The perceived

need to change interaction patterns in social and ecological systems triggers a change in how the nature of value is perceived – not the other way around. Healthy natural environments and the well-being of societies are unlikely to be achieved by clinging to the idea of 'more and better' economic valuation or even by propagating the use of non-economic values under basically the same institutional framework. Rather values will change fundamentally as a result of fundamentally changed interaction patterns.

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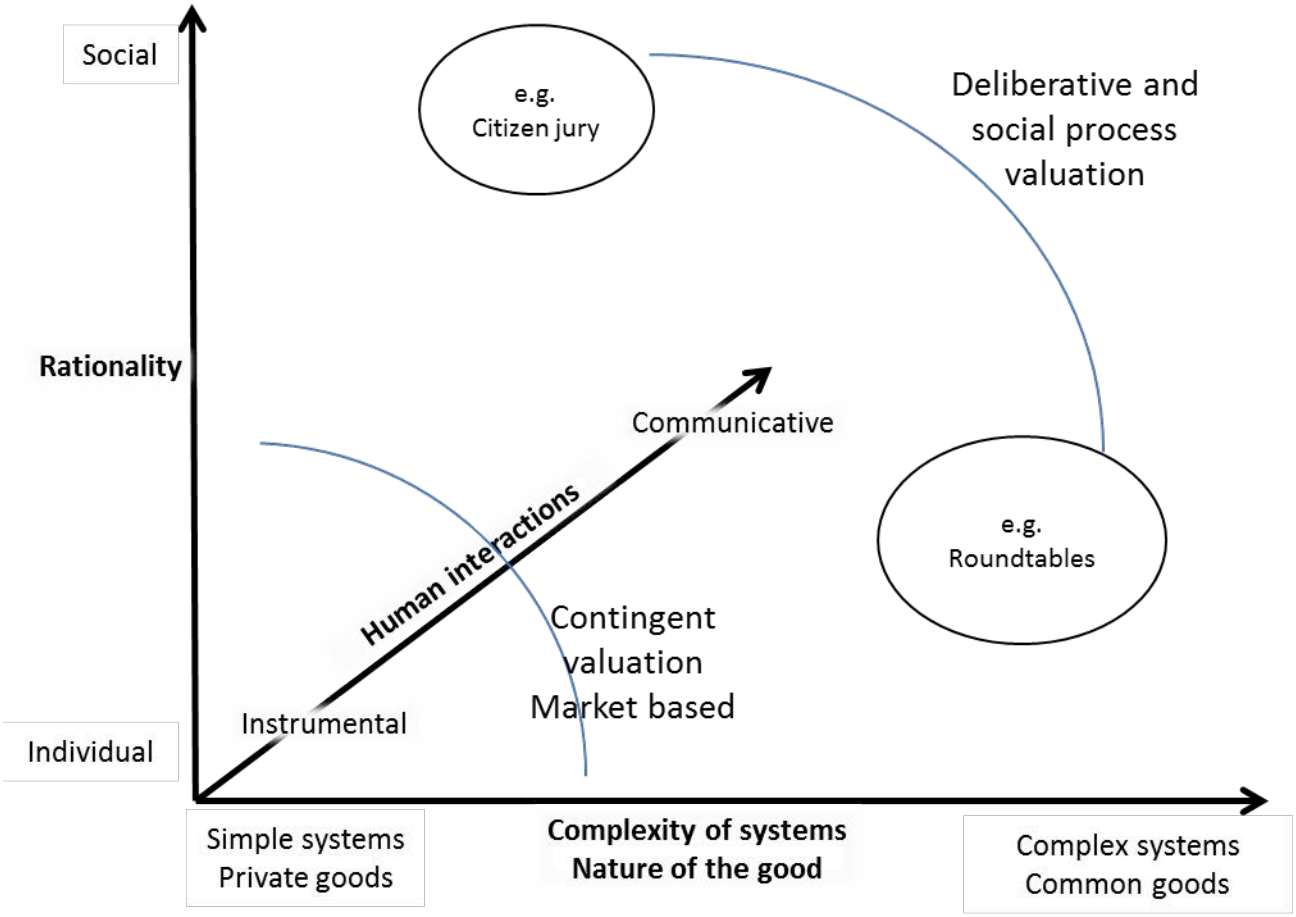
Social
e.g.
Citizen jury
Deliberative and
social process
valuation
Rationality
Communicative
Human interactions
e.g.
Roundtables
Contingent
valuation
Market based
Instrumental
Individual
Simple systems
Private goods
Complexity of systems
Nature of the good
Complex systems
Common goods

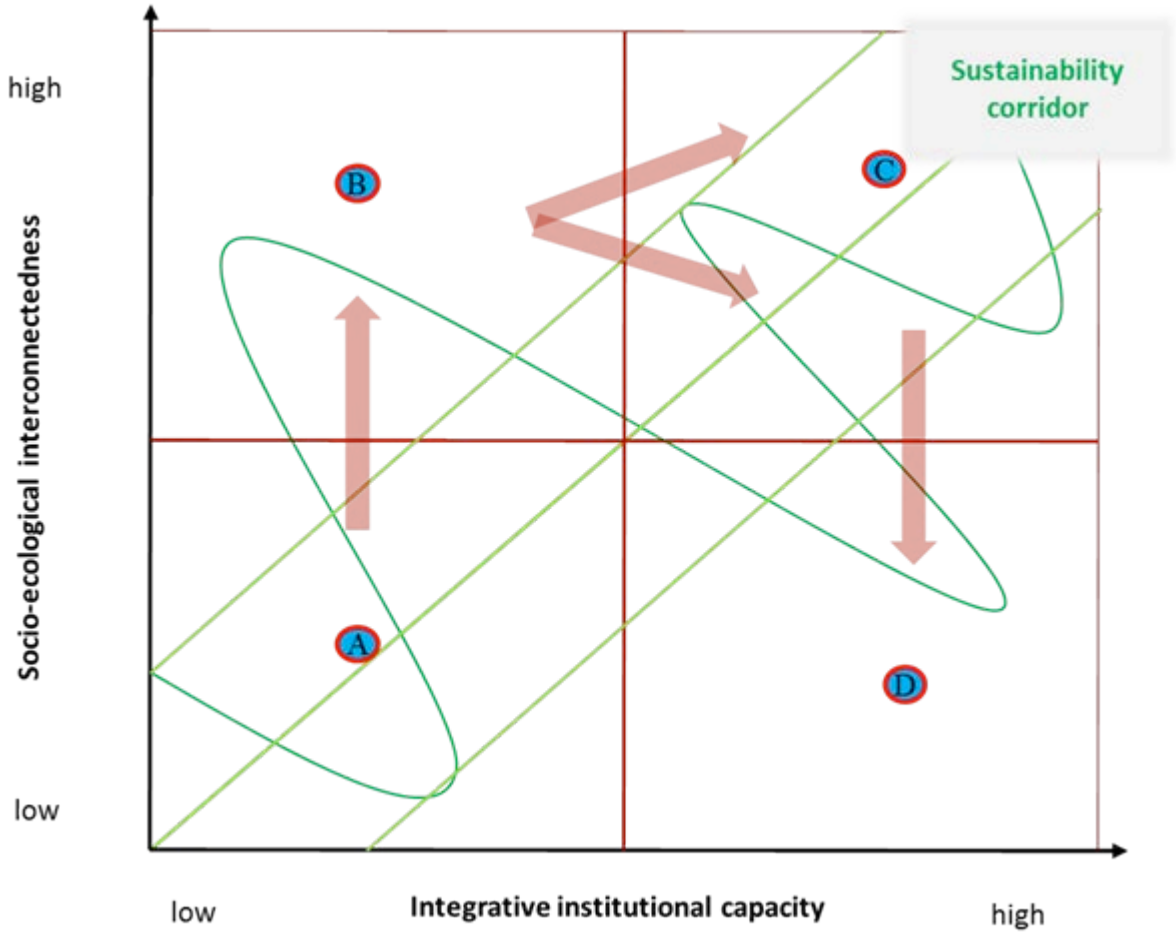

Figure 2: Scenarios and examples of situations with different degrees of socio-ecological interconnectedness and integrative institutional capacity