

Ethical Considerations in On-Ground Applications of the Ecosystem Services Concept

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The ecosystem services (ES) concept is one of the main avenues for conveying society's dependence on natural ecosystems. On-ground applications of the concept are now widespread and diverse and include its use as a communication tool, for policy guidance and priority setting, and for designing economic instruments for conservation. Each application raises ethical considerations beyond traditional controversies related to the monetary valuation of nature. We review ethical considerations across major on-ground applications and group them into the following categories: anthropocentric framing, economic metaphor, monetary valuation, commodification, sociocultural impact, changes in motivations, and equity implications. Different applications of the ES concept raise different suites of ethical issues, and we propose methods to address the issues most relevant to each application. We conclude that the ES concept should be considered as only one among various alternative approaches to valuing nature and that reliance on economic metaphors can exclude other motivations for protecting ecosystems.

Keywords: commodification, conservation policy, ecosystem management, environmental ethics, equity

The concept of ecosystem services (ES) has gained global attention in recent years as a framework for promoting the societal benefits of ecosystem conservation. This has been strongly influenced by widely read scientific publications and international initiatives, such as the Millennium Ecosystem Assessment (MA 2005) and The Economics of Ecosystems and Biodiversity (TEEB; Kumar 2010), and by increasing on-ground application of ES-related policy instruments (e.g., Tallis et al. 2008). Governments are increasingly integrating goals targeted at the protection of ES into their policy directives. For example, the governments of China, Costa Rica, Mexico, and Ecuador all have schemes to pay landholders who engage in management (e.g., protection of forest or improved agricultural practices) that secures the supply of hydrological services (e.g., clean water provision; Sánchez-Azofeifa et al. 2007, Liu et al. 2008, Muñoz-Piña et al. 2008). Global nongovernment organizations such as The Nature Conservancy, Conservation International, and the World Wildlife Fund have projects around the world for investments in market-based instruments that aim to protect ES and biodiversity. The increasing attention paid to ES can be attributed largely to the concept's potential to

promote a broader appreciation of the contribution of ecosystems to human well-being.

Practical applications of the ES concept are now becoming widespread (e.g., Goldman et al. 2008, Tallis et al. 2008) and include payments-for-ES (PES) schemes (e.g., Turpie et al. 2008), spatial planning (e.g., Lubchenco and Sutley 2010), greening of national accounting (e.g., Boyd 2007), and directing strategic arguments in high-level policy and lawmaking (e.g., Reducing Emissions from Deforestation and Forest Degradation [REDD]; Miles and Kapos 2008). The rapid growth in practical applications of the ES concept has illuminated ethical considerations related to its use. For example, concerns have been raised that an emphasis on financial valuations of nature may undermine other forms of valuation based on, for example, moral or cultural values (e.g., Chee 2004, Bowles 2008).

As the ES concept becomes increasingly integrated into environmental science and policy, the time is ripe for a comprehensive and reflective consideration of the range of ethical questions associated with the concept's application. Some critiques of ES have been focused only on a subset of the diverse, multifaceted applications of the concept. For

example, there has been particularly strong criticism of valuing nature in monetary terms (e.g., Child 2009, Sagoff 2011). However, many practical applications of the ES concept do not require such monetary valuations (e.g., education; land-use planning; strategic policymaking; and, in some cases, even PES schemes). It is important to identify which ethical issues are relevant to particular ES applications so that the most pertinent issues may be addressed in a given management context.

A comprehensive consideration of the range of ethical issues associated with different ES applications is also timely because many applications are relatively new and so some ethical facets are only just becoming apparent. Moreover, the debate on the ethics of ES that has been most accessible to ES researchers and practitioners has been focused mostly on the theoretical underpinnings of the approach, which has left the diverse range of practical applications unaddressed. Here, we focus attention on the most common on-ground applications of the ES concept and identify the main ethical issues associated with each application. We begin with a brief description of the range of practical applications. This is followed by a categorization of the major kinds of ethical issues and their relevance to applications of the concept. We then identify ways for addressing these issues to improve on-ground application of the ES concept. We finish with advice on how to integrate consideration of the ethics of ES into a broader ecosystem management framework.

Throughout the present article, we note where a misunderstanding of the major principles of the concept may lead to ethical concerns and where modifying the application of the concept is necessary to address these concerns. Contrasting the core metaphor of nature as a service provider with alternative metaphors describing the value of nature becomes more crucial as the ES concept gains prominence. Overreliance on economic metaphors in discussions about the value of nature may erode noneconomic

motivations for conservation and may lead policymakers to falsely conclude that there are possible equivalents (or substitutes) between economic and ecological values. We show that an exclusive focus on monetary valuations raises particular ethical issues, but we also demonstrate that different applications of the ES concept raise different types of ethical issues, and these issues can be addressed using a range of management approaches.

Applications of the ES concept

There are many and varied applications of the ES concept. We have grouped these into three broad themes—application as a communication tool, for policy guidance and the setting of priorities, and as a strategic objective in the design of policy instruments—to demonstrate the general association among the different applications (table 1).

The ES concept may be used as a tool to help communicate the importance of ecosystems and biodiversity to human well-being in a language that reflects dominant political and economic views. Communication may be focused purely on raising awareness or education, and prominent examples of this include the MA (2005), which raised awareness of the impacts of ecosystem change on human well-being, and TEEB (Kumar 2010), which raised awareness of the costs of policy inaction to halt biodiversity loss. The ES concept may also support strategic arguments designed to influence conservation decisions or to direct policy (EC 2011). Finally, the ES concept can provide a framework to guide and sometimes improve interdisciplinary communication among academic disciplines concerned with sustainability (e.g., ecology, economics, political science) and among academics, policymakers, and various stakeholders and interest groups (e.g., farmers, developers, conservationists).

Another important application of the ES concept is priority setting for policy guidance and decisionmaking support. The ES concept and related valuation tools are often used

Table 1. Applications of the ecosystem services concept.

Ecosystem service application	Themes	Examples
Awareness raising and education	Communication tool	MA, TEEB, Ecuador national mapping
Strategic arguments	Communication tool	European Union biodiversity strategy to 2020 (EC 2011), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
Interdisciplinary communication	Communication tool	Ecological economics, sustainability science
Cost-benefit analyses	Policy guidance or priority setting	
Green accounting	Policy guidance or priority setting	Integrated System of Environmental and Economic Accounts, Common International Classification of Ecosystem Services
Spatial planning	Strategic objective or policy instruments	Integrated coastal zone management
Land or resource management	Strategic objective or policy instruments	Natural Capital Project
Policymaking and law writing	Strategic objective or policy instruments	Kyoto Protocol, REDD
Multiobjective programs	Strategic objective or policy instruments	Ecosystem Services for Poverty Alleviation
Payments for ecosystem services	Strategic objective or policy instruments	Water fund, REDD, PES programs in Costa Rica and Mexico

Abbreviations: MA, Millennium Ecosystem Assessment; PES, payments for ecosystem services; REDD, Reducing Emissions from Deforestation and Forest Degradation; TEEB, The Economics of Ecosystems and Biodiversity.

to quantify ecological impacts and socioeconomic costs and benefits and to document the distributional impacts involved in different options for land-use planning. This serves to improve understanding of the broader effects of decisions (e.g., their impact on ecosystems and, indirectly, on socioeconomic systems) and to better inform approaches to balancing trade-offs. This application theme is arguably the best known and most controversial because it generally involves the monetary valuation of benefits obtained by people from ES. However, benefits are valued by different people in different ways, and the application of the ES concept allows these benefits to be more concretely conceptualized and, in some cases, paid for. Practical applications related to monetary valuation include cost–benefit analyses and green accounting (table 1). However, *valuation*—in the sense of scoring on the basis of importance—need not involve placing a monetary value on these benefits (e.g., Chan et al. 2012).

The ES concept may be referenced in various on-ground practices or policies in which ecosystem protection is one of the strategic objectives. In this way, the application of the concept can shape the approach taken for the design of policy instruments and project execution, including how projects are managed and how stakeholders are identified and involved. This type of application moves beyond simply trying to raise public awareness (as with communication) and influence decisionmaking (as in priority setting) and emphasizes attaining particular benefits delivered through policies or practices that protect ES. Practical examples include ES embedded in large-scale spatial planning (e.g., integrated coastal zone management; see, e.g., www.pegasoproject.eu), modifying land or resource management to promote service delivery (e.g., managing agricultural landscapes to support native pollinating species; Kremen et al. 2004), high-level policymaking and law writing (e.g., the Kyoto Protocol, REDD, and the Convention on Biological Diversity), PES (Kinzig et al. 2011), and multiobjective programs, especially those linked to a development agenda (e.g., Ecosystem Services for Poverty Alleviation, www.espa.ac.uk).

Ethical considerations in applying the ES concept

In this section, we classify ethical issues related to the practical applications of the ES concept into seven main categories.

Anthropocentric framing. Application of the ES concept raises ethical considerations, largely because the concept endorses an anthropocentric perspective that, in principle, is solely concerned with the attributes of nature that contribute to human well-being (MA 2005). The term *service* emphasizes the value that natural entities have for human purposes (i.e., their instrumental values) at the expense of an emphasis on their intrinsic values (Ludwig 2000). An anthropocentric bias in valuation is problematic, because, as some environmental ethicists have argued, nonhuman organisms merit consideration in and of themselves and not only in reference to what they can do for people (e.g., Callicot 1984, Naess

1989). Underlying the values that humans assign to nature are key metaphors that organize human thinking in favor of specific types of values at the expense of others (Larson 2011). Conservationists have always used various metaphors to characterize nature and its values. For example, John Muir (cited in Nash 1982, p. 168) referred to forests as “cathedrals of the people,” whereas others see nature as an organism (e.g., Lovelock 2000). To regard nature as a provider of services is one particular metaphor that carries different kinds of value connotations (Norgaard 2010). For example, it promotes valuing nature primarily through the benefits that humans derive from ecosystems and places these benefits in the same context as those delivered through human activities.

Economic metaphor. The metaphor that describes ecosystems as (natural) capital and ecosystem functions as (ecosystem) services adopts an economic framing, potentially favoring the expansion of the rationality of profit calculus to the environmental domain (Gómez-Baggethun and Ruiz-Pérez 2011). Some authors have been highly critical of this conceptualization (e.g., Callicott 1984, Naess 1989), because there are ethical concerns that refer to broader human interests than just the instrumental ones (Norton 2005). Adopting an economic language and metaphor to frame human–nature relationships implies the idea of possible equivalents (i.e., certain components of nature can be replaced completely by other components or human-derived alternatives). For example, an implication of possible equivalents is that the loss of a species and its various contributions to ecosystem function is completely compensated for by other species in the system or through human alternatives (e.g., the loss of biological control agents compensated for in all contexts through the use of pesticides). Although substitution and compensation for the loss of species and habitats may in some cases be economically rational, there are other rationalities that do not accept substitution. From the perspective of environmental ethics, one could also argue for the importance of recognizing nature’s intrinsic moral value and could argue that this value is inappropriately reduced when nature is subjected to simple economic measures based on, for example, the public’s willingness to pay (Sagoff 2011). As the ES concept increases in prominence, it becomes arguably even more important to contrast its core metaphor of nature as a supplier of services with alternative metaphors and ways of valuing nature (e.g., nature as kin; see the “Addressing ethical considerations” section).

Monetary valuation. Monetary valuation of ES is a specific instance of economic framing, and so it includes all of the concerns listed in the section above and is a major source of ethical controversy (Spash 2008, Child 2009). For example, the monetary valuation of species raises the ethical issue of the anthropocentric bias in how value is assigned across species. Martín-López and colleagues (2008) demonstrated that visible and well-known species (e.g., the giant panda

[*Ailuropoda melanoleuca*] or the mountain gorilla [*Gorilla beringei beringei*]) attract greater attention and, therefore, a higher willingness to pay from the public than do less visible and more poorly known species (e.g., microorganisms). This has important ethical implications in terms of, for example, how priorities are set and public funds are allocated for conservation.

Contingent valuation is a frequently used tool for the monetary valuation of ES because many services are not private goods, so they are generally not directly associated with existing markets. However, there is evidence showing that respondents to contingent valuation surveys often refuse to value nature in monetary terms (O'Neill and Spash 2000, García-Llorente et al. 2011). So-called *protest* responses (high individual bids, zero bids, or a refusal to bid) have been interpreted by some researchers as respondents' unwillingness to assign a monetary value to ecosystem components because they feel that this is an act of betrayal of a moral commitment (Svedsäter 2003). Moreover, proponents concerned with the distributional justice of the benefits and burdens of nature conservation have noted that the poor sell cheap; that is, people in need are willing (or forced) to accept lower sums of money for ES loss (Martínez-Alier 2002). Finally, some authors have objected to valuing ES in monetary terms on the grounds that it promotes the commodification of nature (e.g., Gómez-Baggethun and Ruiz-Pérez 2011).

Commodification. The commodification of ecosystem functions and biodiversity (i.e., the expansion of market trade to previously nonmarketed areas of the environment) is an important ethical consideration related to the application of the ES concept. Ethical concerns associated with the commodification of nature are not new. For example, under the rubric of *commodity fiction*, Polanyi (1957) scrutinized the commodification of land, arguing that such commodification involved subjugating the very essence of human societies to market forces. Polanyi (1957) wrote, "The economic function is but one of many vital functions of land. It invests man's life with stability; it is the site of his habitation; it is a condition of his physical safety; it is the landscape" (p. 178). Ethical controversies related to commodification have grown with the expansion of new market-based mechanisms for the management of ES (Spash 2008, Kosoy and Corbera 2010, Gómez-Baggethun and Ruiz-Pérez 2011). The commodification of nature is now a widespread phenomenon associated with a growing number of ecosystem functions (e.g., carbon sequestration, watershed regulation, habitat provision) that can be increasingly traded in markets through mechanisms such as PES, carbon markets, and biodiversity offsets.

Protest responses recorded in contingent valuation surveys, as was discussed above, have also been interpreted as resistance by the respondents to a representation of ecosystem components in a commodity-like fashion (Vatn 2000). According to some authors, this may reflect recognition by people that there are ethical limits to commodification (e.g., Douai 2009). A further concern with commodification

is the notion of the relational value of natural entities (Muraca 2011), which argues that human well-being rests on relationships with the human and nonhuman environment and that these relationships cannot be adequately commodified, because their very essence is uniqueness, not transferability. In fact, adopting the commodity metaphor that is often implicit in the ES concept implies the idea of possible equivalents and of the capacity to substitute and compensate for the loss of species and habitats (e.g., tradable development permits in habitat and wetland banking; Spash 2008).

Sociocultural impact. The use of market instruments in the application of the ES concept raises ethical questions about the sociocultural impacts of these instruments, especially when they are applied in rural or indigenous communities where external markets may be a relatively new phenomenon. Sociocultural impacts (which may be either positive or negative) can include long-term changes in quality of life, independence, attitudes or belief systems, culture, security, the empowerment of women, community identity, or other changes in behavior and motivations for conserving nature (Gómez-Baggethun et al. 2010). Assessments of sociocultural impacts related to the application of the ES concept must be focused on both short- and long-term effects, because these can vary. For example, although short-term assessments of PES schemes have shown increased income to payee communities, there may be longer-term social impacts of these schemes, and anthropological evidence from integrated conservation and development programs suggests that the likelihood of long-term impacts is real (e.g., West 2006), and those impacts can include the loss of tenure rights, changes in social institutions (such as marriage), and a reduction in cultural diversity. The lack of reliable data to address the long-term effects of PES and other economic instruments that build on the ES concept is partly a consequence of the lack of adequate monitoring and is partly because sociocultural impacts are often indirect and difficult to measure and, therefore, tend to go unobserved or unrecorded (Caplow et al. 2010).

Although the empirical basis for addressing this issue is still weak, there is emerging evidence of cultural impacts from the application of PES schemes (Grieg-Gran et al. 2005). For example, research on PES programs in Central America and Uganda has documented a loss of customary tenure rights or access to the commons (Corbera et al. 2007, Carter 2009), whereas similar research in Mexico has reported reductions in dietary diversity and a loss of cultural practices (Ibarra et al. 2011). Moreover, eligibility criteria to participate in PES programs have made it difficult for the poor to participate, usually because of the requirement of a land title in order to establish the contract (Corbera et al. 2007). Because cultural changes are often slow, addressing the ethical question of the full range of sociocultural impacts of PES programs and other ES applications will require robust assessments of baseline conditions and medium- to long-term monitoring.

We believe that comanagement schemes in which government agencies work in collaboration with local communities would be well positioned to conduct this monitoring to ensure year-to-year consistency in assessment procedures and the longevity of funding support.

Changes in motivations. An important ethical question raised in relation to the establishment of economic incentives to secure ES supply relates to potential changes in motivations for protecting the environment. It has been argued that the very conceptualization of ecosystem functions in economic terms can affect motivations for conservation and may favor utilitarian logic in understanding human–nature relationships (Vatn 2000). Furthermore, empirical data from behavioral experiments suggest that environmental policies based on economic incentives such as PES involve a risk of eroding noneconomic incentives for environmental stewardship, a phenomenon often referred to as *motivational crowding out* (Bowles 2008, Vatn 2010). For example, Vatn (2010) argued that although PES may strengthen community relations and may simplify necessary actions for environmental care, these schemes may also introduce instrumental logic and may, in some cases, worsen the status of the environment by crowding out other environmental virtues. This issue can be particularly problematic, because further empirical evidence from experimental economics suggests that once the motivational change has taken place (i.e., an economic incentive replaces a moral incentive), it may be difficult to return to the original motivation even if the economic incentive disappears (Gneezy and Rustichini 2000). Moreover, if monetary payments are not large enough to compensate for the opportunity cost of conservation (e.g., restrictions on obtaining an income from the conserved land), instruments such as PES might be counterproductive (i.e., they might result in weaker conservation outcomes).

Equity implications. Independent of the question of how ES are valued is the fact that protecting the supply of services can bestow asymmetric costs and benefits to different sectors of society. This raises the important issue of the ethically appropriate assignment of costs and benefits. Problems such as these are the essence of environmental justice, focused primarily on the fair distribution of environmental costs and benefits and the procedural aspects of attaining this distribution (Schlossberg 2007). This is directly relevant to the management of ES. For example, in China, upstream landowners are required to manage forest cover to ensure the ongoing supply of hydrological services primarily to downstream beneficiaries (Liu et al. 2008). However, protection of forests could represent an opportunity cost to upstream landowners who may wish to clear the land—for example, to grow crops. Upstream suppliers may rightfully claim monetary compensation (e.g., PES) for engaging in land management that benefits others (at a potentially personal cost). However, one might argue that upstream landowners have a preexisting moral obligation not to harm others by

the aforementioned land clearing. Environmental justice concerns are also relevant when, for example, a landholder utilizes ES for his or her personal profit (e.g., harvesting timber) but subsequently compromises the provision of other ES that may benefit the broader community (e.g., carbon storage, water filtration, recreation). An assessment of the value of the lost ES is fundamental to identifying a fair distribution of costs and benefits.

Although the discussion above relates primarily to intragenerational equity, intergenerational equity is an equally relevant component of environmental justice concerns and the ethics of ES. Ethical considerations arise, for example, when current generations consider giving up current income for the benefit of future generations, or the opposite—gaining benefits now at the expense of future generations (TEEB 2008). The preferences expressed in current markets cannot capture the preferences of future generations. Discount rates are the solution generally suggested by economists to address this problem. However, these discount rates are often arbitrarily fixed and tend to undervalue the interests of future generations by using rates that are too high (Martínez-Alier 2002). For example, TEEB reported that “a 4% discount rate means that we value a natural service to our own grandchildren (50 years hence) at one-seventh the utility we derive from it” (TEEB 2008, p. 5). One way of tackling this issue is to use discount rates that are variable—that is, much higher in the near future than in the more distant future—to account for the reality of personal discounting and the ethics of social discounting for future generations (Sumaila and Walters 2005). TEEB (2008) advocated using social discount rates, which engage ethical aspects involved in choices such as consumption now versus later or consumption for society versus consumption for individuals.

Addressing ethical considerations

In this section, we outline the ethical concerns pertinent to each application of the ES concept and describe strategies to address these concerns. In certain cases, it may be appropriate to simply provide a more detailed explanation of the major principles of the ES concept to alleviate ethical concerns. In other circumstances, modifying how the concept is applied on the ground is crucial to addressing ethical issues (table 2).

Ethical concerns related to anthropocentric and economic framing pertain to all the applications that explicitly refer to the ES concept (i.e., nature as a source of services). In relation to communication tools (i.e., raising awareness, strategic arguments, interdisciplinary communication), the use of economic framing alone may be avoided by explicitly employing multiple metaphors to describe nature—for example, nature as material life support, nature as sacred, nature as kin, or humans as stewards of nature. The economic metaphor does not necessarily need to be central to any communication regarding how ecosystems contribute to human well-being. Communication about the multiple ways in which nature not only sustains but enriches human lives

Table 2. Addressing ethical considerations for each application of the ecosystem services concept.

Ethical considerations	Most relevant practical applications	Addressing ethical considerations
Anthropocentric framing and economic metaphor	All	Employ multiple metaphors to describe nature (e.g., stewardship of nature). Consider the ecosystem services concept as one of many possible management options.
Monetary valuation and commodification	Policy guidance and priority setting, strategic objective and policy instruments	Employ nonmonetary measures of valuation (in addition to or instead of monetary measures). Consider the most appropriate design of nonmarket valuation (e.g., choice experiments). Promote approaches to managing common-property resources. Restrict commodification to certain types of ecosystem services (e.g., food production) and ban it for others.
Sociocultural impact	Policy guidance and priority setting, strategic objective and policy instruments	Emphasize community rather than individual benefits. Develop baseline assessments and long-term studies of the impacts of particular applications. Adopt the precautionary principle when the impacts are potentially significant.
Changes in motivations	All	Consider the design of motivational incentives in relation to the context. Employ instrumental incentives that enhance or complement intrinsic incentives. Acknowledge up front the various motivations for protecting nature.
Equity implications	Policy guidance and priority setting, strategic objective and policy instruments	Identify the societal sectors that experience costs or benefits from ecosystem-service management. Employ fair compensation to those experiencing costs (e.g., through payments for ecosystem services [PES] schemes). Design PES schemes as redistributive mechanisms or as compensation for ecological debts.

moves far beyond narrow human self-interest and includes aspects such as emotional attachment, cultural meaning, or aesthetic experience.

When deciding on the most appropriate metaphor to use to communicate the value of nature, it is pertinent to consider the target audience. For example, some policymakers or economic rationalists may more easily dismiss noneconomic arguments for protecting ecosystems, especially where monetary valuation is central to guiding decisions among competing values. However, deeply held personal values may trump economic rationalism; therefore, a detailed understanding of the personal and professional backgrounds of message recipients is likely crucial to successfully conveying the value of nature.

In providing policy and priority-setting guidance and in developing strategic objectives and designing policy instruments, the ES approach is only one potential strategy for achieving desired outcomes in nature conservation and improving human livelihoods. Acknowledging the legitimacy of alternative approaches and valuation languages for conserving nature helps to avoid any one strategy, including the ES concept, dominating the conservation discourse. To achieve this objective in the current context, instead of beginning

with the ES concept, one might take a comprehensive, deliberative, and inclusive approach to addressing management issues, including an appropriate framing of the problem and choice among available management options (see the “Placing ES in a broader management context” section).

Concerns about the monetary valuation of nature relate primarily to priority-setting applications and, to a lesser extent, the design of policy instruments. To address these concerns, it may be possible and appropriate to employ nonmonetary measures of valuation either alone or in concert with monetary measures (table 2). For example, Chan and colleagues (2012) described eight dimensions of values pertinent to appropriate valuation and decisionmaking in the context of protecting ES, including whether the values at hand are associated with consequences, moral principles, or virtues or whether they are best understood as characteristic of groups versus individuals. When and if using monetary measures for valuation is desirable, attention should also be given to the most appropriate design of nonmarket valuation. For example, it might be desirable to employ choice experiments, in which monetary values can be

derived from choices among alternatives in which monetary measures are but one variable among several others (e.g., the choice between different types of vacations to Vancouver Island, Canada, that may involve seeing sea otters, a guided wildlife tour or other organized activities, various kinds of accommodation, and an associated cost). This approach may be more useful than traditional contingent valuation in which stated monetary values are requested directly (e.g., *How much would you be willing to pay?*).

Ethical questions raised by the commodification of nature relate primarily to policy-instrument applications and, more specifically, to those implying tradable permits for ES manipulation (e.g., carbon markets, wetland banking, biodiversity offsets). Addressing commodification concerns may be partly achieved through promoting approaches to manage common-property resources rather than privatizing resources. For example, PES programs can be seen as a means of privatizing a resource that previously had some qualities of a public good (Kinzig et al. 2011) and is an attractive option for managing for sustainability if the arguments related to the tragedy of the commons are accepted. However, Ostrom and colleagues (1999) demonstrated that such tragedies can be avoided through collective action

even in the context of common-pool resources. Concerns associated with commodification may also be addressed by restricting commodification to certain types of ES or benefits in contexts in which markets are already widespread (e.g., food production) and even banning it in specific environmental domains. The latter option would be appropriate for benefits directly linked to vital social values or processes, to ES covering basic conditions for life (conceivable as *rights*), and to ecological processes and components for which there may not be economic substitutes and for which private property rights can have undesirable effects (e.g., clean air, potable water).

Ethical concerns regarding sociocultural impacts pertain mostly to the priority-setting applications of the ES concept and, to a lesser degree, to designing policy instruments. Addressing sociocultural ethical concerns in general effectively requires baseline assessments accompanied by long-term studies of the impacts of a particular application across diverse communities and adoption of the precautionary principle when it is necessary. What limited evidence exists (see the “Sociocultural impact” section) suggests a loss of common-access rights and little benefit for poorer people in PES scheme implementations in developing countries. Tackling these concerns may require a greater emphasis on community rather than on individual benefits and rights (table 2).

Ethical concerns around changes in motivation are relevant to all ES applications that appeal to self-interest or that invoke new incentives for conserving nature. The concerns about motivational crowding out can be addressed largely by adequate design of the motivational incentives in relation to the contexts in which they are applied (see Bowles 2008). The behavioral outcomes of incentives depend on a variety of factors, including the nature of motivations and the type of incentive, and the likelihood of motivational crowding out is higher when habits have an important prosocial component, intrinsic or moral motivations are salient, and rewards are monetary and relatively low (Lacetera and Macis 2010). In this context, a key challenge is to identify institutional designs for motivational structures in which intrinsic and utilitarian values complement each other and to identify situations in which the use of utility-based rationales (e.g., financial incentives) may undermine the moral sentiments for conservation (Bowles 2008). Initiatives will more successfully appeal to intrinsic and instrumental motivations if they are explicit about the moral value of an action and also offer technical or financial assistance—or both—toward that action. Initiatives must also explicitly acknowledge the various motivations and reasons for protecting and managing nature. The associated communication strategy must convey the message that monetary values of ES are minimum values only and that intangible values related to, for example, cultural services are priceless (see TEEB 2008, figure 3.2, which places monetary values of ES in context). Apart from prudential reasons that appeal to self-interests, communication strategies should also stress moral reasons

(which involve arguments of justice) and ethical reasons that pertain to specific ideas about what humans need in order to lead a good life (Eser 2009).

Equity implications and environmental justice concerns relate mostly to priority-setting and policy-design applications. These concerns can be alleviated through comprehensive identification of the sectors of society that experience costs or benefits from the management of a given ES in a given context. Such identification enables management of the service designed to yield a fair distribution of the costs and benefits (e.g., through PES schemes or through a fair distribution of property rights).

Placing ES in a broader management context

Addressing ethical concerns related to the ES concept requires also placing the approach within a broader policy and management context—that is, treating it as one possible management strategy alongside the many others that are related to the fields of action-orientated research and evidence-based policy or management. This allows the full gamut of ethical questions to be raised and the answers to be compared across different possible management approaches. Central to these approaches is the issue of *problem framing* (or *problem recognition*), which involves individuals, communities, or organizations coming together to agree that there is a problem that ought to be addressed.

The ES approach is often accompanied by a zero-price-problem narrative of ecosystem goods with public good character (Kinzig et al. 2011), which is just one way in which problems can be framed. Contemporary approaches to environmental management—particularly those that have evolved out of the sustainability debate—often take the position that problem framing must be done in an inclusive, participatory way and must be based on interdisciplinary frameworks that involve scientific experts, policymakers, and stakeholders (Munda et al. 2008). If it is accepted that procedural legitimacy can be strengthened through democratic and participatory approaches, the ethical issues that follow are related to whether the process of problem framing can identify the relevant stakeholders, how powerless stakeholders would be given a voice, and whether the ES concept is appropriate for the particular context.

A key principle of inclusive ecosystem management, in which, it could be argued, the ES approach is embedded, is that decisions about resource use are a matter of social choice (Potschin and Haines-Young 2011). If actions related to ES management are to appropriately address ethical considerations, the decisionmaking process must involve a clear articulation of management options to allow informed choices to be made. A criticism of stakeholder engagement is that it is often misused as a way of legitimizing decisions that have already been made and pays only lip service to consultation (Shepherd and Bowler 1997). Stakeholders may be more willing to take ownership of solutions that they had a role in developing.

Central to the ES approach is evidence-based decision-making, which is designed to integrate understanding (with

available evidence) of the social implications of environmental change across all stakeholders. However, there is a risk that ES applications may entrench existing inequalities, because some stakeholders have greater access to evidence and its integration into decisionmaking than do others (Ferraro 2008). In order to mitigate these political-economy kinds of ethical issues, decisionmakers should be transparent and inclusive regarding the type and availability of evidence and regarding how that evidence is scrutinized. This includes establishing at the outset the use of quantitative or qualitative data as evidence, how to treat uncertainty, the roles of different stakeholder groups in evaluating the evidence, how to ensure equitable access to information, and the tools needed to process and analyze the information. A fair process is likely to facilitate fair outcomes, but since some stakeholder groups may not possess even the capacity to effectively advocate for a desirable process, arrangements to ensure that all parties have effective advocates is essential (Ferraro 2008).

Regardless of the evidence base, choices regarding actions will eventually be made, and at this point, ethical issues become most apparent, because the process generally involves using a set of criteria to weigh the consequences of alternative choices. Much of the debate surrounding the major ethical issues listed above concerns the nature of the criteria used to assess choices. For example, the monetary valuation of nature is only one approach, or one possible valuation language, to demonstrate the importance of the natural environment to humanity (Martínez-Alier 2002, Chan et al. 2012).

In many situations, multiple criteria are used to assess choices, even when most stakeholders agree that economic values are a significant element in their decisionmaking process (Munda 2008). For example, it is widely acknowledged that the valuation of marginal changes in the economic value of ES can be meaningful only when socioecological systems are not close to a tipping point or regime shift (e.g., Limburg et al. 2002, Fisher et al. 2008). In the context of sustainability science, for example, the criteria used to evaluate policy or management proposals should be based on an inclusive, deliberative, and participative process and should also be revelatory and designed to minimize the number of losers (O'Riordan 2000).

Once a decision has been made, the management action to be implemented will also probably raise ethical issues. These issues may actually be included in the criteria that are considered during the choicemaking process, but it is worth separating the implementation phase from the earlier phases in order to emphasize that ends do not necessarily justify means. For example, it may be economically efficient to pay landowners to supply a particular ES (e.g., water filtration), but, as was discussed above, from the perspective of environmental justice, it may not be morally appropriate to compensate landowners for not undertaking actions that may be considered damaging to other sectors of society. The rights and responsibilities associated with the ownership of land or resources have to be part of the ethical debate surrounding

the appropriateness of the ES concept (Corbera et al. 2007, Vatn 2010), along with scrutiny of the balance between private and public goods and benefits.

As we argued above, decisions and actions with regard to ES occur in the face of substantial uncertainty. The outcomes of actions must therefore be monitored, and the actions must be modified if the outcomes are not desirable. Monitoring and adaptive management (i.e., learning from mistakes) is vital to demonstrate the appropriate expenditure of funds and to show that the expectations of stakeholders and wider society have been met without significant unintended consequences. The motivation for adopting this type of adaptive management is technical (owing to uncertainty) and ethical. That is, we argue, it is ethical to reconsider the initial decision if evidence suggests that the outcomes from that decision are unacceptable.

Conclusions

The ES concept is applied in many different contexts, which yield different consequences and raise different suites of ethical issues. Although the economic framing of ES in general—and their monetary valuation in particular—have received special attention, this emphasis does not (and should not) necessarily lead to a denial of the nonuse and intrinsic values of nature. These particular values may not be central to economic conceptualizations of the benefits of nature, but there are means for effectively integrating intangible and noneconomic values into ES practice (Chan et al. 2012). Applications of the ES concept that involve the monetization or commodification of nature raise a raft of ethical issues that are not necessarily pertinent to using the concept to raise awareness or develop strategic arguments. Therefore, it is vital to recognize the context dependence of ethical concerns to ensure that the most relevant concerns are addressed for a given application.

The increasing prominence of the ES concept has occurred in parallel with the rise of a globalized economy, increasing privatization of public assets, greater government deregulation, and economic rationalism. This environment is challenging for promoting nonmonetary values of nature, and local communities that elevate intrinsic values above all else may be economically disadvantaged, especially considering the increasing opportunities afforded by global trade. For example, the global trade in timber means that forest resources can be harvested from a number of locations, and local communities that promote these instrumental values of forests may experience greater financial reward than those that do not, putting increasing pressure on the latter to abandon some of their intrinsic values, especially in times of economic hardship. Some policy instruments (e.g., REDD) are designed to address this issue by establishing financial incentives for forest protection. However, these instruments are very new, and their capacity for long-term protection is untested. Promoting the intrinsic values of nature will likely become increasingly difficult with growing economic uncertainty.

Our approach provides both generalized and specific recommendations. Several commentators have emphasized the importance of place and context in terms of, for example, understanding the values and trade-offs related to ES (e.g., Martín-López et al. 2008, Sagoff 2011). We argue that the treatment of ethical issues is no different and that few principles can be applied universally. A major challenge, then, is to ensure that the actors in any particular application of the ES concept are sensitive to the range of possible ethical considerations and that these considerations are treated alongside other issues in a reflective and deliberative fashion.

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