Chapter 4

Socio-cultural context of ecosystem and biodiversity valuation

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Key messages

- Valuation, including economic valuation, functions as a system of cultural projection which imposes a way of thinking and a form of relationship with the environment and reflects particular perceived realities, worldviews mind sets and belief systems. However, it can also serve as a tool for self-reflection and feedback mechanism which helps people rethink their relations to the natural environment and increase knowledge about the consequences of consumption, choices and behavior.

- Because of the multidimensional and socio-cultural embeddedness of value any exercise of valuation is relative to a given individual or group of people. In a multi-cultural and democratic context of biodiversity valuation, this makes the question of choosing a value articulating institution more important than that of finding a correct value.

- Economic valuation influences the notion of ownership and property applied to biodiversity and over the long term may change human relationship to the environment in significant ways.

- Intrinsic values are culturally embedded moral truths. They can be taken into account by choosing the appropriate institutions which allow their articulation in addition to utilitarian values.

- Valuation processes can be seen as a form of regulatory adaptation by serving as a mechanism to provide feedback in a system where production and consumption, trade and exchange are so distant and complex that they undermine perceptions of the impacts of habits and behavior on the environment.

- Value change along the commodity chain has implications for the distribution of benefits, affects the level of incentives for conservation and represents an important methodological challenge for economic valuation.

- Economic valuation may contribute to address our inability, reluctance or ideological intolerance to adjust institutions (also those which are value articulating) to our knowledge of ecosystems, biodiversity and the human being.

- Economic valuation is a complex, spatial and institutional cross-scale problem. Many efforts focusing on particular parts of ecosystems or species, while effective at one level, lack the scope to control the pressure of commodity markets for land resources surrounding them. As such, and depending on their biophysical context, they may be limited to capturing the linkages and vertical interplay created by a growing functional interdependency of resource use systems nested within larger ecosystems.

1 Introduction

Economic valuation of ecosystems, their services and biodiversity represents a balancing act. On the one hand, valuation can function as a system of cultural projection which imposes a way of thinking and a form of relationship with the environment[i], a particular notion of property and ownership, and view of development and what constitutes human wellbeing. Side by side with contributions from several distinguished scholars such as Arrow, Sen's liberal paradox has shown the inadequacy of this worldview (Sen 1973; Arrow 1982). On the other hand, valuation can serve as a tool for self-reflection which helps people rethink their relations to the natural environment and increase knowledge about the consequences of consumption choices and behavior for distant places and people. Questions such as what factors influence human relationships with nature, what is the role played by nature in the formation of social and personal identity and what are the social and environmental consequences of various ways of relating to and using the environment (Zavestowski, 2004; Clayton and Optorow 2004) become the focus of this self reflection.

As such, valuation can work as a feedback mechanism for a society that derives its resources but has distanced itself from the environment for the consequences of its actions. Further, economic valuation can help communicate the value of nature to different people using a language which speaks to dominant economic and political views around the world. The outcomes of any valuation exercise depend on what the various interest groups value, whose values count, who benefits, and how we account for the growing interdependencies of social and ecological systems. In that context the question of how to value ecosystem services and biodiversity and the choice of a valuation method are as challenging as the attempt to attach a particular value to them. Valuation entails conceptual and methodological challenges to account not only for different dimensions of value and their interconnections, but assimilating different cultural perspectives and levels of analysis.

Across disciplines, scholars have recognized cultural differences as very fundamental in the way people conceive and relate to the environment. While it is not the intention of this chapter to compare and review these attempts, a brief overview may offer insights that are particularly relevant to the exercise of environmental valuation. For instance, Descola (1996) proposes a three tier analytical model to characterize implicit schemes of praxis [practical and applied knowledge] used by different societies to objectify their relationship to nature: 1. modes of identification including animism (i.e. social character of relations between humans and non-humans thus the space between nature and society as being social), totemism (metaphoric conceptualization of social distinctions based on the relationship between nature and culture) , and naturalism (the space between nature and society as being natural and biological); 2. modes of interaction (i.e., based on reciprocity, predation, protection), and modes of identification (i.e., metaphoric similarities like in totemic structures, and metonymic as exemplified differently by animistic and naturalistic inter-associations between species). His approach helps to place the western perspective (i.e., scientific, naturalist, and protectionist) as rooted within not only a Judeo-Christian tradition of control and utilitarianism, but

also in the context of the historical separation of social and biological sciences and the consequent epistemological distinction between culture and nature. This contrasts with indigenous understandings of the human-nature relationship that acknowledge a continuum between human and non-human as part of a large chain of reciprocity and predation. In contrast, for instance, the conservation movement, as Descola puts it, "fetishing nature as a transcendental object, the control of which would be displaced from predatory capitalism to the rational management of modern economics, the conservationist movement, far from questioning the foundation of Western cosmology, tends rather to perpetuate the ontological dualism [culture-nature] typical of modern ideology." (1996: 97). Descola goes further, however, predicting that in the long run this agenda may shift completely the relationship of people to nature:

> "However, the program set forth by environmental activists will perhaps lead, unintentionally, to dissolution of naturalism, since the survival of a whole range of non-humans, now increasingly protected from anthropic damage, will shortly depend almost exclusively upon social conventions and human action. The conditions of existence for blue whales, the ozone layer or the Antarctic will thus be no more 'natural' than they are presently for wild species in zoos or for genes in biological data banks. Drifting away from its time-honored definition, nature is less and less the product of an autonomous principle of development; it's foreseeable demise, as a concept, will probably close a long chapter of our own history." (1996: 97-98).

Along similar lines, Palsson (1996) distinguishes three kinds of paradigms representing particular forms of human-environment interaction: orientalism; paternalism; and communalism. While the former two are based on different degrees of separating nature and society, the latter "rejects the radical separation of nature and society, object and subject, emphasizing a notion of dialogue." (1996: 65). Ellen (1996), on the other hand, proposes a model to interpret cultural variations on the relationship between people and nature based on a comparative perspective to human cognitive imperatives: how people identify things based on senses, context, and value; which code systems people use to contrast self and others; and, the different ways people recognize some inner force and essence in nature. However, calling attention to the danger of 'infinite relativity', Ellen's model seeks to understand the implications of different systems of thinking to our current environmental challenges. In other words (paraphrasing Ellen 1996: 28), how particular ways of conceiving the environment serve the interest of particular groups, whether these are the conservation movement, industries, churches, political parties, academics, indigenous people, or governments. Whether reinventing an image of the noble ecological savage, or defining nature with a price tag, or constructing a shared image of the global environment, these models carry political and social goals and have long far-reaching consequences (Ellen 1996: 28). An important message for TEEB studies is that approaches to understand nature and environment originally driven by naturalism have drifted away to utilitaria-led paradigm of economics as a social choice. But the limitations of utilitarian approach is not fully understood by societies, after all an utilitarian approach is essentially individualistic, from which there is no way to deduce a social welfare unless very strict conditions are laid (Arrow 1963; Sen 1970a).

Yet, while some scholars tend to focus on the contexts of people-nature relationship, others have proposed that our modes of relation to nature are also innate to human evolutionary history (Wilson 1984; Kellert and Wilson 1993). The biophilia hypothesis, for instance, articulates that all humans have an innate need and connection to nature, including spiritual and emotional, as well as utilitarian dimensions. These relationships, however, are not ahistorical and change in level of importance as a function of the different degrees of interaction and dependency on it. Kellert (1996) presents nine dimensions intrinsic to the way people and environment relate, some of which can dominate depending on our experience and context, the balance of which influence well-being: utilitarian; naturalistic; scientific/ecologic; aesthetic; symbolic; humanistic; moralistic; dominionistic; and negativistic (1996: 38). As in other domains of science and philosophy, dichotomies and typologies defining how people vary in the way they value and relate to nature can be useful or misleading, not necessarily true or false. Following the approach suggested by Ellen, the intention here in recognizing cultural differences and perspectives to nature is to find synergies between them, the utilitarian and aesthetics, the pragmatics and the symbolic (Ellen 1996).

The epistemological tradition of economics has also evolved from a specific socio-cultural context which presumes that economic values are predefined, held by people as preferences and can be derived by analysis, either via stated or revealed preference methods. Economics is built on this "belief system" as manifested in the Cartesian and Newtonian tradition of modern science, and Descola's referred naturalism, according to which the world works mechanistically as a giant clockwork. Understanding the complexity of the world requires taking it apart to its individual components or according to the Cartesian worldview, even if implying separating the mind from the body, culture from nature, so the latter can be understood objectively, free of values. In this sense, one can see this particular context, and the pre-analytic assumptions of how ecosystems function and humans behave, as part of TEEB's constructed reality and values, nevertheless based on perceived social demands and scientific methods. Gowdy (1998: xvi) expressed this by stating that "My own particular tribe, that of academic economists has its own belief system to explain and justify the world of commerce we have created, typified by the notion of "economic man.". Within the Western socio-cultural context "economic man" stems from the Judeo-Christian conception of human nature: because of Adam's original sin, inherited by humanity, humans are viewed as "scarcity-driven creature(s) of need" and "as ever imperfect and suffering beings with wants ever beyond their powers" (Sahlins 1996: 397). Others have argued that "In Hebrew religion, the ancient bond between God and nature was destroyed" (Frankfort 1948: 343), and that "Christianity continued to widen the rift between man and nature by its opposition to pantheism" (the belief that nature/the universe is a manifestation of god or spirits), thereby desacralizing nature and reframing it as natural resource) (Gatzweiler 2003: 61).

As such, economic values and processes of valuation, although grounded in a shared scientific methodology, are socially and culturally constructed, as are concepts such as ecosystems and

biodiversity. Economic values are not objective facts nor do they reflect universal truths; instead they reflect the culturally constructed realities, worldviews, mind sets and belief systems of particular societies and/or sectors of society (Wilk and Cligget 2006). They are not exogenous, but rather shaped by the social interactions of everyday life (Henrich et al. 2001) as well as political and power relations operating within a system of local, regional, and global interdependencies (Hornborg et al 2007). They derive from a belief system of how economists and others view the world and what they think the role of humans in it should be. Mainstream economic beliefs of values of ecosystems and biodiversity are defined by people's willingness to pay for them and the existence or creation of markets, but they have to be understood as part of the broader historical and geopolitical context which gave rise to contemporary environmental conservation and valuation.

The rise of the so-called new-environmentalism during the 1960s marked a shift from environmental concerns based on the protection of "empty" spaces and particular species to concerns with the human environment (McCormick 1989; Caldwell 1990). This is well represented by the 1972 United Nations Stockholm conference on 'The Human Environment'. Since then, although many efforts have aimed at regulating development and reconciling economic growth and conservation, the most striking outcome of these processes has been the exponential rise of protected areas (Zimmerer 2006). Some have referred to this process as the globalization of conservation for its generalized world distribution and impact on local populations (West et al. 2006). Even today, more political emphasis is placed on protecting and isolating ecosystems from economic development and commodity markets, than on redefining and regulating the latter.

During the 1980s, the now landmark Brundtland Commission of the United Nations 'Our Common Future' report (Brundtland 1987) marked more directly an effort to internalize the environment in the economy, slowly opening space for new conceptions of development based on the principle of intergenerational responsibility. The latest Global Environmental Outlook (GEO 4) of the United Nations Environment Program (UNEP), for instance, which has started as a periodic assessment exercise since 'Our Common Future', positively acknowledges the mainstreaming of environmental issues in government and corporate agendas during the past 20 years, i.e., "from periphery to the core of decision making" (UNEP 2007; King et al. 2007).

Reflecting these larger trends in conservation, the Convention of Biological Diversity (CBD), one of the lasting high-profile agreements resulting from the UN Rio 1992 Earth Summit, represented a shift from species-based conservation, championed by some international conservation organizations, to the conservation of ecosystems and biomes. It also gave heightened importance to local populations as stewards of nature and as a source of knowledge relevant to conservation and sustainable development. Not unlike TEEB, it has put significant emphasis on the value, including economic value, of biodiversity and local knowledge, such as through incentives for bioprospecting (Reid et al.

1993), a process which triggered diverse social consequences, many of which are still unfolding (Moran et al. 2001).

The Millennium Ecosystem Assessment (MA) represented another important shift to the efforts to view the environment at a global scale and internalize it in policy and economic thinking. Its core concept of ecosystem services, for instance, while emphasizing an anthropocentric and utilitarian approach, proposes a framework centered on human dependency not only on resources, but on ecosystem functioning itself, contributing to make visible a broad array of ecological and biophysical functions taken for granted by society (MA 2005). In doing so, the MA has contributed to a broader understanding of the overwhelming scale of human impacts and their footprints, and their current and future economic and social consequences.

Valuation exercises have not shied away from the challenges of valuing biodiversity and ecosystems from different social and cultural perspectives, and levels of analysis. Many recognize the multiple dimensions and concepts of value embedded in ecosystems and biodiversity, and that any exercise of valuation is relative to a given individual or group of people (Turner et al. 2003; Shmelev 2008). A comprehensive report from the United States Environmental Protection Agency (EPA), for instance, proposes an approach of multiple methods to help capture different dimensions of biodiversity and ecosystems services, as well as the perspectives of different stakeholders. The underlying idea is that an integrated and multi-dimensional approach will be more likely to capture the full range of contributions, thus the broader value, of biodiversity and ecosystems, including values which may be context specific (global, national, regional, local) (EPA 2009). It adopts a broad definition of value to incorporate aspects based on human preference (e.g., attitudes and judgments, economic value, community-based value, and constructed preferences) and on the biophysical environment (bio-ecological and energy-based values). In order to capture these dimensions, the report recommends that the Agency (EPA) should not only use economic models and tools, but also methods to capture social attitudes, preferences and intentions, such as civic valuation, a decision science approach, ecosystem benefit indicators, biophysical ranking methods, and cost as a proxy for value (EPA 2009).

A similar recognition of the multidimensional and context dependent nature of valuing biodiversity and ecosystems has been adopted by the UK Natural Environmental Research Council (NERC 2009). Based on the OECD (2002) typology, it distinguishes several types of value (e.g., direct use consumptive value, direct use non-consumptive value, indirect use value, insurance value, option value, and bequest value) and proposes a series of eight pathways for valuation each defined in terms of specific assessment frameworks and disciplinary expertise, but which together aim at presenting a more comprehensive picture of the valuation process. These pathways include valuation of ecosystem services, existence value, recreation and amenities, well-being, direct resource use, genetic and bio-prospecting value, and conservation and energy values (NERC 2009).

In spite of these advances, it is important to recognize some limitations of economic valuation. The inclusion of social and cultural criteria, for instance, while desirable is difficult to attain and constrained by methodological limitations (Shmelev 2008; see also chapter 5), as are studies examining the longitudinal aspects of different attempts to value biodiversity and ecosystem services. In particular, valuation studies face the challenge of recognizing the inter-dependency among the many types of ecosystem services and that of different interest groups competing or associated with different parts of the same ecosystem (Turner et al. 2003).

Considering the issues above, how a middle ground can be found about various implications of economic valuation, including an appraisal of the limitations of what should and should not be valued, are significant challenges before us. Beyond proposing definitive solutions, this chapter aims at contributing to these discussions and to TEEB by raising questions about the trade-offs and challenges of valuation. Valuation represents one particular way of thinking and a perspective that is based on a rational management approach to the environment, and can play an important role in calling attention to the value of biodiversity and to intangible ecosystem services vis-à-vis other forces competing for use and control of particular resources in detriment of others (e.g. standing forest versus land for agricultural expansion). Although this requires some level of objective measurement and some imposition of a value system, it is one way to confront the pressures of market forces which see the environment strictly as a commodity. However, finding a middle ground will imply shifting attention from the question of the value of nature to second-order questions of when, how, and what to value, and whose values count.

The following section continues the discussion of the socio-cultural context of valuation by referring to the trade-offs of valuation as well as its challenges. The discussion of trade-offs of valuation includes (A1) changing notions of property and property relations induced by valuation, (A2) the role of intrinsic values, and (A3) the importance of valuation as a social and economic feedback mechanism. The chapter concludes by focusing on methodological challenges such as (B1) the problem of equity and the transformation of resource value along the value chain, (B2) the growing complexity and inter-dependency of ecosystems and the limitations of valuing ‘islands’ of resources, and, finally (B3) the importance of considering value-articulating institutions.

2 The trade-offs of valuation

2.1 The long-term implications of valuation: the changing concept of ownership and property

In spite of efforts to acknowledge value of biodiversity and ecosystem services as multi-dimensional, contested, and context-specific, exercises of valuation represent an effort to promote some universal notion of the environment, and as such, they carry broad and long-term consequences. By acknowledging the value of benefits derived from biodiversity and ecosystems, perhaps the most important consequence of economic valuation is the way it contributes to change the notion of

ownership and property applied to the environment in general, and biodiversity in particular. In this context, to use a reference from Polyani (1944: 73), valuation contributes to create a "commodity fiction." Or, as Sahlins (1996: 411) says, "...a purely Western (construct) that nature is pure materiality." The danger with the commodity fiction is that the commoditized environment becomes a contrived artifact of itself: Ecosystems and biodiversity can be owned and traded in the market system for dollars (Vatn and Bromley 1994: 137).

As such, environmental valuation creates a means for valuing biodiversity monetarily, and thus implies and/or imposes new notions of ownership and property. However, people do not necessarily have previously-defined monetary values for non-market goods (Cummings et al. 1986; Mitchell and Carson 1989) such as biodiversity or biological processes such as carbon uptake, and the process of valuation can trigger negotiations between and within endogenous and exogenous systems of value (Sagoff 1998; Hanemann 1994). This suggests that environmental valuation creates a framework that can induce not only previously ignored monetary appreciation of biodiversity and ecosystem functioning but new utilitarian frames of appreciating them. Gowdy and Erickson (2005) explain that behaviors such as cooperative consensus building and collective decision-making become difficult to pursue in a decision-making framework where only individual preferences count. In other words, the institutional setting influences preferences in a choice situation by activating particular motivations and rationalities (Vatn 2005).

There are two separate though interrelated lines of critique worth pointing here- a. institutional and b. psychological. While cultural and social anthropology points towards flaws in the structural and institutional outlook of economic valuation (Descola's theory points to fundamentally different cultural approaches in conceptualizing human-environment relationship), psychological critique centers on the depsychologizing of human behavior as seen in stated or revealed preference theory where there is little appreciation of intrapsychic or interpersonal origins of human behavior. The relationship between economics and psychology has been quite fraught. Several authors, notably, Sen (1973), Lewin (1996), Johansson-Stenman (2002) and Muramatsu (2009) voice a common criticism that economics has chosen to use psychological theories and constructs in an inconsistent way to explain economic behavior mainly through championing the rational choice paradigm. Sen (1973, 1979) pointed out that despite seeking motivations behind their actions, economists choose to solely focus on the outcome, that is, resultant behavior or have chosen to aggregate the behavioral outcomes as if these were prices and physical quantities. Psychological reasoning, understanding affects, feelings and thoughts underpinning different states of mind, interactions between individual and group, groups and social institutions has been compromised in this process. This is despite the fact that empirical research in behavioral economics, anthropology, psychology and moral philosophy have time and again rejected the standard economic assumptions with respect to people's preferences and behaviors (Sen 1973; Wilk 1993; Kahneman 2003; Nussbaum 2001; Muramatsu 2009) and in terms of theoretical advancement what resulted over time is a corpus of (unsuccessful)

nonpsychological preference theory proven to be ineffective, counter-intuitive and limited in explanatory potential (Lewin 1996).

More recent developments in behavioral economics suggest that utility and emotions cannot be divorced from each other, utility arises from emotions and emotions arise from changes and people's judgements and choices have more intuitive than rational- logical origins (Kahneman 2003: 1457; see also Bernoulli 1954). A theory of choice that completely ignores feelings such as the pain of losses and the regret of mistakes is not only descriptively unrealistic, it also leads to incorrect prescriptions that do not maximize the utility of outcomes as they are actually experiences (Kahneman 2000; Kahneman et al. 1997).

A discussion on the implications of attaching new forms and concepts of property to nature and culture (e.g., ethnic affiliation and markers, knowledge systems) is on-going in anthropology (e.g., Dove 2006; Hames 2007; Commaroff and Commaroff 2009), but this is still an overdue discussion in environmental sciences and conservation policy. Since the late 1980s, and concomitant with the rise of protected areas in previously populated regions, numerous policies have focused on granting resource use rights and ownership to indigenous groups and rural populations considered "traditional." These policies are changing significantly local relationships within and between indigenous and rural populations in terms of rights to control, exclude, and derive monetary value based on distinct ancestry, ethnic affiliation, and knowledge of resource use. Martinez-Alier (personal communication, 2007) directs attention to a phenomenon he calls 'fetishism of fictitious commodities' referring to those environmental commodities that are not even in the market and yet are valued in monetary terms.

Hale (2002) has described these processes in Latin America as a form of 'neoliberal multiculturalism', one which has come about during the rise of neoliberalism since the 1980's in part as a response to demands for rights by the culturally oppressed and excluded, in part a move away from class-based politics and more universalist social policies. Despite having opened new political spaces, an over-emphasis on ethnic-based policies are contributing to fragment society into multiple identity groups with few perceived common interests and characteristics. These changes have represented a form of commodification of intangible goods such as ethnic identity usually associated with a repackaged version of the "noble savage" where local populations are expected to behave as stewards of nature (Dove ibid; Hames ibid; Pedrosa and Brondizio 2008). Not only the needs and rights of the local populations ought to be recognized but also their unique interdependence and attachment to the nature needs to be better understood. The association of multicultural policies and environmental conservation has set the stage for competing ownership to natural resources and knowledge systems (Escobar 1998; Kohler 2008). In parallel, critical theory and its influence in disciplines such as anthropology, psychoanalysis, sociology, and ecology have challenged dominance of largely patriarchal, educated, logico-positivist structures of thought and reasoning over voices of weaker,

marginalized sections of society (see, Roughgarden 2004; Agarwal 1994; Martinez-Alier and Thrupp 1992; Martinez-Alier 2008) and towards alternative discursive, hermeneutic paradigms (Howarth and Farber 2000; Zografos and Howarth 2008).

Nazarea (1998; 2006) called attention to the value of biodiversity, particularly but not only agrodiversity (e.g., identification of varieties and their specific qualities), as depending in large part on having cultural memory and knowledge associated with it: "Local knowledge and cultural memory are crucial for the conservation of biodiversity because both serve as repositories of alternative choices that keep cultural and biological diversity flourishing." (Nazarea 2006: 318). The value of medicinal plants, crop varieties or forest resources, for instance within the perspective of bioprospecting, gains meaning as valuable only when associated with knowledge to identify and recognize how to use and manage a resource (Jarvis et al 2007). In other words, these knowledge systems associated with biodiversity are held collectively and inter-generationally and change processually as local systems and practices co-evolve with changing environments (e.g., Pinedo-Vasquez et al 2002).

Bioprospecting programs based on the association of corporations (e.g., pharmaceutical, agronomic), governments and local populations have flourished around the world with the 'promise of selling biodiversity to protect it' (Reid et al 1993; Hayden 2003). While the economic benefits of these experiments have been minimal or null in the majority of cases, internal conflicts within and between communities, governments, and corporations have abounded (Greene 1997; Hayden 2003). Some have raised the questions of bioprospecting as another form of colonialism, a "bioimperialism" which appropriates resources and knowledge from marginal groups to powerful corporations using social and environmental discourse (Moran et al. 2001). The key issue, however, is that in doing so, biodiversity and knowledge about it becomes "No longer considered 'common heritage', the pre-CBD paradigm that provided open access to bioresources." (Moran et al. 2001: 501). It has become clear that the commodification of knowledge which evolved historically from a collective base do not lend themselves to the application of `conventional' legal-economic tools of property rights, such as industrial patent, intellectual property, and royalties. Examples in Mexico (Hayden 2003), Peru (Greene 2004), and South Africa (Commaroff and Commaroff 2009), among many others, illustrate some of the trade-offs of the valuing and selling to protect approach, at least when it comes to the distribution of benefits. The unfolding lessons of bioprospecting programs started during the 1980s and 1990s can serve as powerful examples for other programs of economic valuation to reflect on their long-term and potentially negative implications.

2.2 Intrinsic value of nature and value articulating institutions

Among the values of ecosystems are cultural values perceived by specific cultures (e.g. the belief in holy trees). But, all values are culturally constructed and contextualized. Values are institutions and as such (contribute to) define behavior. Values can be made visible by applying specific valuation

methods and the valuation methods themselves are socio-cultural constructs which define the rules for eliciting or articulating values. Choosing the socio-cultural context of valuation also implies a choice of the respective valuation method. Valuation methods themselves are designed in a way and emerge from the understanding of what values are, or should be and how they can be elicited. Valuation methods, for example imply certain models of humans, nature and their interactions and they define whether values are revealed, discovered, constructed or evolve during the process of valuation (Vatn and Bromley 1994). Vatn (2005) refers to valuation methods as value articulating institutions. Values for the same ecosystem service therefore vary across institutional settings.

The question of the value of nature also raises the opposite question of the nature of values (Gatzweiler 2003). Values, as well as norms, beliefs and conventions of society are an essential part of our culture. Values derive from worldviews and fundamental perceptions of a society of, e.g. what is right or wrong, good or bad, valuable or worthless. They are deep manifestations of a culture of which not all can be directly observed or predicted through models of rational choice (Wilk and Cligget 2007). A large number of empirical studies based on experimental games as well as experimental social psychology have shown that apart from being egoistic utility maximizers, as assumed to be the case for the *Homo economicus,* "people tend to be more altruistic than the economic model predicts" (Gowdy et al. 2003: 469) and that they act both selfishly and cooperatively (Alesina and Ferrara 2000; Fehr and Tougareva 1995; Gintis 2000; Güth and Tietz 1990; Manski 2000; Nowak et al. 2000; Ostrom 1990; Etzioni 1986; Caporael 1997; Kahneman 2000; 2003).The model of *Homo reciprocans* presented by Bowles and Gintis (2004) suggests that people behave altruistically to those who reciprocate their altruistic behavior. Depending on whether they perceive the behavior of others as being beneficial or harmful, they will respond in kind.

Gowdy et al. (2003), however, have presented yet another type of behavior observed in a rural Nigerian village, where fairness was an important predictor of economic behavior, but not retaliation. Their case demonstrates that non-cooperative behavior elicits a cooperative response and that "retaliation is much less common in traditional cultures than in Western societies." An important implication of those findings is that behavioral differences among cultures are large and they are often correlated with group norms and values, and not with attributes of the individual. This should be clearly articulated in the context of our attempt to value ecosystem service and biodiversity according to a model evolved from the very particular cultural tradition of the industrialized world.

The view of nature and humans being distinct from each other, as discussed above, shows itself in the neglect of intrinsic values in economics – values of nature simply for the sake of its existence, independent of any current or future usefulness to humans (Gatzweiler 2008). The Newtonian conception of reality, however, has fundamentally changed with quantum physics, the philosophical substance of which tells us that no clear distinction can be drawn between observer (subject) and observed (object), or, human and nature. This has consequences for human cognition, because it

entails that there is a close connection between human software and hardware: the way people perceive their environment (software) and the way they measure, value and construct it (hardware). From that holistic perspective, "what we observe is not nature itself, but nature exposed to our method of questioning. […] The observer decides how he is going to set up the measurement and this arrangement will determine, to some extent, the properties of the observed object." (Capra 1991: 140; see also Heisenberg 1958).

In this context, the methods used to elicit values define the values actually elicited. If individuals are asked about their willingness to pay for ecosystems and biodiversity, it is likely that people actually state their willingness to pay for ecosystems and biodiversity and the method requires the individual to articulate its values according to a consistent logic and specific rationality. Other methods allow for communication, deliberation and value statements then emerge from a social process.

The issue of intrinsic values is helpful to reflect on the relationship between nature and humans. It proposes that nature has value in itself and is valued as an end in itself, independent of its usefulness to achieve some higher end. The question whether intrinsic value can or should exist or not, directly relates to how we perceive human-nature relationships and the way people relate to nature is not only reflected by their actions but also by the rules they apply to articulate values for nature. Therefore, acknowledging intrinsic values of nature acknowledges the fact that people are part of nature and "it is how we choose to perceive people and biodiversity that determines choices of how to (value and eventually) conserve biodiversity" (Gatzweiler 2008).

The point made here is that the approach to eliciting values from people for ecosystems reflects understandings, perceptions, and normative stances of what values are and how values are generated and held: the pre-analytic conceptions of those asking questions. And just these pre-analytic conceptions define the values the researcher wishes to discover or create. Two extremes are to ask individuals about their willingness to pay or allowing people to deliberate. Asking individuals about their willingness to pay thereby reflects different pre-analytic conceptions than allowing them to deliberate, whereas former assumes that people:

- hold these values in advance or can easily generate them
- have sufficient information and understanding of what they are valuing
- can decide (alone) on the values they attribute to ecosystems
- behave according to the cost-benefit rule
- value consistently
- value according to individual rationality

On the other hand, deliberative valuation methods do not assume pre-existing values for ecosystems and biodiversity. Given the fact that values are part of the institutional and cultural context people live in and that this societal context has co-evolved over long time periods it is likely that values are not held in advance and that people need to communicate and deliberate on issues which require valuation. In such deliberative processes values emerge from a communicative social process.(O'Connor 2000; Zografos and Paavola 2008). Commonly known techniques such as Participatory Rural Appraisals (Chambers 1991) Citizen Juries or Roundtables can be suitably modified to facilitate these processes.

The foregoing discussion makes a case for environmental valuation as value articulating institution (Jacobs 1997), i.e. a framework that is invoked in the process of expressing values and which influences which values come forward and what sort of conclusions can be reached on the basis of those values. Vatn (2005) defines a value articulating institution as a "constructed set of rules or typifications" which specifies the conditions under which values will be expressed such as what type of data will be deemed relevant (e.g. environmental valuation considers only monetary bids as relevant data), who participates in valuation (similar concerns raised by feminist economics, Agarwal et al. 2005) and in what capacity (e.g. environmental valuation asks individuals to participate as consumers). He further explains that different value articulating institutions "tend to give different outcomes or preferred solutions", which implies that "the choice of such institutions is certainly non-trivial" (ibid: 211).

As a value articulating institution, environmental valuation is not particularly inclusive of plural environmental values, given that values of some ecosystem services cannot be monetarized. However, as also discussed in chapter 5, alternative value-articulating institutions such as multi-criteria evaluation and deliberative processes (e.g. citizen juries, etc.) try to reflect environmental values and motivational plurality (Table 1). These alternatives also attempt to consider the criticism towards environmental valuation that people may want to participate as citizens instead of consumers in environmental decision-making (Sagoff 1988).

Table 1 **Value articulating institutions and respective normative and epistemological stances** (Source: Modified from O'Connor et al 1998)

Value articulating institution	Normative and epistemological stance
Contingent valuation method	Cartesianism: Value is pre-existing and needs to be discovered. Separation between values and facts, human and nature. Substitutability between money and ecosystem goods and services. Values are revealed.
Deliberative or social process methods	Democracy stance: value is constructed in social processes. Previously unknown values evolve from deliberation and debate. Prioritizes each member of society to contribute to knowledge and judgment.
Multi-criteria methods	Complexity: Value understood in terms of ranked importance. Irreducible plurality of analytical perspectives for a stationary enquiry.

Deliberative methods stem from an awareness of the need to acknowledge and legitimize plural values in public policy and decision-making. Deliberative democracy scholars require that beyond other outcomes policy generates a public domain where reflection upon preferences is stimulated in a non-coercive manner, by means of information provision and deliberation (Dryzek 2000). As deliberative democracy's aim to pursue such public spheres is in tune with environmental value plurality, deliberative forums (e.g. citizen juries) seem to provide a desirable model of a value articulating institution. However, the potential of deliberative decision-making has skeptics. For example, advocates of deliberative planning are reproached for paying "insufficient attention to the practical context of power relations in which planning practice is situated" (McGuirk 2001: 196). Likewise, others argue that "a deliberative and democratic praxis of sustainability may be effective only if and when underpinned by substantive changes to the exercise of power and leadership" (Stratford and Jaskolski 2004: 311). Similar concerns have been raised as regards biodiversity management through deliberative decision-making processes (O'Riordan 2002).

Valuation scholars have attempted to integrate deliberative processes in environmental valuation by means of developing deliberative methods of environmental valuation (Sagoff 1998). This practice can be seen as a response to criticisms towards contingent valuation (CV); those criticisms postulate that environmental value is a group value and should not be sought as an aggregate of individual values. The practice also tries to take on board criticisms that environmental preferences do not exist ex-ante but are socially constructed (Vatn 2005) and that values are sensitive to changes in issue framing and information brought to the attention of the public during the process of value elicitation (Slovic et al. 1990). Basically, deliberative valuation tries to turn the value elicitation process into a

preference-constructing process in order to deal with the issue that people do not hold pre-determined preferences towards the environment and that such preferences should be well-informed and deliberatively derived (Zografos and Howarth 2008). However, critics of deliberative environmental valuation point out that in practice it has been applied as a means for justifying stated preference methods by adding often superficial forms of deliberation or discussion, and that in essence the relevant studies establish that the economic model they use is unsuitable for understanding particular sets of social values as regards the environment (Spash 2008).

2.3 Valuation as a feedback mechanism

Exercises of valuation can play an important role in calling attention to the value of biodiversity and to intangible ecosystem services vis-à-vis other forces competing for use of particular resources to the detriment of others. Although this requires some level of objective measurement and some imposition of a value system, it is also a way to confront the pressures of market forces which approaches the environment as commodity. Further, valuation of ecosystem services can create incentives for land use change, such as promoting what has been called an agroecological transition aiming at reconciling the value of production and environmental services (Mattos et al. 2008). While several parts of this chapter have called attention to the potential negative implications of economic valuation, its value as a decision making and awareness mechanism to society are also clear. One can argue that in the long run, this approach actually will lead to the internalization of the environment into western thinking and economics. In this context, valuation methods can serve as a mechanism to provide feedback in a system where production and consumption, trade and exchange are so distant and complex that they undermine perceptions of the impacts of habits and behavior on the environment (Moran 2006; Wilk 2002). One can see these processes as a form of regulatory adaptation where behavioral responses within particular cultural and social contexts are taken progressively to cope with environmental changes perceived as detrimental (Moran 2000). In this context, valuation can be seen as a feedback mechanism which confronts the problems of market demand for commodities and lack of accounting for externalities with the same tools and language, i.e., values and costs. However, the processes that mediate perceptions of value and actions to conserve biodiversity and ecosystems carry a time lag between behavioral responses at the levels of the individual and whole populations, in which the actions of the former can be overwhelmed by the inactions of the latter. In this context, as other processes affecting society, the impact of valuation on behavioral changes are functions of cultural context (e.g. perceived notions of value, whether changes are culturally accepted), society and economics (e.g. degree of participation of the larger society, available institutional arrangements facilitating collective action), and the perceived environment benefits (e.g. availability of resources or access to desirable landscapes) (Brondizio and Moran 2008). Furthermore, adaptation to environmental change depends on forms of institutional arrangements that facilitate these activities within and across levels.

The socio-cultural construction of economic value is not static, but evolves in a processual way as behavioral actions respond (or not) to feedbacks. It coevolves with changing perceptions of society's environmental reality (Norgaard 1987; 1984: 165). This process of co-evolution is underpinned by a cognitive performance of mutual specification and co-determinism (Varela 1999, Maturana and Varela 1928): humans bring forth their own domain of (environmental) problems and solve them according to their ability to order interactions with nature. This process of ordering interactions between humans and nature is also facilitated by institutions, because "institutions pattern lives" (Tool 1986: 51). Therefore, ecosystems are degraded and biodiversity is lost, attitudes and values towards nature (must) change. The institutions according to which people pattern their lives will then change as a consequence, but the timelag may be long.

The values attached to ecosystems and biodiversity (or anything else), are not only determined by a constructed ethical environment and the respective institutions. They also depend on social emotions and feelings. The extinction of the blue whale might be deemed economically rational by some (Clark 1973). Ethically and culturally, however, the extinction of blue whale would make many people feel incensed and react in extremely angry ways. Because of the complexity of the issue, those people may not be able to reason scientifically and logically why the blue whale should not be hunted until extinction; they could merely express their unease about it. Both stances employ their very own ethics: The economic stance is based on an ethics of individual rationality (which also defines "good" and "bad" decisions) and the "ethical stance" is one that is based on some feeling of what is "good" and "bad".

Damasio (2003: 162) identifies feeling as the "embryo of ethical behavior" and part of "an overall program of bioregulation." He defines feelings as homeostatic devices to keep the body-brain system in balance, just like institutions are rules to keep social and socio-ecological interactions in balance. Damasio says that ethical behavior depends on the working of certain brain systems which are not exclusively dedicated to ethics but also to biological regulation, memory, decision-making, and creativity. On those grounds, the role of feelings can be tied to natural, life-monitoring functions: "Ever since feelings began, their natural role would have been to keep the condition of life in mind and to make the condition of life count in the organization of behavior. Our life must be regulated not only by our own desires and feelings but also by our concern for the desires and feelings of others expressed as social conventions and rules of ethical behavior … feelings remain essential to maintaining those goals, the cultural group considers unavoidable and worthy of perfecting. Feelings also are a necessary guide to the invention and negotiation of ways and means that somehow, will not clash with basic life regulation and distort the intention behind the goal. [They] remain as important today as when humans first discovered that killing other humans was a questionable action." Feelings are important for decision making to enable people to deal with the uncertainty inherent to all complex decision making situations. Although abstract, they are located where communicative interactions, social rationality and complex system properties are taken into account, thus, as an important aspect of human behavior, they remain a central component for valuation.

3 The challenges of valuation: ecosystems, biodiversity and level of analysis

The scope of this section is to present, on the one hand, the main challenges of addressing various levels of analysis using valuation methodology and accounting, and, on the other hand, the required attention to complexity embedded in resource use systems today. It is divided into 3 parts, each of which is built upon issues raised above.

3.1 The problem of transformative value and economic return of resource use

Indigenous and rural populations, although often considered stewards of biodiversity, share an unequal position, usually at the lower end, of larger commodity chains of resources. Around the world, the value of resources increases along the market chain usually far from their areas of origin, thus creating unequal distribution of benefits and weak incentives for conservation and management. As a resource moves from a state of raw material to various levels of industrial transformation, its economic values are increasingly attached to market symbols aimed at different groups of consumers (Brondizio 2008). This is a classic situation for many valuable resources coming from tropical forests or aquatic systems around the world. On the one side, the producer of tropical forest fruits who manages standing forests receives a few dollars for a basket of fruit while on the other side a consumer in the United States pays high prices for products which in some cases contain only traces of the same fruit, but which holds splashing advertisement and claims about sustainable development. Thus, what parameters should be used to value specific resources? Which basis can we use to estimate the value of a resource as it changes in price as much as 70 folds along a commodity chain? If valuing biological resources is a tool to improve in situ conservation, it assumes that local stakeholders have sufficient incentives to maintain a given ecosystem against other competing uses. The symbolic value embedded in resources as commodities mediates its economic value along a commodity chain (e.g., Appadurai 1996; Haugerud et al. 2000; Brondizio 2008). The economic value of forest resources, for instance, becomes dependent not only on their demand as raw material, but the level of industrial transformation and, most importantly, the symbolic meaning attached to their marketing as end products to consumers. The pragmatic dimension of this discussion, as illustrated by the case of acai palm fruit of the Amazon presented in Box 1 and Ethiopian wild coffee in Box 2, is the importance of aggregating value to resources locally as a form of creating incentives for local management vis-à-vis conversion to other uses because of market pressures. The Amazon illustrates well this tension. The combination of limited global availability of arable land associated with increased demand for vegetable (e.g., soy bean) and animal protein (e.g., beef), vast land availability, government priority to export surplus, and the low value of forest resources at a regional level explains the majority of Amazonian deforestation during the past two decades.

Box 1 The boom Açaí palm fruit in the Amazon

There is possibly no better example of an economic prospect for reconciling forest conservation and development Amazônia than the case of the açaí fruit (*Euterpe oleracea* Mart.) production system (Brondizio 2008). Emerging from the initiative of local producers to supply a growing market demand for açaí fruit, using locally developed technology and knowledge with respect to forest management, açaí fruit production embodies the social and environmental principles that permeate the discourse of sustainable development for the Amazon region. At the same time, the formation of this production system poses important questions concerning the spread and duration of benefits resulting from booming tropical forest economies. To what extent are production and market opportunities to value forest resources diminished by a history of socio-cultural prejudice, land tenure insecurity, and differential access to economic incentives? The expansion of the açaí fruit economy occurs as a combination of both endogenous and exogenous factors associated with the region as a whole, and in association with its consumption basis. These include rural out-migration and urban expansion since the 1970's, the organization and marketing strategies developed for the export of other Amazonian fruits during the 1980's, and the growth of the "green products" industry during the 1990's. The growth of açaí fruit consumption is driven by various claims relating to its healthy and invigorating qualities, rainforest conservation, respect for Indigenous causes and products, and its representation as an icon of the sustainable development agenda proposing alternative forms of land use in the Amazon. Açaí fruit's secure position at the regional level as a staple food favorite, as well as its expanding national and international markets, has transformed açaí fruit into a symbol of cultural identity and regional pride for Amazonian small farmers, particularly in the Amazon estuary. Today, it has been industrialized into a range of products of popular consumption, such as yogurts, concentrated juices, ice creams, energetic beverages, vitamin pills, as well as products such as shampoos and soaps.

Overall, for most of the history of açaí economy producers have received better prices than the average price of most agricultural and husbandry products of the region. Analyzing the evolution of prices, it becomes clear that açaí producers had an incentive to manage forests for açaí production. As a result, during the past 30 years, the Amazon estuary as experienced, contrary to elsewhere in the Amazon, a forest transition, i.e., high rates of regrowth, increasing forest cover, and minimum deforestation. Emerging from a local rural economy, the açaí fruit industry is now functioning as a complex multilevel economic structure. As part of this process, forest managers and producers of açaí fruit negotiate a position amid regional and international investors and companies, although suffer from the lack of infrastructure to commercialize their product and incentives to participate on value aggregation. This creates a paradoxal situation whereas the açaí fruit economy continues to grow in scale, but the proportion of revenues retained locally is increasingly smaller. Although producers have been benefiting from the expansion of this market, they have been unable to participate on new sectors of the economy associated with the commercialization and control of fruit stock, its transformation, and its value aggregation along the chain. Producers suffer from the stigma of extractivism and the invisibility of their intensified management and production in standing forests (still widely referred as an extractivist system), a situation which continues to maintain them as suppliers of raw material (Brondizio and Siqueira 1997). New entrepreneurs and large regional producers have come to occupy the most profitable niches of the market and assume greater control over production, commercialization, processing, and marketing. Estimates of the current economic impact of the açaí fruit market in the region and abroad range from R$100 to 500 million/year, possibly much larger depending on how, what, where, and how far the commodity chain one counts (Brondizio 2008).

Most of this economy, however, aggregates value away from production areas. For instance, the value of acai fruit pulp resulting from the harvest of one hectare of managed forest at the farmer's gate (i.e., fruit in nature) ranges from around US$ 1,000 to US$1,200. The same amount (in equivalent processed pulp) will increase 20 to 50 folds (depending on the end product) when reaching consumers in southern Brazil and up to 70 folds or more (depending on the end product) when reading international consumers (Brondizio ibid.). Further, the increasing competition from new areas of production and corporate plantations seeking to control supply are leading, progressively, to increasingly to monocultural systems (vis-à-vis forest management). The lack of transformation industries installed locally and accessible to producers that could help to aggregate value locally (to producers and municipalities) is progressively decreasing incentive for managing and maintaining diverse standing forests where small farmers manage several species vis-à-vis other land uses.

Box 2 Commodity and symbolic values for wild coffee from Ethiopian forests

Despite Ethiopia being the largest Coffee Arabica producing and exporting country in Africa, 98 percent of the national coffee production comes from smallholdings which are less than a hectare in size and 95 percent of that coffee is produced in forest-, semi-forest and garden systems. The commodity chain involves producers, cooperatives, exporters, importers, roasters, retailers and consumers. Coffee is bought and sold as a tradable commodity and the farm gate prices of coffee in Ethiopia is connected to price fluctuations at the New York Commodity Exchange. Although some specialty coffees, like wild forest coffee, are connected to retail prices, the largest price margins are still achieved between the roaster and the retailer and between the retailer to the consumer. Once the coffee has reached the consumer it is no longer just a commodity which is valued for its quality as raw material, and by the forces of supply and demand. It is now a lifestyle product for which consumers are willing to pay because it responds to their needs, wants, beliefs or convictions. Whereas in 2006/7 an Ethiopian farmer in Yayu received 0.5-1 USD (=0.4-0.8 Euro) per kg green wild forest coffee, when he delivered it to the cooperative, 1 kg of packaged, roasted wild forest coffee is now sold for 38 Euro/kg. If a kg of coffee is sold in form of 100 warm cups of coffee á 2-3 Euros/cup, its value has already increased to 200-300 Euro/kg.

On the other hand, although valuing biodiversity can be a tool for in-situ conservation, the increasing economic value of forest resources along the value chain can also be a disincentive for biodiversity conservation. Seyoum (2009) shows that higher incomes for households in Ethiopia close to coffee forest areas, can be an incentive to intensify coffee management inside the forest and thereby reduce the wild coffee and forest diversity. However, the discussion of whether intensification of land use leads to deforestation is still poorly understood (Angelsen and Kaimowitz 2001), in part because this relationship is mediated, on the one hand, by the role of markets and their distributive benefits (i.e., the degree of value aggregation at a local level), and on the other hand, by the effectiveness of

institutions regulating use of resources. The two examples presented here illustrate well the problem of value aggregation and the counter-forces of intensification.

The recognition that value change along the commodity chain has implications for the distribution of benefits and affects the level of incentives for conservation represent an important methodological challenge for economic valuation. The inability of conservation and development programs to create incentive systems to aggregate value locally (and thus employment in rural areas) represents a widespread problem not only for developed countries, but around the world. Initiatives such as certification and terrier recognition are growing with diverse success in different parts of the world. In general, however, the lack of policy frameworks to promote local value aggregation and reduce distances between producers and consumers fuel an economic logic whereas the market for monocultural plantation and/or cleared land is many-fold higher for the [valuable] resources of standing forests or the rich agrodiversity passed down through generations.

3.2 Complexity and functional inter-dependencies underlying valuations

Economic valuation is a complex, spatial and institutional cross-scale problem (Turner et al. 2003). As also pointed out in chapter 5, section 3, values of ecosystem goods and services differ with changing ecological features and with differing size and characteristics of groups of beneficiaries. Whereas recreational values of a site may be valued for its direct use at local scale by visitors of the site, the value of high levels of biodiversity may be valued for its option, bequest, existence and altruist benefits at a global scale by the global community.

Many efforts focusing on particular parts of ecosystems or species, such as the creation of protected areas, while effective at one level, lack the scope to control the pressure of commodity markets for land resources surrounding them. As such, and depending on their biophysical context, they are limited to capturing the linkages and vertical interplay created by a growing functional interdependency of resource use systems nested within larger ecosystems (Young 2006; Brondizio et al. 2009). Increasingly common around the world, as described at the introduction, ‘islands of protected ecosystems’ are nested and affected by systems at higher or lower levels, and thus have substantial long-term limitations to guarantee conservation. Furthermore, they illustrate the importance of understanding the diversity of cultural perspectives to the environment. Take for instance the case of an indigenous group which values and has successfully protected forests within a given territory, an area/ecosystem which is, however, nested within a larger watershed. Assume the larger watershed is occupied by very different groups of people who have very different perspectives of the environment and who are closely responding to global markets for agricultural commodities. The result is that rampant deforestation outside reserves will systemically undermine the [protected] environment through water pollution, soil erosion, and forest fire, including the possibility of reaching thresholds which may lead to unpredictable ecosystem changes. As the authors describe, recently arrived farmers may see the forest as a threat and the environment as sets of resources to be

transformed. On the other hand, the environment as a whole is an intrinsic part of indigenous cosmology and an organic part of their economy. Indigenous groups carry detailed intergenerational knowledge about forest and water resources, cultural attachment to place, and customary rules of use and resource appropriation which tend to hinder members of the group from carrying out short-term and large-scale transformations that are characteristic of large (and small scale) and corporative farmers aiming at taking immediate opportunities of commodity markets. The authors stress that "we should build social capital that enhances the long-term sustainability of natural capital at multiple levels on scales of relevance to particular ecological resources." In other words, it points to the role of institutions in facilitating cross-level environmental governance as an important form of social capital that is essential for the long-term protection of ecosystems and the well-being of different populations. (Brondizio et al 2009: 258-259). This scenario illustrates the challenges of conservation and development in the Brazilian Amazon during the past two decades and currently. The creation of a record number of protected areas and indigenous reserves, today corresponding close to around 30% of the region, happened concomitantly with the period of highest rates of deforestation ever observed. Increasingly, the region is observing the formation of `islands' of forests and forest fragments (Carneiro Filho and Souza 2009). This scenario represents the trajectory of many regions around the world and raises the issue of social and environmental interdependency and the limitations of valuation methods which may account for valuing resources at one level, but neglect other levels affecting its long term sustainability.

The situation of vertical interplay of institutions (Young 2006) representing groups competing or cooperating for authority over resources requires one to look at questions of subtractability (i.e., whether resource appropriation by one user reduces availability to others) and exclusion (i.e., how costly it is to keep potential beneficiaries out of the benefit stream) from a multiscale perspective (Brondizio et al. 2009). Local forms of use and regulation of a resource (e.g., based on customary rules of use and exclusion), while potentially effective at a local level, are affected and in some cases overwhelmed by resource use in a different part of the larger ecosystem. As called attention by the MA, one of the biggest challenges of contemporary environmental governance is to promote conservation outside protected areas (Bhattacharya et al. 2005).

Along these lines, valuing resources and protecting an ecosystem requires attention to the value of connectivity at a landscape level. An overemphasis on conservation focused on carbon storage, for instance, with metrics based on stocks of carbon may downplay the role of connectivity of habitats, habitat and species diversity, or the water quality within a watershed. Interconnected social-ecological systems are dynamic, thus requiring constant monitoring and institutional adjustments, but most institutions and forms of incentives are designed to be applied at a given level. Görg (2006) calls attention to multi-level decision making as a pressing issue for environmental governance. He proposes the concept of landscape governance as an approach based on the notion of society relationship to nature to bridge what he calls the "politics of scale" ('socially

constructed spaces') and the biophysical interconnection between places. In this context, the challenge for valuation is to function as part of a larger process of co-evolution and adaptive management which stresses, on the one hand, the value of flows and connectivity within and between ecosystems, and on the other hand, facilitates the dissemination of knowledge and responses of institutions and social groups across levels.

3.3 How to choose how to value

One relevant question for decision makers is about how to decide which valuation method is to be used to guide decisions. According to Arrow (1963) and Sen (1970b), the social choice problem is to make decisions for a society composed of a variety of members having non-identical interests and values.

Ostrom (1990), McGinnis (1999), Ostrom et al. (1994), among others, have tried to answer the question of how to design institutions for the governance of complex resource regimes (such as water, forests, or knowledge). Their proposed design principles for successful governance of common pool resources have proven very useful to policy making, particularly when applied to specific local level situations. They were guided by a rule defined by Ashby (1952) formulation of the 'Law of Requisite Variety'. This law says that any regulatory system needs as much variety in the actions it can take as exists in the system it is regulating. Ostrom and Parks (in McGinnis 1999: 284) concluded: "the more social scientists preach the need for simple solutions to complex problems, the more harm we can potentially cause in the world" (see also Ostrom 2009).

There is today considerable evidence that putting a monetary value of an environmental change is a cognitively very demanding task for which people tend to use various simplified context-depending choice rules, thereby implying that the responses are often difficult to interpret (Schkade and Payne 1994; Vatn and Bromley 1994) and psychologists like Kahneman and Tverskry spent nearly 40 years trying to show that people have developed preferences for very few familiar good and for most circumstances employ various heuristic choice rules (Johansson-Stenman 2002).

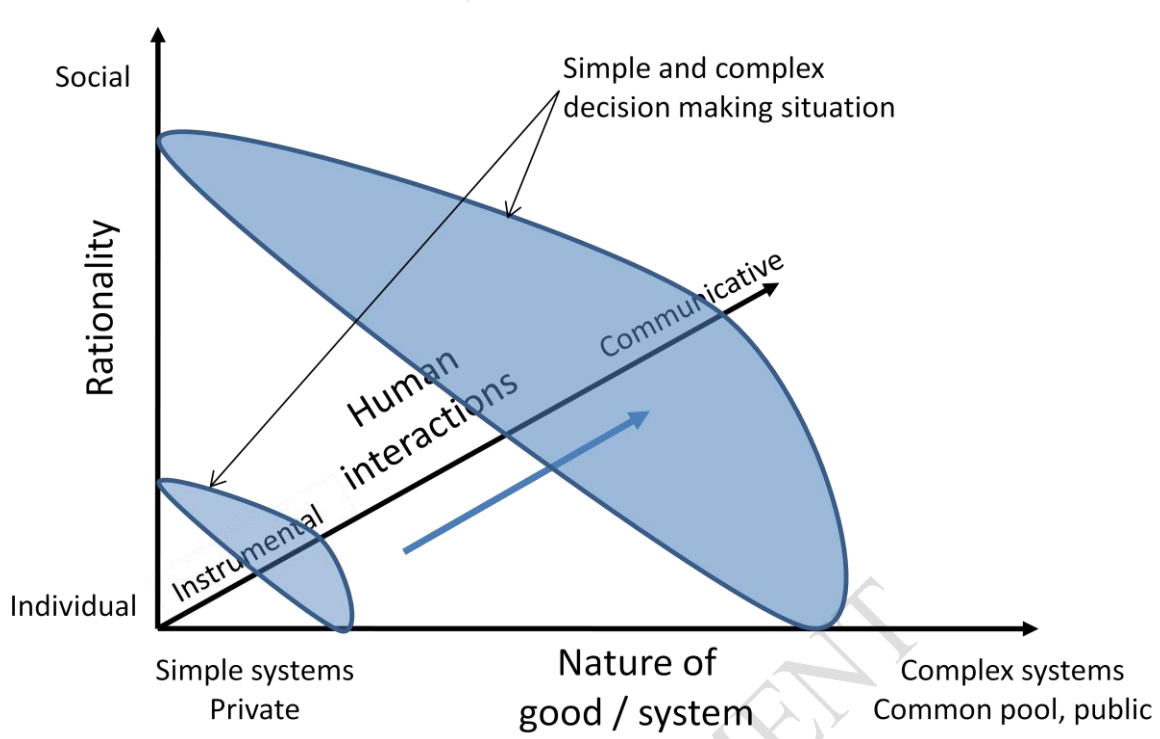

Figure 1: Dimensions for choosing the valuation method
Source: adapted from Vatn (2005: 419).

Making decisions in situations of high complexity and incomplete knowledge is characteristic for decision situations related to ecosystems and biodiversity. According to Ashby's law such situations require methods which are able to capture value plurality, ecosystem complexity and biodiversity. This would require a move from aggregating individual values to reasoning over a common set of priorities. Because "…to handle the common goods aspect social rationality and some form of communicative process must be taken in account. It is the only institutional structure that can be true to the choice problem at hand." (Vatn 2005: 421). Strategies for the management of complex systems have been developed (Malik 2008) (Figure 1).

Applied to the complex problem of biodiversity conservation this would require matching the complexity of the problem situation with the organization of public engagement, which is (principally) able to capture as much variety (value plurality, types of rationality, etc) as in the system it aims to conserve. Neglecting socio-ecological complexity (e.g. by limiting discussion to the rationality of economic man and the market system) leads to increasing system vulnerability and increasing danger of system collapse. Applying valuation methods which apply simplified models of the complex systems being addressed, by, e.g. monetary valuation, would consequently not only be less useful, it would reduce value plurality from the start.

O`Connor and Frame (2008) therefore suggest, "that the logic of valuation [...] is: 1. make the proposition to sustain/conserve the forms of community or environmental features in question (e.g.,

avoid the production of toxic wastes, preserve a designated forest system or other feature of nature), and then, 2. investigate what commitments this does or might entail for—and on the interfaces between—the various communities of interest involved." To engage methodologically with this hydra-like problem, O'Connor and Frame, (ibid) introduce a sequence of strong dialectical simplifications. First, they propose two main types of thresholds beyond which assessing trade-offs or the consequences of choices on the basis of monetary measures alone are of questionable pertinence. Either the estimation is scientifically very difficult, or the proposition of a "trade-off" implied by the opportunity cost considerations is deemed morally inappropriate (Figure 2).

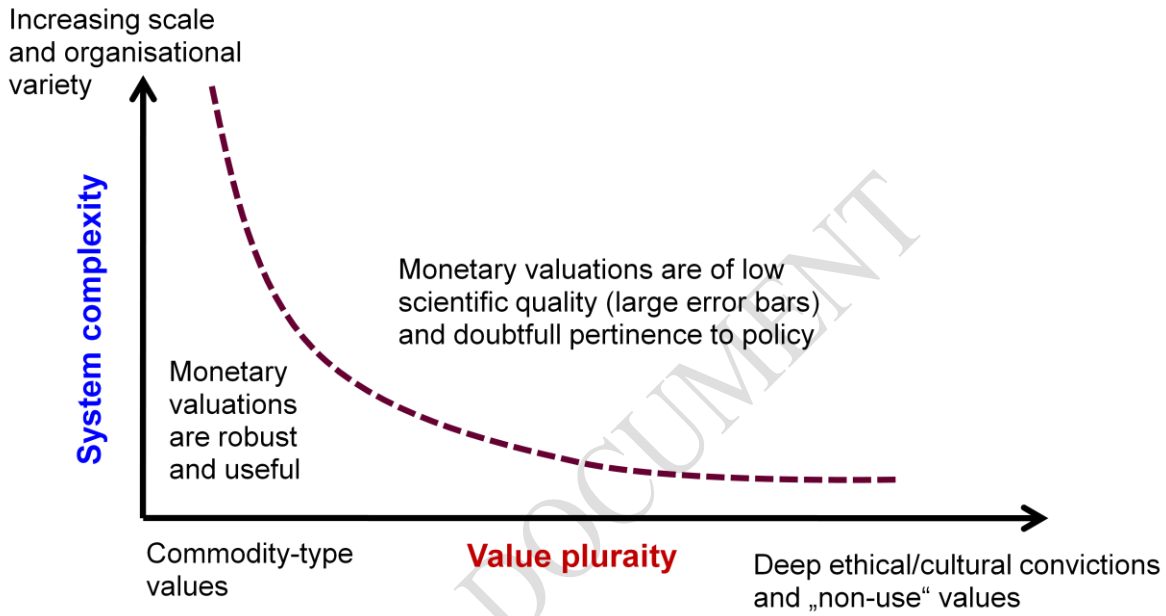

Figure 2: **With increasing system complexity and value plurality, monetary valuations become of low scientific quality and doubtful policy relevance**
Source: Redrawn from O'Connor and Frame (2008).

Recognizing the fact that valuation methods are 'value articulating institutions' and that the choice of a method can strongly influence the outcome of a valuation exercise and thereby actual behavior, supports Atlee's (2003) argument that people are co-producers or 'co-creators' of institutional change: (global) environmental change is a collective process, the consequences of which individuals can not comprehend in its entire range, depth, and detail. Therefore, better ways are needed to perceive and reflect the state of the earth and to facilitate integration of the individual diversity of perceptions and values. Atlee defines co-intelligence as a human capacity and ability to generate creative responses.

And therefore, the choice of value-articulating institution (=valuation method) will define the outcome of the valuation exercise. For instance, :

- the private good side (instead of common pool and public features) of ecosystems and biodiversity,
- simple (instead of complex) systems,
- the individual and egoistic (instead of social) side of human behavior and rationality and
- the instrumental (instead of communicative) type of human interaction,

will bring forth values a world as understood and seen by the eye of the beholder. That means, the way ecosystems and biodiversity are perceived determines the way they are valued, and the way they are valued determines the human interaction with and (mis)use of the natural environment. The decision situations with ecosystems and biodiversity are not simply a matter of value exclusion, meaning that some values of ecosystems and biodiversity have not been considered. The decision making situation is about applying (what one thinks is) the right valuation frame of reference for the valuation of ecosystems and biodiversity. Valuing biodiversity and ecosystems in order to conserve it require more than attaching additional values to nature by appreciating its goods and services. The choice of the value-articulating institution becomes more important than valuing nature in order to prevent market failure. That is, one may assume that if markets do not fail, ecosystems and biodiversity will be conserved. We do not know that and we cannot know that for sure. Therefore one may argue that it is more important how we value than which value we attach to nature.

4 Final Remarks

Trying to put a value on biodiversity and ecosystem services involves tradeoffs. The broader literature on economic valuation recognizes these challenges and problems, and the multi-dimensional and contested nature of these approaches. The social sciences literature calls attention to some pitfalls and the potential long-term implications of economic valuation. Many challenges remain ahead, among others: the difficulty to account for inter-linkages between different ecosystem services, the lack of tools for cross-level valuation and mechanisms to promote value articulating institutions, and the limitation of valuation tools to promote equity distribution and value aggregation to resources and ecosystems at the local level. On the other hand, properly used, economic valuation has the potential to serve as a tool of awareness and as a feedback mechanism for a society which has distanced itself from the resources it uses and from the impacts of its uses on distant ecosystems and people.

Economists know and have known all along (not just since the rise of ecological economics) that their value-articulating institutions are not all-inclusive. Therefore, valuation is essentially a matter of choosing how to perceive the human being itself, how to perceive human's place in nature, and how to perceive nature itself. This is because the way we perceive our natural environment determines the way we value and change it. One way of incorporating a multilayered understanding of human-environment relations and understanding the value and motivational linkages between the two is to

address the large gap that exists between the language in which the preference of the people for ecosystem services is elicited and the language in which people feel more at home. The languages of research and policy show similar dissonance. The more the discourse moves away from the common lives and real life concerns to abstruse quantification and reductionism, the more people are likely to give preferences that are fudged and confused as much as these are confusing, merely because the choices we offer are far from adequate (Kumar and Kumar 2008: 814). Valuation approaches aiming at addressing complex socio-ecological systems require attention to the challenge of understanding problems of credibility, saliency, and legitimacy at the intersection of different knowledge systems and access to information at different levels and by different groups (Cash et al. 2006). In this sense, valuation mechanisms should be seen as part of a broader range of diagnostic and assessment tools and political-institutional mechanisms that facilitate the understanding of complex socio-ecological systems (Ostrom 2009), as well as coproduction, mediation, translation, and negotiation of information and knowledge within and across levels (Cash et al. 2006; Brondizio et al. 2009). The main lesson that comes across when one reviews valuation literature is to avoid an 'one size fits all' approach, or as Ostrom (2007) puts it when proposing a framework for the analysis of complex social-ecological systems, we need to move beyond panaceas.

Economic valuation may contribute to address our inability, reluctance or ideological intolerance to adjust institutions (also those which are value articulating) to our knowledge of ecosystems, biodiversity and the human being. As such, it can contribute to more inclusive economic accounting and planning, and a more inclusive view of non-human beings. In other ways, however, it can also contribute to separate people and nature further apart by simplifying its meaning and value to human societies. In this balancing act, one hopes valuation approaches will not be taken as panaceas, but as tools which may contribute in the long-run to internalize a respect for nature into western cosmology and social life.

[i] For all purposes, we use environment and nature as interchangeable terms, unless referring to their use by particular authors. For a comprehensive review of these terms, particularly the concept of nature, see the volume edited by Ellen and Fukui (1996), in particular, Ellen (1996).

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