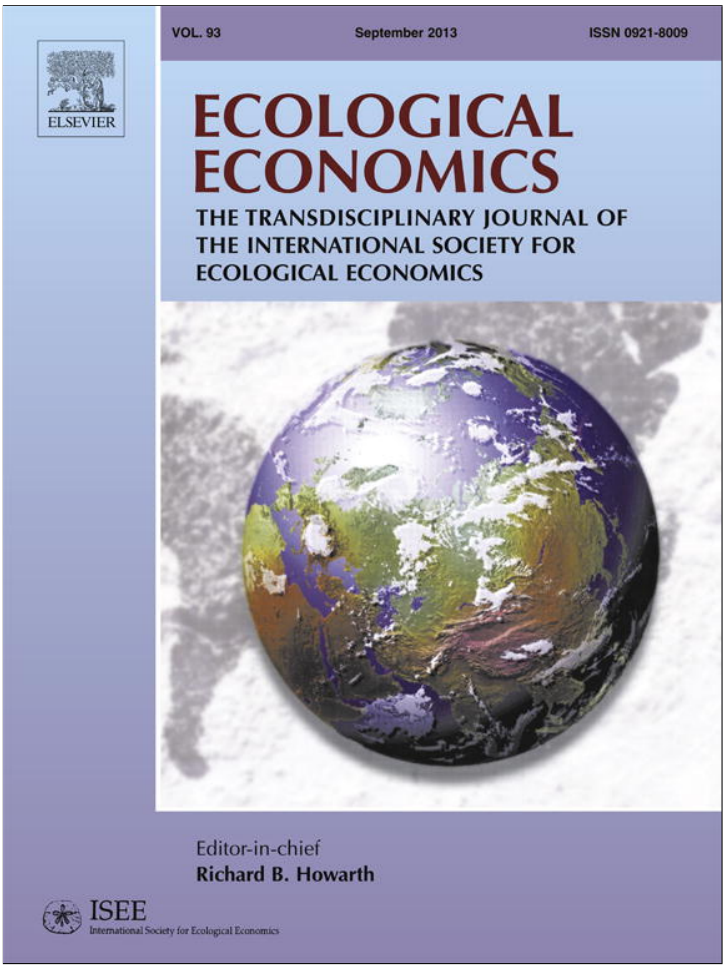

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Analysis

Ecosystem services and ethics

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ABSTRACT

A major strength of the ecosystem services (ESS) concept is that it allows a succinct description of how human well-being depends on nature, showing that the neglect of such dependencies has negative consequences on human well-being and the economy. As ESS refer to human needs and interests, values are to be considered when dealing with the concept in practice. As a result we argue that in using the concept there is a need to be clear about what different dimensions of value are involved, and be aware of ethical issues that might be associated with the concept. A systematic analysis of the ethical implications associated to the ESS concept is still lacking. We address this deficiency by scrutinising value dimensions associated with the concept, and use this to explore the associated ethical implications. We then highlight how improved transparency in the use of the ESS concept can contribute to using its strengths without succumbing to possible drawbacks arising from ethical problems. These problems concern the dangers that some uses of the concept have in obscuring certain types of value, and in masking unevenness in the distribution of costs and benefits that can arise in the management of ESS.

1. Introduction

The ecosystem service concept is increasingly being used in the fields of biodiversity conservation, natural resource management, development policies, environmental accounting and business (e.g. Cowling et al., 2008; Gómez-Baggethun et al., 2010). In May 2011 the European

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Commission adopted the "Biodiversity strategy to 2020" (European Commission, 2011) in which the protection of biodiversity is intimately linked to the protection and restoration of ecosystem services, and in April 2012, the United Nations established an Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES). Likewise, following the Millennium Ecosystem Assessment (MA, 2005), several countries have established national ecosystem assessments based on the ecosystem services concept (e.g. EME, 2011; UK NEA, 2011), or are planning to do so.

Although various definitions have been proposed, the core idea of the ecosystem services concept is that ecosystems contribute to human well-being. In some definitions (e.g. UK NEA, 2011) the biophysical components and processes *leading* to human wellbeing are called "ecosystem services", in others (e.g. Millennium Ecosystem Assessment, 2005) the term is used for the benefits *derived* from the ecosystems (black arrows in Fig. 2). In any case, ecosystem processes and/or components only become or lead to ecosystem services if somebody requires, demands or uses them, either actively or passively (white arrows in Fig. 2; Boyd and Banzhaf, 2007; de Groot, 1992; Hein et al., 2006; Jax, 2010). By exploring the interface between ecosystems and human needs, interests, and the demands on these systems, the concept inevitably involves judgements about human actions with respect to nature, and about what we value in nature (Potschin and Haines-Young, 2006). "Ecosystem services" is thus a value-laden (i.e., normative) concept. As a result it is prone to controversies about the specific values it highlights or obscures (Peterson et al., 2010), and about the arguments and policy proposals we make on the basis of those values (Martínez-Alier, 2002). The use of the ecosystem services concept therefore raises a number of questions of fundamental ethical significance.

For example, some argue that the utilitarian perspective implicit in the concept may compromise those ethical positions in nature conservation that promote the protection of biodiversity regardless of its instrumental value to humans (Child, 2009; McCauley, 2006; Ridder, 2008; Vira and Adams, 2009). Furthermore, the growing use of the ecosystem service concept in connection with economic accounting and market-based mechanisms, like Payments for Ecosystem Services (PES), has raised concerns about the commodification of nature (Kosoy and Corbera, 2010; Peterson et al., 2010; Robertson, 2004). Commodification in the context of ecosystem services means the transformation of ecosystem components or processes into products or services that can be privately appropriated, assigned exchange values and traded in markets (Gómez-Baggethun and Ruiz-Pérez, 2011). Some have criticised commodification of ecosystems on the grounds that ecosystem components ought not to be for sale (McCauley, 2006), while others have noted that commodification raises equity issues related to unequal access to the benefits and burdens from ecosystem services protection (Corbera et al., 2007).

Despite these ethical issues, many consider the ecosystem services concept to have the capacity of highlighting the critical role ecosystems and biodiversity play in sustaining life, human well-being and long-term economic sustainability (Costanza and Daly, 1992; TEEB, 2010). Others see it as a conceptual tool with the capacity to make environmental externalities explicit, and as the basis for the design of policy mechanisms intended to internalise the value of such externalities in market transactions and decision making processes (Daily, 1997; de Groot et al., 2002). Finally, Potschin and Haines-Young (2011), along with others, have argued that the position of ecosystem services at the science–society interface provides it with the capacity to promote dialogue between academic disciplines and to improve communication between interest groups, as different as conservationists, farmers, economists, policy-makers and entrepreneurs. Menzel and Teng (2010) go so far as calling it a "stakeholder-driven concept".

While some ethical aspects of the ecosystem service concept have already been addressed in the literature (e.g. Child, 2009; Luck et al., 2012; McCauley, 2006; Spash, 2000), a comprehensive and systematic analysis of the ethical implications associated with the ecosystem services concept is lacking. In this paper, we therefore chart the value dimensions of the ecosystem service concept and the associated ethical issues. By clarifying and structuring the key questions arising from these value dimensions we develop guidance on how to deal with ethical issues in the context of the ecosystem services concept. The paper proceeds as follows. The next section describes how ethical concerns have expanded to consider not only human–human but also human–nature relations. It then goes on to discuss key controversies in the valuation of non-human nature beyond the traditional intrinsic vs. instrumental value dichotomy. Section three draws together fundamental ethical questions arising from the use of the ecosystem services concept. Building on this, section four highlights the role that improved transparency in the use of the concept can play in addressing the ethical questions that have been identified. Finally, some conclusions are drawn.

2. Ethics and the Values of Non-human Nature

Ethics is the theory of morality, morality being the set of accepted norms, values and informal rules within a social group that guide individual and collective behaviour. By analysing and critically reflecting existing moral rules, ethics aims at justifying right and (morally) good actions. To allow for responsible action we need specific criteria that can be justified by rational arguments.

2.1. Broadening the Scope of Ethics from Human to Human–Nature Relationships

Discussion of the ethical issues surrounding the way people deal in different and controversial manners with non-human nature is quite old, especially with respect to animals (e.g. Bentham, 1789). However, the idea of a distinctive ethical basis for respecting nature is a recent one, developing mainly in the mid-20th century (Holland, 1995, p. 812). Thus, while traditional ethics has mainly dealt with relations between human beings, the field of environmental ethics has extended concern to the relation between humans and non-human nature (e.g. Callicott, 1989; Rolston, 1988).

Traditionally, ethics encompasses *axiology* (the discipline of value and valuation) and *deontology* (the discipline of duties and obligations), both of which are crucial in environmental ethics. Deontology refers to any moral obligation that a moral agent (i.e. a being that can act in a morally responsible way) might have, either *towards* other beings and/or *regarding* something. In the first case, we are faced with a *direct* moral obligation towards a being, which can be morally harmed or wronged (Holland, 1995). In the second case the obligation is an *indirect* one, with a moral being impacted by our treatment or interaction with a thing on which it depends or which it values. A typical example is when we have a moral obligation towards our neighbour, say, *regarding* her or his garden: we may not have any obligation towards the garden directly, but only insofar as it is valuable to the neighbour, important to her well-being and the like. From this point of view, nature conservation can be framed in terms of obligations *towards* other human beings (also as members of future generations) *regarding*, for example, ecosystems. To put this classification in axiological terms, beings towards which we have a direct moral obligation are said to hold *inherent* moral value (Taylor, 1986), whereas other beings are considered to hold non-intrinsic (O'Neill, 2003) or so-called *instrumental* value. Whether values are considered as existing independently from human valuation (as Rolston, 1994 holds) or are the result of human attribution, is still an open controversy in environmental ethics. Nevertheless, to say that humans attribute value to non-human nature does not necessarily imply that they merely value it instrumentally.

The discussion of direct and indirect values leads to one central question within the environmental ethics debate: the so-called demarcation problem. It concerns the issue of which non-human natural beings can legitimately (by means of convincing rational arguments) be considered as holding inherent value and therefore deserving direct

moral consideration for their own sake, independent of their relation to humans or to human well-being. Beings holding inherent value in this sense may not be reduced to mere means, so they also may not be (completely) replaced, compensated for, or monetised. Much of the debate regarding ethics and ecosystem services seems to suggest that the principle value of ethics is to posit the outer limits of moral legitimacy: namely, what may be considered for its contribution to human well-being and what instead is valuable for its own sake. Furthermore, some have gone so far as to juxtapose an (economically understood) ecosystem service perspective with an 'ethical perspective' on nature (referring to inherent values, e.g. McCauley, 2006). Such a juxtaposition is not a useful one, nor is the view that the only value of ethics to ecosystem services is demarcating beings with inherent value. Such positions seem to rest upon overly narrow interpretations of both 'ecosystem services' and 'ethics'.

The ethical consideration of non-human nature therefore encompasses critical questions regarding human-non-human relations and the contribution of non-human nature to human life and well-being. In this article, we argue that instrumental values, in the form of economic values, do not fully capture the ways people assign worth to nature. We show that by focussing exclusively on them significant ethical questions may be overlooked, and we demonstrate how relating to a broader set of value categories can help to deal with these questions.

2.2. The Values of Non-human Nature

In the axiological debate within environmental ethics, scholars have struggled with the distinction between inherent and instrumental values (Justus et al., 2009; Muraca, 2011; O'Neill, 2003; Ott, 2003; Sagoff, 2009).

As noted in the Millennium Ecosystem Assessment (MA), "the counter-utilitarian idea that there is a difference between preferences and values and that considerations of individual rights tempers [*sic*] calculations of aggregate utility was most clearly and powerfully expressed by Kant, who wrote, 'Everything has either a price or a dignity. Whatever has a price can be replaced by something else as its equivalent; on the other hand, whatever is above all price, and therefore admits of no equivalent, has a dignity. But that which constitutes the condition under which alone something can be an end in itself does not have mere relative worth, i.e., a price, but an intrinsic worth, i.e., a dignity' (Kant, 1959 [1785], p. 53, italics in original)" (Millennium Ecosystem Assessment, 2003, pp. 142–143).

As some environmental ethicists claim, the axiological category of beings holding merely instrumental values, which are replaceable, compensable and (in the extreme) can be price-tagged, is a very limited one and does not reflect adequately the intuitions that most people have about their relation to non-human nature and the reasons for preserving it (Hargrove, 2003; Taylor, 1986). In fact, this would imply that all beings, which cannot be plausibly considered as holding 'dignity', are left to a merely instrumental valuation. In this case, the only limit to economic valuation would be a question of feasibility (finding accurate equivalents and substitutes). As Martínez-Alier (2009) has shown, in many cases the instrumental language does not capture the actual meaning of the human–non-human relation for local communities.

Aware of this difficulty, and in order to include a more complex understanding of the relations between human and non-human nature, some scholars plead that we recognize a much broader range of human values, including concerns for future humans and values that enrich human lives in non-consumptive ways (Norton, 2003). A more complex classification (Fig. 1) encompasses categories of value beyond inherent values (as defined above), such as fundamental values (Muraca, 2011), and eudaimonistic values (Krebs, 1999; Muraca, 2011), the latter including aesthetic values (Hargrove, 2003) (for value classifications from an economic perspective see e.g. Pascual et al., 2010).

Fundamental values refer to the fact that non-human natural beings might be valuable for being the fundamental and substantial conditions for life on earth and the fundamental context of relation for human beings. The idea of fundamental dependency is connected with the idea of human finitude, as it is stated in most spiritual traditions, and reveals the vague intuition of fundamental relationality. For example, the connection to the 'Land' (especially for peasants and indigenous people) is not a 'functional' or a merely instrumental relation to a single entity, which is valued for its provisioning services by those who benefit from them. Rather, it represents the overall relational system that constitutes single entities and individuals and encompasses their ecological, cultural, and social interdependence (Landis Barhill, 1999; Muraca, 2010, 2011). Whereas the term 'instrumental' refers to means which enable the achievement of a valued end, the term 'fundamental' refers to the most basic, systemic, and complex conditions for existence, including the very possibility of setting ends and choosing means. To illustrate this with an example: the oxygen bottle that I can buy in the pharmacy for my grandfather is of very important instrumental value for his survival. The oxygen of the atmosphere also contributes importantly to the survival of most living beings, but its value exceeds the direct instrumentality above. Atmospheric oxygen is a fundamental condition for human existence and not an instrument that merely raises utility. In fact, the air as a collective, fundamental system is the very condition that makes it possible for us to do anything, including producing and using oxygen bottles.

Similarly, *eudaimonistic values* not only refer to a surplus in quality of life, in terms of leisure and aesthetic experiences, such as a walk in the woods, swimming in a natural pond, or climbing beautiful mountains. Rather and more properly, they refer to all those entities and processes considered as necessary for living a 'good life'. Such a notion of 'good life' was referred to by Greek philosophers as *eudaimonia*. From this point of view eudaimonistic values are not confined to subjective preferences but extend to issues of intra-generational and inter-generational justice (Muraca, 2011). Moreover, beings holding eudaimonistic values are valuable in themselves and are not *prima facie* reducible to the benefits and services that they deliver as means; thus the old oak tree in my garden is not an instrument to produce wood or sequester carbon – even if it can be used for that goal – instead it bears a deeper meaning for my life and cannot be simply replaced by something else. As a result, while the economic approach to ecosystem services might partly capture aspects connected to fundamental and eudaimonistic values, it may also overlook other aspects related to these value categories. This is the case when an exclusively instrumental language, which implies the idea of 'equivalents', might significantly affect self-understanding and the possibility of leading a 'good life' (i.e. the life worthy of a human being). In this case the reductive perspective of economic valuation bears on issues of justice (see below). The question of which of these values are captured by the ecosystem service concept strongly depends on how it is operationalised and implemented in practice. In the following sections we outline a path for a critical approach to its use.

We assert that axiological aspects enter the ecosystem services concept at various points, partly through the definition of the concept, and partly in its application (Luck et al., 2012) — with the definition depending to a considerable degree on the intended purpose. Underlying values already play a major role in how ecosystems are perceived and what is considered an ecosystem service. Therefore normative aspects are important both in the conceptualisation of ecosystem services and in their measurement and evaluation. The choices to be made reflect specific individual or societal values, or values of specific groups within societies. The next section will scrutinise these issues by identifying relevant ethical questions.

3. Ethical Questions Related to the Use of the Ecosystem Services Concept

Key ethical questions related to the use of the ecosystem services concept comprise: i) who makes the choices regarding use; ii) which values are included or highlighted and which are excluded or obscured; and, iii) who is impacted (positively or negatively) by choices regarding

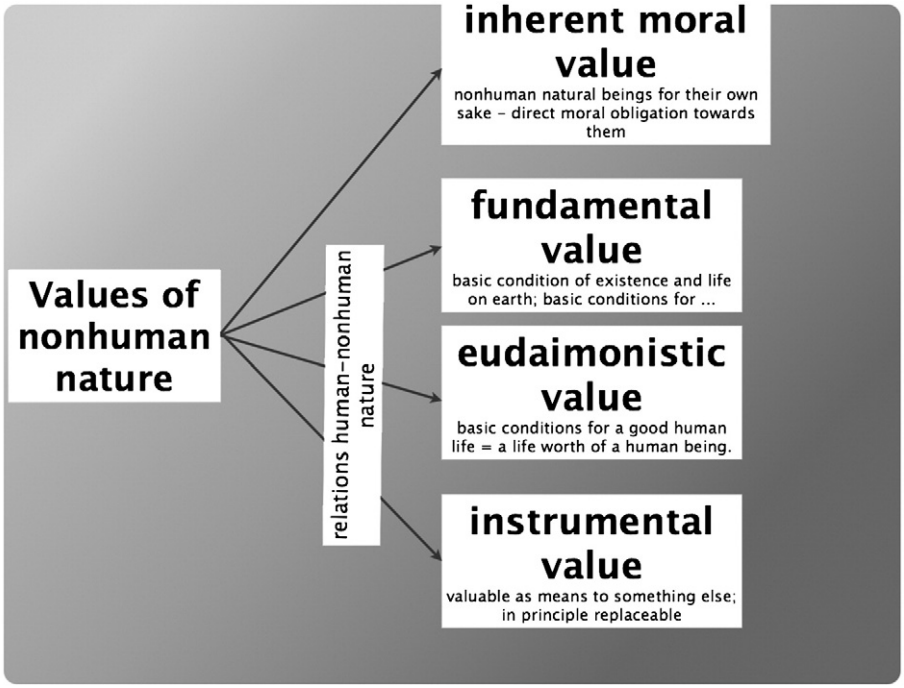

Fig. 1. Types of values of non-human nature as explained in the text. Please note that what is called here "inherent" value is called "intrinsic" value by some authors.

ecosystem service use (see Fig. 2 for these and other questions related to values and choices).

3.1. Who Makes the Choices and for What Purposes?

The core of the ethical perspective discussed here concerns the questions: Who has a voice that can be heard when defining, selecting and managing ecosystem services, and therefore who can make a difference? Who can actually establish and decide about the language(s) of valuation admitted into consideration and negotiation (Martínez-Alier, 2002)?

The ecosystem service concept was first brought up in the context of conservation biology (Daily, 1997; Ehrlich and Ehrlich, 1981) and landscape planning (e.g. de Groot, 1987; Niemann, 1977). Ehrlich and Ehrlich

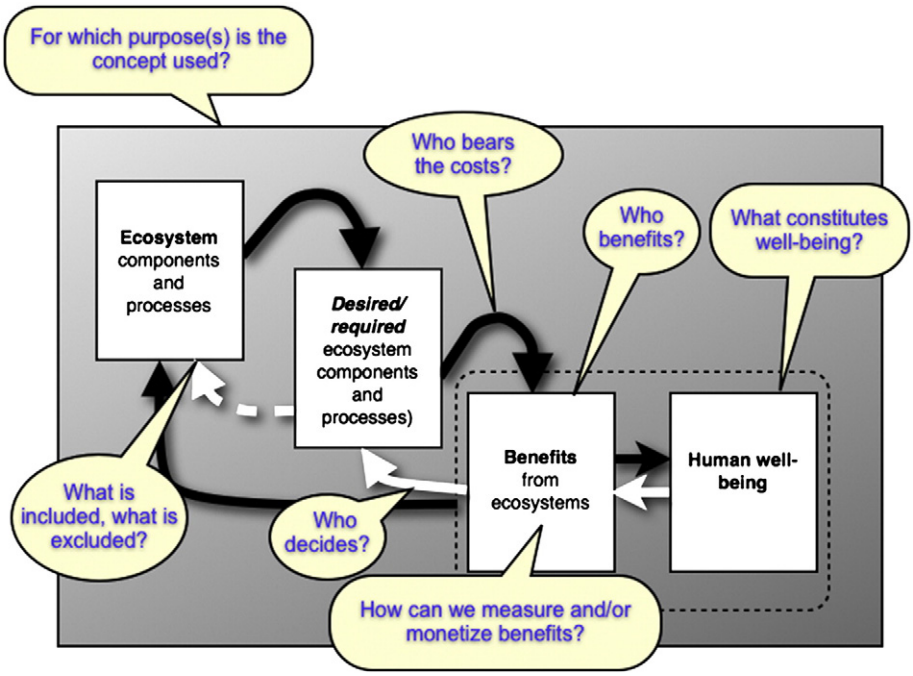

Fig. 2. The basic idea (or generic definition) of "ecosystem services" and ethically relevant questions related to the ecosystem services concept. While different definitions exist for the term "ecosystem services", the common idea is the causal relation (black arrows) that some components and processes of ecosystem provide benefits for human wellbeing. The use of ecosystems by humans in turn affects the systems. What counts as service, however, is subject to societal choices (white arrows) about what benefits are and which ecosystem processes and components are considered as desirable to promote these. Due to the hybrid nature of the ecosystem services concept, which includes descriptive and normative dimensions (related to values and choices), a number of ethically relevant questions can and should be posed in regard to the different components of the concept and its application. Most of these are dealt with in the text. Note that in some definitions the "desired/required ecosystem components and processes" are called "ecosystem services" in the narrow (measurable) sense, in others the "benefits derived from ecosystems".

(1981), and Daily (1997) framed their ideas about ecosystem services around concerns about the conservation of biological diversity, with the aim of arguing for the protection of nature. However, the notion of ecosystem services has also been used for several decades to demonstrate that nature is undervalued in terms of its importance to the economy (Costanza et al., 1997) and to human well-being (Daily, 1997, p. 1), again with a view to strengthening the argument in favour of nature conservation. The focus on human well-being became widespread with the Millennium Ecosystem Assessment (MA, 2005), in which the ecosystem services concept was used as the basis of global and sub-global assessments, and to represent the state of ecosystems in framing environmental policies. Building on previous research, the work of Costanza et al. (1997) situated ecosystem services into an explicit economic framework, which has found its culmination in TEEB (The Economics of Biodiversity and Ecosystems; see TEEB, 2010 and teebweb.org). More recently the ecosystem services concept has found its way into different policy fields, with politicians and other public and private decision makers becoming new voices shaping the debate, with ecosystem services and biodiversity not only being considered from a conservation perspective but also in respect of questions of economic efficiency (e.g. European Commission, 2011). However, while the concept has become more relevant for policies and management decisions, the voices of those who benefit "on the ground", or affect ecosystem services or are affected by their use, are less often heard. If some values and value languages are neglected through a specific definition and application of the ecosystem service concept, this neglect impinges on the well-being of those people who embrace these values, and therefore has moral relevance (Brondizio et al., 2010). It thus also touches on questions of justice.

For example, for the people of Dongria Kondh in Orissa, India, the Niyamgiri Hill is sacred (Martínez-Alier, 2009). That is, it is neither instrumentally valuable for the life of the community living nearby, nor an entity holding inherent moral value in the sense of moral dignity. Rather, it is a basic condition for the people to define themselves, to develop their concept of a 'good life', to care for future generations, and to give sense to their existence (i.e. holds a fundamental value). Merely instrumental language is not adequate to capture this complexity of relation to the Hill (Muraca, 2011). The Hill's contribution is directly parallel to how fishing as a way of life contributes to coastal communities: this way of life is of transformative value to these people, shaping who they are and what they value (Chan et al., 2012a, b). Many cultural ecosystem services may play such roles, and they are intertwined with other ecosystem services — e.g., the ecosystem production of fish for harvest is generally regarded as a provisioning service (Chan et al., 2012a).

Accordingly, if the ecosystem services concept is to enter the arenas of policies and management – as it already does – it cannot be left to scientists and politicians alone, but must be opened to the voices and choices of the different stakeholders involved, i.e. involve participatory approaches in different steps of definition and application (Chan et al., 2012b; see also Menzel and Teng, 2010).

3.2. Which Values are Highlighted and Which are Obscured?

An important and necessary clarification in the application of the ecosystem services concept is the notion of value. Within the discourse about ecosystem services 'value' is easily misread as merely denoting *monetary* value. However, from both the history of the concept as well as from many of its current uses, 'value' is by no means restricted to monetary value, even if much research has put the focus in this value dimension (e.g. Costanza et al., 1997). In fact, the MA does not place monetary values on ecosystem services and even the more economically focused TEEB study accepts the existence of multiple and non-commensurable value dimensions (Pascual et al., 2010, p.193; TEEB, 2010), stating that for specific types of ecosystem services, monetisation is inadequate or even misleading. It is also apparent that, especially in the context of accounting, cost–benefit analysis and Payment for Ecosystem Services (PES) schemes, the economic dimension has become more prominent, and the accompanying economic language has contributed to establishing the economic rationality of cost–benefit calculus in environmental policy, thereby paving the way, at least implicitly, for ecosystem service commodification (Gómez-Baggethun et al., 2010).

Commodification of ecosystem services has recently been criticised on the grounds that it can obscure the services' non-economic value dimensions behind an undifferentiated screen of money values (Gómez-Baggethun and Ruiz-Pérez, 2011; Kosoy and Corbera, 2010; Peterson et al., 2010). Commodification involves the transformation of all possible ecosystem services values into a single unit of exchange. This raises the issue of value (in)commensurability, i.e., the degree to which non-equivalent value dimensions (aesthetic, cultural, symbolic) can be expressed in a single metric (Martínez-Alier et al., 1998). For example, recent contributions have noted that money metrics are of limited use for capturing the values attached to the non-material benefits of cultural ecosystem services, which are – as above – inextricably intertwined with other categories of services (Chan et al., 2012b). Especially under the assumption of a far-reaching substitutability of natural capital with other sorts of capital, this then may lead to neglect of other non-monetary values of nature, such as inherent, fundamental, and eudaimonistic values.

In principle, monetary language need not exclude other value dimensions in that it may be complemented with alternative valuation languages and real processes of deliberation in ecosystem services valuation. However, due to its tangibility and seemingly easy usability, there is a risk that it will exclude other value dimensions in practice — if it becomes the dominant or only language actually employed, and if other value dimensions must be expressed in monetary terms to be considered at all. In fact, specific decision support frameworks that are widely used in ecosystem services research and policy, such as cost–benefit-analysis, preclude the inclusion of non-economic valuation by reducing all values to a single metric of money.

Finally, the focus on services that can be quantified tends to lose sight of the qualitative aspects and non-quantifiable values of ecosystems, which is important regarding cultural benefits and services (Chan et al, 2012b). Although biodiversity is increasingly perceived and dealt with as underpinning ecosystem services (e.g. Mace et al., 2012), the concept of biodiversity not only describes the number of different living beings, but references and values the individual uniqueness of genes, species and ecosystems, and thus their differences. As stated in the UNESCO 'Man and Biosphere' Programme: "Biodiversity is the property of living systems of being distinct" (Solbrig, 1991, p.9). This uniqueness is in danger of being neglected by a merely functional concept of ecosystem services. Any wetland can perform the function of sewage treatment – but in concrete environmental conflicts, a specific wetland means more to the people concerned than this function alone. They often perceive it as an "individual" entity with symbolic values that cannot and should not be replaced by anything else – even if the replacement is functionally equivalent.

Once the importance of integrating multiple valuation languages has been recognized, a remaining question is how different and non-reducible value dimensions can be consistently aggregated or combined to reach sound decisions. While this aspect is still poorly developed in the ecosystem services literature, recent contributions have taken important steps in this direction by providing practical guidance to analyse trade-offs across value domains in ecosystem service assessment (see e.g. Martín-López et al., 2013). Moreover, methodologies like multicriteria analysis allow for accommodating multiple values without necessarily reducing them to single metrics (Martínez-Alier et al., 1998; Norton, 2005).

3.3. Who is Impacted by Decisions Related to Ecosystem Services?

The selection of ecosystem services relevant for consideration has consequences for their management. Obviously some ecosystem services become a subject of management, while other potential services

may not be considered. Moreover, ecosystem services are certainly beneficial for some people but may also generate costs and burdens for others (e.g. when the production of energy crops imported by highly industrialised countries threatens the livelihood of people elsewhere). Thus questions of justice arise, which are fundamentally ethical questions. There are synergies within particular bundles of ecosystem services (e.g. on a local scale between some ways of timber production and clean drinking water) as well as trade-offs (e.g. between some food production practices and climate regulation) (Raudsepp-Hearne et al., 2010; Rodríguez et al., 2006), and often different groups of people are affected either beneficially or negatively by specific management decisions. There can also be conflicts between the use of ecosystem services and the protection of biodiversity or other human activities. The distribution of benefits and costs associated with the provision of ecosystem services is important across all scales, both spatial (e.g. global gain, local loss or vice versa) and temporal (use by present generation or options for future generations). The latter highlights the importance of the 'insurance value' associated with elements securing ecosystem resilience and stability (Armsworth and Roughgarden, 2003). Insurance values add a temporal dimension to the analysis by highlighting the importance of maintaining ecological conditions to secure ecosystem services flows over time in the face of disturbance and change, thereby preventing value myopia whereby actions are taken to achieve short term gains at the expense of inducing losses in ecosystem resilience.

The degree to which the problems described above become relevant depends on the way the ecosystem services concept is defined and used. The issue of value myopia, for example, is less relevant when an ecosystem services study is explicitly focussed on a small number of services and is conducted at a local scale (Goldman et al., 2010). In this case, it is obvious that the ecosystem services discussed do not claim to cover the 'whole ecosystem' and all possible value dimensions. Also, if stakeholders are involved on a regional scale and are able to add their own perspectives on the ecosystem services that are important for them, the dangers of social imbalance as well as myopia are reduced (Ash et al., 2010; Chan et al., 2012b).

As this discussion demonstrates, several ethical issues related to the ecosystem services concept derive from its hybrid nature which links ecological conditions and societal choices. In the next section we sketch how to deal with the ethical dimensions of the ecosystem services concept in a way that can take advantage of its strengths, without succumbing to possible pitfalls and drawbacks.

4. Improving the Ecosystem Services Concept by Increasing Transparency

The complex ethical problems identified in this paper point to the need for a responsible use of ecosystem services concepts. We suggest that the problems described above can be mitigated mainly by improving transparency in the way the ecosystem services concept is used. We argue that the ecosystem service concept should not be restricted to a narrow economic understanding while at the same time also recognizing the limits of its applicability. Improving transparency involves being aware of, and taking into account the complexities and ambiguities associated with the concept in terms of: 1) different definitions in different contexts, and purposes; 2) addressing (and respecting) different types of values; and, 3) considering possible trade-offs and conflicts in using it.

4.1. Clarifying Definition, Context, and Purpose

Within the various fields in which it has become prominent (i.e. conservation biology, economic valuation and accounting, policy formulation, etc.), the ecosystem services concept is used and defined in different ways and for different purposes. For example, at the *level of general societal discourses*, the ecosystem services concept is used to denote a *generic idea* or metaphor about the contribution of ecosystems to sustain life and human well-being, e.g. to facilitate communication between different disciplines and interest groups and to increase awareness of dependencies of human well-being on natural systems. By contrast, at the *policy level*, the concept is often used as an operational tool to support decision making processes, e.g. through the application of the ecosystem concept, say, to make explicit the trade-offs arising from different decisions regarding land-use policy and territorial planning. Finally, at the *management or 'site' level* ecosystem services are often treated as entities that can be measured and then expressed in monetary terms and potentially converted to commodities that can be traded in markets.

The different purposes for using the ecosystem services concept pose different demands in terms of the precision necessary for their definition and often imply different value categories. Making explicit the broader context within which the ecosystem service concept is used can therefore help avoid misunderstandings regarding the specific purpose the concept is serving (e.g. for awareness raising, policy guidance, damage compensation, rewards for stewardship, profit making), and by implication the ethical questions that arise.

Thus, for awareness raising, the concept can be used at a very general or metaphorical level, without the need to distinguish much between, for example ecological processes, benefits and values, nor even quantifying services in economic or biophysical terms. In this situation, however, it is important that space is given over to debates about different kinds of value, and the perspectives on those values that different groups might bring. By contrast, in the context of using cost–benefit analysis, ecosystem services may need to be biophysically quantified and valued in monetary terms, but only to a level of precision that will allow relative priority-setting between alternatives with an acceptable level of confidence. Nevertheless it must be recognised, that while values might seem precise, they may not reflect the value of ecosystem services themselves, but depend on other considerations. In some PES schemes agro-environmental payments are set at the level of the income forgone by land managers in making the intervention rather than the 'worth' of the outcome to society. In these circumstances moral questions about the appropriateness of making payments to individuals to stop them dis-advantaging others must arise: should the polluter pay?

4.2. Clarifying and Respecting Various Values and Valuation Languages

Since there are multiple and often conflicting approaches to the elicitation of ecosystem values, exercises of ecosystem services valuation should both acknowledge the existence of multiple values and valuation languages, and be explicit about the valuation approach that is being endorsed, the decisions context in which it is being used, and its underlying assumptions. This involves, on one hand, being clear about the specific value types that are addressed when making use of the ecosystem services concept (e.g. monetary, conservation-related, and/or cultural values). On the other, it involves being conscious of values that are not included (e.g. spiritual, inherent, deontological values), why they are not included (e.g. because they are considered less important or because they cannot be captured with the particular valuation method being used), and which other valuation languages and related tools may be considered as complements or alternatives (e.g. cost–benefit analysis, multi-criteria analysis, deliberative valuation and narratives). Equally important is being aware of the connotations associated with the use of a specific (e.g. economic) language, and if necessary adapt one's language to avoid unintended implications. Thus, even though one intends to use the ecosystem services concept to evoke values beyond economic ones, the terms used to explain the concept might be taken up in politics or the wider public arena in a narrow manner that overemphasises economic aspects and neglects other dimensions.

Clarifying values also involves avoiding use of imprecise formulations that conflate specific *value types* with the general notion of *value*; e.g. the expression 'taking the full value of ecosystems into account in decision making' is often used in introductions of valuation exercises that consist *only* of monetisation. It also involves the ethical imperative that, on grounds of social justice, we have 'duties and obligations' to find ways to ensure that different values to be considered in an equitable way.

4.3. Clarifying and Meditating Possible Conflicts and Trade-offs

The trade-offs and conflicts that arise from the uses of ecosystem services are not always obvious. For example, substantial *time lags* may exist before negative consequences (and thus trade-offs) from the use of some service become visible; they are often obscured by complex and sometimes poorly understood biophysical and/or social interactions, and account for much uncertainty in the sustainable and just use of ecosystem services. Another important reason why tradeoffs are not always obvious is that they are not just a matter of general biophysical conditions, such as when intense agricultural production interferes with drinking water provision from groundwater. They also depend on specific local conditions (such as specific production methods and economic potentials) and on the specific needs and preferences of various stakeholders. Depending on these needs and conditions, the same set of ecosystem services may be perceived as either synergistic or conflicting, and so either promote or impair needs and values of groups of people. For example, in a recent study in three European regions, stakeholders perceived of agriculturally produced food and of flood protection partly as being synergistic and partly as involving trade-offs. In one region (Saxony, Germany) stakeholders indicated that there was a strong negative impact of "agriculturally produced food" on "flood protection", while in Satakunta (Finland) they were perceived predominantly as synergistic. Yet, in the Finnish region not all respondents automatically assumed synergies and pointed out that the consequences of agriculturally produced food for other ecosystem outputs depended on the type of agriculture (Hauck et al., 2013). Also, depending on the stakeholders involved, a given ecosystem may be seen both as a source of benefits and disbenefits. For example, green areas in cities can be perceived both as pleasant sites for recreation or as scary and dangerous places (Bixler and Floyd, 1997). Likewise a large street tree may be seen by pedestrians as providing aesthetic benefits, while a person living in a building close to it may see it as nuisance blocking the views out of his or her window. Thus, involving stakeholders, especially at local and regional levels, early on in the definition and selection of relevant ecosystem services allows the clarification of synergies, trade-offs and conflicts across beneficiaries, across ecosystem services, and across different dimensions of value (Martín-López et al., 2013). Such engagement can foster a dialogue about the appropriate and just management strategies for ecosystem services that takes into account a broad array of values and interests (Ash et al., 2010; Chan et al., 2012b).

It is important to note that, though ecosystem services and biodiversity are often assumed to be closely related and mentioned in the same strategies (e.g. European Commission, 2011), the protection of either one of them does not necessarily foster the protection of the respective other (Rey Benayas et al., 2009). High biodiversity is often – but not always – needed to maintain the potential for a continued provision of ecosystem services, but the production of some ecosystem services can also have negative consequences for some components of biodiversity. The controversy here is unresolved, not the least because it covers several interrelated levels, namely: the biophysical level, concerning the biophysical relations between biodiversity and ecosystem services (see especially Mace et al., 2012); a conceptual level (what exactly is biodiversity and what is its place in an ecosystem services scheme); and, a pragmatic one (in terms of what degree projects devoted to ecosystem services and to biodiversity coincide in matching the aims of both approaches; Goldman and Tallis, 2009; Reyers et al., 2012). Behind the latter there is also a level of values and strategies, where dissent often occurs due to the unproductive juxtaposition of the attribution of inherent value to biodiversity and mere use values to ecosystem services. A more complex value system, as introduced above, can help to overcome this dichotomy and lead to more fertile discourses, especially when different stakeholders are involved. In fact, many values that are mostly dealt with under the heading of "inherent values" can also, and in a less dichotomous way, be captured by, for example, eudaimonistic values, which also attribute value to non-human entities beyond any use values. Dealing with this more complex typology will not always lead to the harmonisation of different values, but can result in a more differentiated way of identifying conflicts within specific settings. On the contrary, trying to harmonise different values within, as well as between both approaches (i.e. biodiversity and ecosystem services) may in fact lead to hiding conflicts which are unavoidable in some situations (Chan et al., 2007).

Conflicts and trade-offs between different ecosystem services and between the use of ecosystem services and other human activities also occur when considering broad-scale (global) flows of services and the benefits and costs related to them. Many ecosystem services (e.g. animal feed from soya, shrimps from shrimp farming) that are heavily used by people in developed countries are produced at the cost of the livelihoods of people in developing countries (e.g. through the destruction of forests with their various local ecosystem services and/or traditional lifestyles) (Martínez-Alier, 2002). Matters of distributive justice with regard to costs and benefits should be clarified and addressed in strategies of planning and managing for ecosystem services.

5. Conclusions

The idea of ecosystem services is important for biological conservation, natural resource management and environmental policy. It highlights human dependence on ecosystems and explicitly connects science and society. It therefore has a great capacity to foster inter- and transdisciplinary research and to foster and guide discourses about the appropriate use of nature between different interest groups. These strengths are intimately related to the fact that the concept is strongly value-laden. While this has been generally recognised, the precise nature of the value dimensions of the ecosystem services concept has been contested. In this paper we have described the value dimensions that are associated with the concept and discussed the ethical and practical issues emerging from them.

We argue that the simple juxtaposition of an economically understood ecosystem service perspective and an ethical perspective is not a useful one. In this sense we have tried to reclaim the concept as a useful one in terms of the wider ethical debates surrounding human–nature relations. The ecosystem service concept neither necessarily excludes the consideration of other than economic values nor does it capture the whole array of values which people connect with nature. Although there are ethical problems associated with the conceptualisation and use of the ecosystem services concept, many of them can be dealt with when it is clearly defined and by making explicit the specific aim, value dimensions under consideration, and possible trade-offs involved in specific decision- or policy-contexts. This can be achieved by adopting integrative perspectives that involve and balance different scientific disciplines and divergent stakeholder groups and perspectives. Different contexts and purposes entail different needs for the definition of ecosystem services, and these in turn have different ethical implications accompanying its use and influencing its usefulness. It remains an important consideration for the future to systematically scrutinise in which types of contexts the ecosystem services concept can be applied. We need to

better understand the manner in which it can be used, and also, where its use is inappropriate or unhelpful.

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