The Justices and Injustices of Ecosystem Services

Humankind benefits from a multitude of resources and processes that are supplied by ecosystems, and collectively these benefits are known as ecosystem services. Interest in this topic has grown exponentially over the last decade, as biologists and economists have tried to quantify these benefits to justify management interventions. Yet, as this book demonstrates, the implications for justice and injustice have rarely been explored and works on environmental justice are only now addressing the importance of ecosystem services.

The authors establish important new middle ground in arguments between conservationists and critics of market-based interventions such as Payment for Ecosystem Services. Neither can environmental management be separated from justice concerns, as some conservationists like to believe, nor is it in fundamental opposition to justice, as critics like to put it. The book develops this novel interpretation of justice in environmental management through analyses of prominent governance interventions and the conceptual underpinnings of the ecosystem services framework. Key examples described are revenue-sharing around protected areas and REDD+ for forest ecosystems.

The analyses demonstrate that interventions create opportunities for enhancing social justice, yet also reveal critical design features that cause ostensibly technical interventions to generate injustices.

Thomas Sikor is Professor of Environment and Development, University of East Anglia, UK.

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Edited by Thomas Sikor

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Chapter 6

Environmentalisms, justices and the limits of Ecosystem Services Frameworks

Sharachchandra Lele

Introduction

The idea that humanity is facing major environmental challenges has gained ground over the past century. But there are major variations in how environmental 'problems' and 'the environmental crisis' are understood and framed, resulting in the emergence of different 'environmental-isms' over this period (Guha, 2000). The back-to-the-land reaction to industrialization differs from the wilderness movement, the protests against environmental pollution triggered by Rachel Carson's work or the call for heeding global resource limits presented by the Club of Rome. Each of these environmentalisms emphasizes particular values or normative concerns along with particular understandings of the society–nature relationship (and of society itself) to lead us to particular sets of solutions to the environmental crisis. An important strand or set of strands within these environmentalisms is what in the Global South is called the 'environmentalism of the poor' (Guha, 1997) or 'environmental justice' more generally (see Introduction). These -isms correspond loosely with differing perspectives within academia on the environment–society relationship (see Robbins *et al.*, 2010). For instance, 'political economy of the environment' is the academic perspective best corresponding to the environmental justice strand in environmentalism.

Over the past decade or so, the Ecosystem Services Framework (ESF) has emerged as an alternative perspective on the environment–society relationship that has captured the imagination of researchers, advocacy groups and policy-makers (see Introduction). While the idea that human society benefits from the environment or nature in various ways, both directly and indirectly, is hardly new, the ESF emphasizes the magnitude, breadth and criticality of this dependence and, broadly speaking, suggests that recognizing this dependence in economic terms and incorporating these values in decision making can substantially resolve the crisis we are facing. Following the Millennium Ecosystem Assessment (2005), a rapidly expanding literature has emerged in academia that seeks variously to identify,

measure and value ecosystem services (Fisher *et al.*, 2009). And this literature appears to have triggered policy shifts of two kinds. On the one hand, policy makers are asking for economic assessments or valuations of how biodiversity and ecosystem service loss might be translating into welfare loss (such as *The Economics of Ecosystems and Biodiversity* commissioned by the European Union: Sukhdev, 2008). Recently, ninety governments agreed to set up the Intergovernmental Platform on Biodiversity and Ecosystem Services (www.ipbes.net). On the other hand, a number of Payments for Ecosystem Services (PES) schemes have been launched, spanning watershed services, biodiversity conservation, and of course now carbon sequestration.[1] Not surprisingly, a recent editorial in *Nature* suggested that 'ecosystem services [have entered] into mainstream scientific and political thinking' (Anonymous, 2009).

How does the Ecosystem Services Framework speak to the normative concerns underpinning environmentalism in general and the concern for environmental justice in particular? This is the question I attempt to address here. In line with the concepts discussed in the Introduction, I use the idea of 'framing' (Mitchell, 2002; Leach *et al.*, 2010) as a starting point. The concept of framing argues that there are no 'perfect' ways of looking at or characterizing problems (Rittel and Webber, 1973). Each perspective comes with a set of values, assumptions about what matters and what does not (salience), and scales of analysis. At the same time, it is possible that some perspectives are more inclusive (speaking to multiple values) or may have more robust characterizations of reality than others. Applying the idea of framing to this enquiry, I first try to locate the idea(s) of environmental justice within the idea(s) of environmentalism, arguing for a 'multi-valent' notion of environmentalism and justice within it. I then review the ES framework and its variants, attempting to delineate the normative and analytical choices made consciously or unconsciously. I then examine how these choices allow or inhibit a multi-valent and analytically adequate understanding of the environmental problem. In conclusion, I offer some thoughts on how the ESF might be reframed not only to better address justice issues but also the wider environmental problem.

Environmentalism and justice

The ideas of justice and environmental justice have been reviewed comprehensively in the Introduction by Sikor. I summarize them in my own words and with some additions here. In brief, justice has at least three dimensions: equity or justness of outcome (what Sikor calls distribution), procedural justice (what Sikor calls participation) and recognition. The environmental literature makes two-fold additions to the justice discourse, one at the normative level and the other at the analytical level (what Sikor calls mechanisms of (in)justice). At the normative level, environmentalism broadens

the content of the idea of justice to cover not just intra-generational justice between human beings, but also inter-species justice (fairness to other living organisms) on the one hand and inter-generational justice (fairness to future generations) on the other. Note that these two kinds of justice arguments emerge from very different corners of the environmental movement: the deep ecologists and the sustainability folks respectively. Their proponents may have a conflictual relationship with those who focus on intra-generational justice, because the deep ecologists skip the question of intra-human justice before talking about justice to other beings (Guha, 1989) and because the sustainability folks similarly ignore intra-generational injustices by promoting a 'lifeboat ethics' or the notion of 'our common future' (Thrupp, 1990).

At the analytical level, while environmental movements have invoked the idea of justice and therefore been informed by the social justice literature, including the central idea of political economy, environmental thinking has also broadened the 'mechanisms of justice' literature by showing how biophysical processes, environmental science and technologies of natural resource use (not just social structures of resource access) are implicated in the creation of injustices at various levels: within households, between caste/ethnic groups, and across nations (e.g. Roy, 1985; Hecht, 1985).[2]

At the same time, it is important to understand and acknowledge the points of tension between the wider environmental discourse and the environmental justice discourse (for details, see Lele and Jayaraman, 2011; Lele, 2011). At the normative level, expanding 'justice' to include inter-generational and inter-species justice still leaves a significant fraction of the environmentalist community outside the justice movement. Conservation cannot be reduced to inter-species justice because many people wish to conserve wildlife or plants for religious, spiritual or aesthetic reasons (Mace *et al.*, 2012), not because they want to be fair to these species. Even existence value is not identical with the animal rights argument (Hayward, 1998). In fact, the fairness argument goes only so far: people may oppose eating of meat or the horse carriages on grounds of animal rights, but they cannot survive without eating plants, which are also living organisms. The emerging literature on the psychology of conservation suggests that quality of one's own life rather than that of others may be a major factor motivating conservation (Hågvar, 1998). Similarly, concern for sustainability cannot be reduced to concern for inter-generational equity, because one may simply be worried about one's own future five or ten years down the road (Lele, 1993).

At the empirical or analytical level, if political economy is the analytical framework for understanding why environmental injustice occurs, it works best (but even then not always) for explaining the presence of intra-generational injustice. Often, the cause of unsustainable resource use – i.e. use

that results in future loss to the same person or his/her descendants – may not be the absence of rights for future generations but the absence of tenurial security or a belief in infinite substitutability between biotic and abiotic nature.[3] The former points to the need for reforms in property rights institutions, while the latter points to the need for a better understanding of biophysical limits to human well-being. Similarly, given that there will always be an asymmetry of power between human beings and other animals, the political economy framework does not suggest a way to achieve conservation goals. Unless human beings change their value systems, there may be little hope for wildlife.

Any assessment of a new framework for the environment–society relationship must therefore be made keeping in mind not only the multiple ideas of justice, but other normative ideas of environmental soundness, green-ness, sustainability, quality of life and so on, i.e. the multi-valent nature of environmentalism itself. Similarly, one must ask whether and how the new framework explains different human decisions driving different processes of environmental degradation, i.e. how the framework incorporates the complexity of socio-environmental phenomena. I shall now proceed to review the concept (or, as we shall see, concepts) of ecosystem services from this perspective.

The Ecosystem Services Framework, variants and choices made

In order to understand the choices made in the ESF, it is important to understand what the ESF is and how it is practised. The MEA is normally taken to be the defining point for the ecosystem services discourse, a point at which it went from being an idea pushed by a few ecologists or economists to a globally accepted framework. As per the MEA framework document (Millennium Ecosystem Assessment, 2003, 3), ecosystem services are 'the functions and products of ecosystems that benefit humans, or yield welfare to society', including 'products such as food, fuel, and fibre; regulating services such as climate regulation and disease control; and nonmaterial benefits such as spiritual or aesthetic benefits'. Its core argument is that human well-being depends critically on these services, and that human actions are degrading the natural capital or 'life on earth' that produces the flow of ecosystem services. More details about the ESF, including the key diagram that explicates the framework, are given in the Introduction.

Although the MEA is treated by many as the standard, even a superficial examination of the literature on ecosystem services after the MEA indicates a continued and significant degree of incoherence. First, it is not clear whether ecosystem services and environmental services mean the same thing. As Pesche *et al.* (2012) point out, it appears that the term environmental services is associated with the literature on 'payment schemes',

whereas the term ecosystem services has emerged somewhat independently. Second, commentators (typically economists) have pointed out the confusion between ecosystem processes, functions, products, goods, services, benefits, income and utility (Boyd and Banzhaf, 2007; Fisher *et al.*, 2009) in the literature. Third, whereas some researchers consider intrinsic value of biodiversity to be subsumed under ecosystem services or under the idea of well-being, others talk consistently of 'biodiversity and ecosystem services' as two broad but distinct variables of interest (see Balvanera *et al.*, 2001; Daily, 2001; Mertz *et al.*, 2007; Martínez *et al.*, 2009). The new Intergovernmental Platform on Biodiversity and Ecosystem Services (www.ipbes.net) also makes this distinction. These persistent differences or discrepancies suggest that there is no single coherent framework but different versions that may correspond to different disciplinary roots from which the concept has evolved and that make somewhat different normative and analytical choices.

One version, developed by conservation biologists, focused initially on 'life-support services', i.e. those features of the biotic environment that are seen as essential for the very *survival* of human beings on earth (Ehrlich and Mooney, 1983), the organisms one might take on a spaceship to create life-support systems on a lifeless planet (Daily, 1997a). This approach then expanded to embrace all *indirect* benefits that human beings get from the functioning of ecosystems: soil conservation, water purification, waste assimilation, pollination, hydrological regulation, and so on (also called 'nature's services', Westman, 1977). But they initially maintained a distinction between conventional goods or products (timber, non-timber forest products, fish, etc.) and services. More importantly, in this approach, ES-related benefits are seen as distinct from and *in addition to* the value of biodiversity conservation for its own sake (Balvanera *et al.*, 2001). This corresponds to a 'deep ecology' position which sets 'intrinsic value' on a different pedestal from all values that human beings may ascribe to ecosystems. The difference is that instead of focusing only on intrinsic value, the proponents of this version want to highlight the material benefits of conservation also. I call this the 'conservation biology' (CB) version of the ESF.

A different version, which developed in parallel, included all aspects of human dependence on the environment, and was driven by the concern that human actions leading to 'resource depletion, pollution, and extinction' could have significant negative consequences for human well-being (de Groot, 1987). The idea of natural capital emerged here and was developed by a group of environmental economists including David Pearce and Ed Barbier and ecological economists such as Robert Costanza and Rudolf de Groot. In this version, natural capital is the stock that generates different kinds of benefit flows: products or goods, indirect benefits or services, and pure conservation (existence or aesthetic) values. I call this the 'environmental economics' (EE) version. Initially, the environmental economics

school simply used the term 'Total Economic Value' (Randall, 1987) to refer to the entire gamut of benefits received (and valued in economic terms), whether from goods, services or sheer existence of the ecosystem. The difference with the conservation biology school was that, for environmental economics, all values ascribed to the ecosystem were human values, including any 'conservation for its own sake', and therefore part of the calculus. Another difference was that, for the environmental economics school, the calculus was necessarily an economic one (Total Economic Value), whereas the conservation biology school was initially quite sceptical of using such a calculus, focusing more on explicating the biophysical magnitudes of the benefits. This also related to the focus on life-support services: if something is crucial for the very existence of the human species, it does not require to be (and perhaps should not be) evaluated in monetary terms. Finally, environmental economists continued to be open to the idea that the natural capital (on which the flow of ecosystem benefits depended) could be substituted by human capital as long as overall human welfare remained undiminished: the so-called 'weak sustainability' position.

From these variants, the MEA crafted a framework that contained four elements: a clear adoption of an 'ultra-strong sustainability' position, a clear adoption of the economic calculus,[4] a gesture towards a more inclusive definition of well-being, but simultaneously a conscious fuzziness about whether this well-being includes the idea of conservation for its own sake. The ultra-strong sustainability position comes about by equating natural capital to 'life on earth' and to biodiversity (see Figure 1.1 in Introduction), which excludes the substitution of natural capital not just by human capital but also by abiotic natural resources such as minerals.[5] The discourse is further 'ecologized' by using the terms 'supporting services' or 'functions' for even underlying ecological processes such as nutrient cycling. The (perhaps unconscious) result is an ascription of 'purpose' to the ecosystem – nature as an active provider of service, not just a set of interconnected but not necessarily directed processes that happen to take place.

The adoption of the economic calculus and indeed of an explicitly 'utilitarian' approach (MEA, 2003, 20) is rationalized on the basis of the argument that 'current decision-making processes often ignore or underestimate the value of ecosystem services' (19) and that even if other considerations are part of the ultimate decision-making process, 'estimates of changes in utilitarian value [i.e., economic value] provide invaluable information' (21). This formulation appears to have been adequate for the EE school and was also accepted by the CB school for pragmatic reasons: the fear that policy-makers do not pay attention to non-economic arguments.

The nuances introduced into the idea of human well-being such as security, health, social relations and 'freedoms' appear to be gestures made towards the non-economics social science community. But in practice,

hardly any literature linking ecosystem services with 'freedoms' or 'social relations' has emerged, as most non-economics social scientists have stayed away from the ecosystem services discourse (Daily *et al.*, 2009).

While the idea of human well-being was thus attempted to be broadened, the question of well-being of non-human species was kept fuzzy: while existence value is included, intrinsic value is said to be outside and to be factored in later at the level of 'political decision-making' (MEA, 2003, 20; see also Mace and Bateman, 2011, 9). This reflects a refusal of the conservation biology school to abandon its fundamental deep ecology position. In practice, what this has meant is that a large fraction of the literature continues to treat conservation of biodiversity as an ultimate goal or normative concern, in addition to it being the means to maintaining the flow of ecosystem services (e.g., Mertz *et al.*, 2007; Martínez *et al.*, 2009).

All of the above are debates and distinctions at the normative level, namely about what constitutes the ultimate concerns and what variables and approaches best capture them. At the analytical level, namely regarding what drives ecosystem services degradation, the ESF is superficially all-encompassing. It allows for the possibility that the drivers of such environmentally degrading human actions may be 'demographic, economic, socio-political, science and technology, and cultural or religious' (MEA, 2003, 9), thereby including all the causal factors outlined in Lele (1991) or all the perspectives outlined by Robbins *et al.* (2010). But in practice, the entire focus of the ecosystem services literature has been on identifying, quantifying and representing in economic terms the links between ecosystems and human well-being. The question 'why ecosystems degrade' is rarely asked and answered explicitly. Implicitly, the answer is a simple techno-economic one: that ecosystems degrade because society (primarily policy-makers) knows neither the 'true extent' of these benefits (because some of them are indirect and thus ignored) nor their 'true value' (because some of them are not priced correctly). The way to incorporate these values is to carry out an extended cost-benefit analysis, which will lead to more rational decisions.

At the same time, there is a third stream or sub-literature with ecosystem services that explicitly adopts the position that ecosystems degrade because the indirect services provided by them are positive externalities (benefits to other, 'downstream' groups) that do not then enter the calculus of the ('upstream') owners/managers of these ecosystems. The solution then lies not in more comprehensive cost-benefit analyses, but in setting up markets for indirect services, enabling the downstream groups to pay the upstream resource managers, thereby creating conditions for the managers to take decisions that will ultimately maximize net economic welfare. I call this the PES stream.

Thus, while the ecosystem services literature appears to agree on a strong sustainability position (to the point of privileging biotic natural

capital) and on an economic characterization of outcomes, the conservation biology, environmental economics and PES versions of the ESF differ in their understanding of whether all social values or normative concerns are included in the idea of well-being, and whether a top-down utilitarian approach or bottom-up markets-based approach is to be taken to solving the problem of ES decline.

Implications for Ecosystem Services Frameworks for environmental justice and wider environmental concerns

A detailed analysis of the strengths and weaknesses of the ESFs is beyond the scope of this paper (see Lele *et al.*, 2013). The question here is how the ESFs speak to environmental justice concerns or more generally how the ESFs enable or inhibit an adequately comprehensive understanding of environmental problems. I explore the interface both at the normative and the analytical level, keeping in mind that these two are closely interconnected (analytical choices strongly influence which normative concerns can be addressed and vice-versa).

Normative concern for justice: non-existent, confused or weak

From the previous discussion, it is obvious that the terms fairness, justice or equity are not explicitly part of the 'outcome variables' in the ESFs. The focus is on 'aggregate human well-being' (represented by total economic value). There is an attempt to cater to some of these concerns by claiming that the fifth component of human well-being, namely freedom of choice and action. The argument given is, however, inadequate and confusing. The MEA synthesis document states that this freedom, which is 'the opportunity to achieve what an individual values doing and being', is a 'precondition for achieving other components of well-being, particularly with respect to equity and fairness' (MEA, 2005, v). But since no other components of well-being (basic material for a good life, health, good social relations and security) include any mention of equity or fairness, it is not clear how these concerns are actually incorporated into the framework. Moreover, it is noteworthy that, in the entire MEA synthesis document, there is no other place where these terms occur. Thus, it seems reasonable to conclude that the ESFs have no explicit interest in *intra-generational* justice, equity or fairness.

Does the formulation of human well-being allow some space for or indirectly incorporate some notions of intra-generational justice? Clearly, the focus on 'aggregate human well-being' is inimical to attention to such justice. In the conservation biology and environmental economics versions, the utilitarian position underpinning the idea of economic valuation clearly

undermines equity issues. This is discussed in detail in Chapter 8 and hence I shall not elaborate further on it.

The PES version is slightly more justice-oriented, in that (in theory) the PES approach does not allow for losses to be imposed on some just because higher gains accrue to others: it requires actual bargaining and compensation to occur, i.e. a real Pareto improvement to take place. In other words, the PES version provides for some amount of procedural justice. Moreover, there has been a strong claim from the PES stream that Payments for Ecosystem Services are win-win with respect to equity and environment. This claim is based on an additional empirical argument, namely that 'upstream' resource managers are usually from the poorer sections of society (say communities living in tropical forests) whereas 'downstream' recipients of positive externalities (urban municipalities in the case of hydrological services, Northern countries in the case of carbon sequestration) are usually richer. Therefore, getting the recipients to compensate the service providers reduces deforestation and poverty simultaneously.

How tenable are these arguments? At the outset, it is important to note that poverty alleviation is a weak notion of intra-generational equity. Not only is it narrower in terms of focusing only on income rather than broader ideas of well-being, but it also does not address relative inequities, focusing only on getting people above the poverty line. Furthermore, although initial reviews suggested that PES is often pro-poor (Pagiola *et al.*, 2005), later work has pointed out the highly contextual nature of this finding (Bulte *et al.*, 2008), even when analysed within the economic framework. Finally, from the broader social science literature, it becomes clear that markets are embedded in social relations, limiting the bargaining power of socially marginalized groups, usually those that are most directly dependent on ecosystems for their survival (see McAfee and Shapiro, 2010).

What about concern for sustainability, or inter-generational equity? One would think that a framework that is so ecological fundamentalist or based on strong sustainability would pay enormous attention to sustainability. But interestingly, even the term sustainability appears only in passing in the framework document. The reason for this is not a lack of interest in sustainability, but an assumption that attention to ecosystem services automatically translates into an attention to environmental sustainability. For instance, the synthesis document states that:

> the goal of environmental sustainability, including access to safe drinking water [one of the Millennium Development Goals] cannot be achieved as long as most ecosystem services are being degraded.
>
> (MEA, 2005, 18)

Or

> However, even in scenarios where one or more categories of ecosystem services improve, biodiversity continues to be lost and thus the long-term sustainability of actions to mitigate degradation of ecosystem services is uncertain.
>
> (18)

It is strange that, even though ecosystem services flows increase, doubt is cast on long-term sustainability simply because biodiversity levels go down. This suggests that there is enormous hand-waving (or fudging) about the relationship between sustainability, biodiversity, and current versus future flows of ecosystem services. The logic seems to be as follows: human well-being is critically dependent upon the flow of ecosystem services, and the flow of ecosystem services can be maintained undiminished only if natural capital is maintained undiminished, and natural capital can be maintained undiminished only if biodiversity is undiminished. Therefore, focusing on service flows or on biodiversity conservation is the same as focusing on sustainability. This is an empirical argument that will be discussed later. Here, it is enough to point out that in practice, hardly any of the ecosystem services literature actually asks questions of future flows of ecosystem services. It is almost entirely focused on measuring and valuing current flows.

What about inter-species justice? Clearly, ESF and particularly the conservation biology version indirectly strengthen the cause of inter-species justice. But they do so in a peculiar manner, by creating a situation of having one's cake and eating it too. For instance, the MEA's framework document itself says that

> If the aggregate utility of the services provided by an ecosystem (as measured by its utilitarian value) outweighs the value of converting it to another use, its intrinsic value may then be complementary and provide an additional impetus for conserving the ecosystem. *If, however, economic valuation indicates that the value of converting the ecosystem outweighs the aggregate value of its services, its ascribed intrinsic value may be deemed great enough to warrant a social decision to conserve it anyway. Such decisions are essentially political, not economic.*
>
> (MEA, 2003, 20, emphasis added)

In other words, by acknowledging intrinsic value as a valid formulation but keeping it outside the list of variables of interest (components of human well-being), the ESF allows intrinsic value to be used as a hidden 'trump card'. This suggests an instrumental use of the ESF, rather than an honest commitment to seeing where the framework leads. Statements such as the following give cause for such worries:

> It is going to be a long haul for biodiversity for its own sake… Ecosystem services is a strategy to buy time as well as getting buy-in.
> (Gretchen Daily, quoted in Marris, 2009)

Or,

> Although we understand ecosystem services provide a larger audience and more resources for conservation, it is now our responsibility to ensure that these new tools are used in ways that we intended; namely, to protect the diversity of life on Earth.
> (Skroch and López-Hoffman, 2010)

While such strategic use of the ESF may be somewhat justified in the case of policy advocacy work, this sleight-of-hand is not justified in the context of research, which needs to speak to all societal values.[6] The obvious question that arises from the quote from the MEA framework document is: aren't all decisions political? Isn't the decision as to how much weight to assign to economic benefits accruing to poorer sections of society also a political decision? As Garmendia and Pascual point out in Chapter 8, isn't the assumption in conventional cost-benefit analysis of equal weights for all sections also a political decision? Why should intrinsic value be outside the pale of any assessment altogether while poverty alleviation and justice are subsumed under the utilitarian logic? Unless these questions can be answered satisfactorily, the ESF will provide an unfair advantage to one kind of justice.

Analytical constructs: major omissions

It is not only the (implicit or explicit) normative positions or variables of concern that determine how the ESF speaks to justice concerns. Framing is an act of including and excluding not only normative concerns (what societal goals we care about) but also about the empirical links between environment and society (how these goals are affected by environmental change). These inclusions and exclusions have implications for what can or cannot be done with the framework, for what the framework highlights and what it ignores. In the case of the ESF, a series of omissions create troublesome implications for justice and broader environmental concerns.

De-emphasized trade-offs and missing dis-services

The representation of the relationship between ecosystems and human well-being in the MEA framework diagram (see Figure 1.1 in Introduction) is somewhat bland. The diagram does not tell us which link between ecosystem services and well-being is positive and which is negative. The

term 'service' has a positive connotation and so do terms like provisioning, regulating and cultural. There is no suggestion of a negative relationship.[7] In the text, there is mention of trade-offs between services. Typical examples given are trade-offs between provisioning services such as food and regulating services (MEA, 2005, 1). In practice, the majority of the literature does not talk about trade-offs, and the few studies that do highlight again provisioning versus regulating service trade-offs (e.g. Nelson *et al.*, 2009). But trade-offs are actually ubiquitous in the ecosystem–society relationship: increasing carbon sequestration may result in lower biodiversity as well as reduced harvest of timber, and maximizing timber production will reduce the available fodder, firewood and biodiversity (see Lele, 1994).

While the trade-off issue has at least received some attention, there has been complete inattention to what one may call 'dis-services', i.e. relationships that are clearly negative. Biotic examples include pathogens (Willott, 2004; O'Farrell *et al.*, 2007; Dunn, 2010) and damage and human injuries and death caused by wildlife (KETF, 2012; see also Lele *et al.*, 2013, table 2). Abiotic examples include rain that brings life-giving water but also life-threatening floods. Conversely, what are seen as services (soil conservation on hill slopes by forests) can also been seen as dis-services (if the eroded soil was an important source of nutrients for agriculture in the floodplain: see Lele, 2009 for a discussion).

The omission of dis-services and the downplaying of trade-offs is not just a neutral simplifying assumption, but has significant intra-generational justice implications. Much of the ecosystem service literature focuses on the tropics, in biodiversity-rich areas. But these are also areas where dis-services such as pathogens and wildlife-induced damage are high. Both at the global scale and at the local scale, the communities who face these dis-services are amongst the most marginalized in society: forest-dwelling tribes, poor farmers lacking the ability to erect electric fences, and so on. Similarly, when trade-offs are ignored, the losers inevitably include the weaker amongst society: tree plantations exclude pastoral nomads, timber plantations exclude women firewood collectors, and (to extend the idea of justice) carbon plantations will exclude voice-less denizens of the natural forest.

Abiotic resources and development

Early formulations of natural capital also included mineral and water stocks; entities whose presence is only mildly influenced by biota. The 'life on earth' formulation as per the MEA would exclude such abiotic stocks and flows from the ambit of natural capital, although some analysts have tried to include rainfall and mineral deposits in the category of environmental services (Gray, 2011). The inattention to abiotic stocks is a problem not just because one is missing out some source of services, but because the

relationship between abiotic resources and biotic systems is often highly competitive. From the use of hydropower, petroleum, coal or nuclear energy as replacements for firewood to using iron, aluminium and cement to replace timber, nylon for clothing, and petrochemical-based fertilizers to replace organic manure, abiotic resources have rapidly expanded and *directly replaced* ESs derived from biota. Statements such as 'human societies have been built on biodiversity' (Díaz *et al.*, 2006) do not tell the whole story.[8] Modern societies are disinterested in biotic nature precisely because they see a much smaller dependence on it than earlier societies did.

The justice and broader environmental implications of this omission are complicated. On the one hand, it is clear that some substitutions of biotic by abiotic have resulted in major gains in quality of life for certain marginal communities. A classic example is the replacement of firewood by cooking gas. Cooking gas is no doubt a non-renewable resource and no doubt its burning adds to CO_2 emissions. But at the same time, shifting from firewood to cooking gas pays a double dividend for women: it reduces their firewood collection burden and it dramatically reduces their exposure to indoor air pollution from open wood stoves, not to mention easing the challenge of cooking in other ways.

Some would argue that this is short-term thinking: the shift to a petroleum-based lifestyle is what has brought about the global crisis of climate change, and the sustainability of these lifestyles is also threatened directly by the 'peak oil' syndrome. Moreover, households in developing countries can much less afford the economic pain that peak oil will cause as compared to households in the North. So it would be better to craft a different, sustainable energy pathway, using (say) improved woodstoves or charcoal (Bailis *et al.*, 2005; Wilkinson *et al.*, 2009). But the question is whether the responsibility of shifting to sustainable lifestyles or pathways must be dumped on poor and marginalized households in the South or the rich and highly resource-consumptive households in the North.

The same dilemma between sustainability and justice when switching from the biotic to abiotic emerges in many other contexts. For instance, the most sustainable lifestyles are those led by forest-dwelling indigenous communities, but then these are also the ones most acutely impoverished. If electricity for lighting is to be considered an absolutely basic amenity, this electricity cannot be provided today without major impacts on biotic resources, whether it is through mining of the coal and the iron required for generating electricity or setting up of hydropower plants, or the precious minerals and energy required to create photovoltaic cells.

Admittedly, mining of these minerals, building of dams and the use of petroleum have also been the source of severe intra-generational and inter-species injustices. Mining and petroleum-related environmental conflicts are well known (Martinez-Alier, 2002). The point therefore is not that omitting

abiotic resources from the ESF automatically leads to unjust outcomes. The point is that the combination of omitting justice from the definition of well-being and abiotic resources from the analytical framework linking environment and society leads to completely overlooking a whole range of today's environmental problems, both local and global, related to the extraction and use of abiotic resources.

A classic illustration of the inadequacy of the ESF is the case of climate change. Even if we assume that 'climate regulation' is a regulatory service provided by ecosystems to human beings, we know that the major disruption currently happening in the global climate system is *not* a result of the destruction of ecosystems or biodiversity, but of the extraction and use of fossil fuels. It is also patently obvious that the biggest resistance to drastically reducing CO_2 emissions is coming from those countries and economic classes that have firstly benefited the most from this use in the past (through building up of man-made capital) and are also today consuming petroleum at per capita rates that are 10–20 times higher than those of poor communities in the Global South. And many of the major impacts of climate change on human well-being, such as submersion of islands and coastal areas or a stalled gulf stream leading to a mini-ice age in Europe, will be felt directly, and will be hard to describe in terms of 'ecosystem service decline' or even 'decline in natural capital'. In other words, the ESF has little to offer us in terms of understanding either the causes or the consequences of arguably the biggest global-scale environmental problem facing humankind today, with all its injustices and even declines in aggregate well-being.

Co-production – the role of the social in the natural

Obtaining benefits from ecosystem processes usually requires the investment of human labour and human-made capital for harnessing the 'service'. Plants or animals do not automatically generate provisioning services, they (or their parts) have to be gathered, harvested, or hunted through human labour. Water flows become useful only when the water is lifted, diverted or stored using various structures or technologies. Rainfed agriculture requires field bunds to capture rainwater and planting the right crops at the right time to benefit from the rain. Even 'existence' values are not really obtained without someone keeping us informed about the status of the species we cherish! Indeed, the same ecosystem process (soil erosion by streams) can generate dis-service (siltation of dams) or a service (fertilization of the floodplain) (Lele, 2009), suggesting that ecosystem processes get value (positive or negative) only within specific human contexts and engagements. The omission of human agency in the form of labour and capital from the MEA diagram is as problematic as the omission of energy, material and ecosystem service flows from the circular relationship between

economic production and consumption depicted in conventional economics textbooks. Even the UK National Ecosystem Assessment (Mace and Bateman, 2011, 7) introduces 'other capital inputs' only at the link between food production and cereals, when in fact they are essential to production itself.

Moreover, co-production is not simply an economic process of combining labour and capital with natural resources. The entire activity of production and consumption is embedded in social structures and institutions that determine who gets access to which resource, capital or labour, and also influences strongly the pattern of demand and consumption of goods and services. Multiplying the biophysical flow of ecosystem services with their market (or shadow) price and subtracting the costs of labour and capital inputs in their production may capture the apparent economic 'value' of the service, but it tells us little about how this came about or how it might be changed, whether in terms of magnitude, distribution or sustainability.[9] Other social science disciplines and perspectives, including political economy, and cultural, gender and science-technology studies, have much more to contribute here.

Recognizing that the value of an ecosystem service cannot be separated from its socio-technical context will also have enormous implications for the manner in which ecosystem services research is conducted and its objectives. Currently, by de-linking the social context or reducing it to the price of ecosystem services, researchers believe they can create global 'maps' of ecosystem service values (e.g., Naidoo *et al.*, 2008). This is not only analytically questionable but also tends to disempower those who are marginalized and therefore invisible, while also analytically inadequate, as it ignores the multi-scale social structures and processes which have created these local situations in the first place. While the tension between local specificity and global generalizability of knowledge and ways of knowing can never be fully resolved, and while even highly local descriptions will do some violence to the details of the situation, there are few signs as yet that the ecosystem services discourse is willing to engage with this tension, and to recognize that this is not just about the scale of analysis or assessment, but about the distance between researcher and local communities, between science and action.

Concluding remarks: From a techno-economic framing to a multi-valent and multi-causal framing?

The ESF frames the environmental problem in a particular way: as a case of the earth's life-support systems being in jeopardy, which in turn jeopardises all human well-being on spaceship earth. This is said to be caused by decision makers under-valuing the contribution of ecosystems in providing human well-being (Daily, 1997b, ch.1; MEA, 2005). What I have tried to demonstrate above is that this framing is narrow and inadequate both in

normative and analytical terms. Normatively, it privileges (depending upon which version of the ESF one follows) the idea of conservation for its own sake (possibly driven by inter-species justice) or of maintaining aggregate economic well-being undiminished (at best tempered with notions of libertarian justice). In the process it not only sidelines the conventional idea of environmental justice as intra-generational fairness and equity but also oversimplifies the challenge of inter-generational justice and sustainability. And the frameworks involve major simplifications and omissions that then make them highly inadequate representations of the environment–society relationship for analytical purposes. This explains why many social science disciplines or perspectives related to the environment, such as political ecology, environmental sociology, ecological anthropology, or human geography have not engaged with the ecosystem services concept.

What then is the contribution of the ESF and in what way could it better interface with questions of justice and environmentalism at large? In terms of practice of environmental research, notwithstanding its limitations, the ESF has encouraged research on understudied aspects of the environment–society relationship, primarily the nature of indirect services such as pollination, pest control or nursery function. And in the process it has made biologists move away from their exclusive focus on internal variables such as ecosystem functioning to socially relevant variables such as production or regulation, and pushed economists to use better representations of ecosystems in their models.

At the conceptual level, the singular contribution of the ESF lies in its attempt to create an interdisciplinary space by talking about the *multiple* links between environment and societal concerns. In some ways, the almost bland nature of the analytical side of the framework, wherein it allows for all possible explanations ('demographic, economic, socio-political, science and technology, and cultural or religious') is a strength as it creates a space for non-economic explanations. But on the normative side, it has tried, but not fully succeeded, in getting conservationists to also recognize the importance of human material well-being (albeit framed in aggregate terms). And it almost consciously steers away from including intra-generational justice and equity concerns, thereby doing gross injustice (pun intended) to a large range of environmental problems, and discouraging actual engagement from the other disciplines mentioned above.

The changes that are required to make the ESF a more useful and meaningful framing of the environment–society relationship are radical, to say the least (for details, see Lele *et al.*, 2013). Will the ecosystem services community engage with these critiques and seek to broaden the framework in the directions suggested, so as to better engage with justice and broader environmental concerns and better incorporate political economy and other explanatory perspectives? The answer is unclear. It is worth noting that past models have been similarly blinkered, whether it is the limits to growth

model that focused on population growth and abiotic resource depletion, or the deep ecology model, which lays the blame at the door of anthropocentrism without adequate enquiry into its meaning or the implications and logical consistency of biocentrism (see Guha, 1989). So at one level, ESF may share the same fate of being a passing fancy.

But what seems clear to me is that disengaging with the framework has its own risks, in particular, the loss of the interdisciplinary space that it sought to create. The framework also serves to remind us that intra-generational justice is not the only legitimate concern in environmentalism. As some interdisciplinary analysts have pointed out, there has been a tendency for different social science disciplines or perspectives to privilege their own explanations (and concerns) to the neglect of others (Vayda and Walters, 1999; Lele, 2008). It is hoped that the ESF will provoke its critics to be self-reflective and broad in their own engagement with the environment-society conundrum.

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Notes

1 Note that, originally, PES stood for 'payments for environmental services' and was somewhat agnostic about whether these were biotic or abiotic in their character.
2 There have also been attempts to show that more just societies are likely to be more sustainable (Jacobs *et al.*, 1987), but there is a large literature showing that the two often do not go hand in hand (von Oppen and Subba Rao, 1980).
3 For instance, an Indian farmer's belief that he can use up all the groundwater in a confined aquifer to make money in the short run and put his children through college and liberate them from dependence upon agriculture forever (Moench, 2005).
4 MEA, 2005, 7. The MEA takes human well-being as the central focus for assessment, while recognizing that biodiversity also has intrinsic value.
5 The MEA framework does not mention human capital at all. The UK National Ecosystem Assessment (Mace and Bateman, 2011) later mentions 'other capital inputs' as complementing the conversion of ecosystem services into ultimate benefits to society.
6 See Lele *et al.* (2013) for more details.
7 As the literature on problem 'framing' points out, particular terms predispose our thinking in particular ways, and the positive connotation of 'benefit' or 'service' predisposes the ES discourse towards focusing on positive relationships only.
8 Interestingly, the MEA actually examined the question of substitutes for ecosystem services, and concluded that the substitutes would be too costly and

could have other negative consequences. I believe this conclusion is highly questionable, because it ignores the hard historical fact that all the development in the North is the result of such substitution.

9 For instance, a recent study of hydrological regulation service of forests found that even the sign of the impact of forest cover change on irrigated agriculture depended upon the nature of the irrigation technology (Lele *et al.*, 2008, 2011). Similarly, the physical magnitude and economic value of provisioning services fluctuated significantly depending upon the rights and institutions for their marketing (Lele and Srinivasan, 2013). Small changes in the structure of property rights have the potential to radically alter the distribution of benefits from forest product harvest and sale (Lele *et al.*, 2010).

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