

## Socio-economic values of natural forests

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### Abstract

Forest and woodland are recognised as important multi-functional resources. Natural forests are characterised by particular types of multi-functionality different to those generated by planted forests. From a socio-economic perspective, it is desirable to unpack and measure the range of values associated with multi-functionality. Natural forests contribute to society and economy in many complex ways. Unless the socio-economic values can be adequately enumerated, and appropriately reflected in policy and regulatory systems, there is a danger that certain types of value (often monetary) over-ride the non-market values and undermine the potential achievement of multifunctionality. The balance of forest functions must be negotiated amongst various stakeholders. In natural forests, the focus is likely to be more on biodiversity conservation than production, but such emphasis need not preclude timber production. The Organisation for Economic Co-operation and Development (OECD) has argued that it is possible to valorise the environment (or green capital) through development of tourist/recreational enterprises through 'the cultivation of rural amenities'. However, delivery of effective management of multi-functional forests requires appropriate institutions, management structures and policies, which balance regulation against the socio-economic dimensions of sustainable development.

Keywords: multifunctionality, stakeholders, market values, non-market values

### 1 Introduction

Forests have long been recognised as multi-functional or multi-purpose resources. In many ways, multi-functionality has re-emerged as a new rationale for forests, replacing a more mono-functional production-oriented view that has been dominant in many developed countries, particularly during the 20<sup>th</sup> century. The re-emergent multi-functionality creates new challenges for social scientists interested in forests, in that in mono-functional forests, costs and benefits are much easier to ascribe (and generally to measure), whereas in the case of multi-functional forests, many more values and costs need to be considered. Further, the tool-kit of cost-benefit analysis might require methodological and epistemological extensions to accommodate some of the additional social science dimensions that have been explored in the more sociological and anthropological studies of forests and people.

This paper takes a broad-based social sciences perspective on the value of natural forests and examines first, what we mean by socio-economic values; second, how we might measure the more important of these values; third, it examines these values in the case of natural forests; and, finally, considers mechanisms for achieving the balanced management of natural forests that accommodates socio-economic values in a reasonably comprehensive manner.

Natural forests represent one end of a spectrum of types of forestry that ranges from virgin forests that have been largely uninfluenced by man, through semi-natural forests common in much of Europe to exotic even-aged stands of completely un-natural forests. Within Europe there is a tendency for the more natural value forests to be associated with lower timber values and higher non-timber values, but this relationship is not always sustained elsewhere.

## **2 Socio-economic values**

### **2.1 Introduction**

The fusion of the words social and economic into a single word 'socio-economic' implicitly acknowledges the inter-relatedness of social and economic values. However, the single term masks considerable interdisciplinary differences within the community of social scientists. LAWRENCE (2004) notes the divergence between a set of social values articulated by economists and a wider set of social values including cultural, spiritual and aesthetic values. At the heart of these differences is the continued dominance of a rationalist positivist position amongst most economists, who believe that it is possible to measure objectively the costs and benefits of different courses of action or the value of a particular economic asset, and the bulk of other social scientists who emphasise, inter alia, competing discourses amongst different stakeholders, the reflexivity of social relationships and who deny the primacy of money values over all others. Sociologists and geographers have often drawn from political economy, constructivism, structuralism and reflexive sociology in exploring socio-economic values, with the emphasis more on the social than the economic. These differences are not simply differences of emphasis but are of a more fundamental epistemological nature.

### **2.2 Economic values**

Within the field of economics it is important to distinguish between a more narrowly based conception of economics that looks only at prevailing market prices and market relationships (supply and demand) etc. and a broader conception of economics that looks at 'social' (as in social cost benefit analysis) values. While there is an important and legitimate field of study in relation to forestry in production and market economics, the search for 'socio-economic value' necessarily takes us beyond an exploration of costs and prices and into the field of social values. However, the economists' use of the term 'social' should not be confused with other social scientists' use of the term. In economics, such an approach is premised on a recognition that the market does not always work to allocate resources effectively because, on the one hand of imperfect competition caused by monopolistic structures and practices and, on the other, because of market failure, where non-excludability and non-rivalry in consumption lead markets to undersupply certain types of good and service.

The typical contemporary mainstream economic position on forests is that there is a range of values associated with forests that create different degrees of difficulty in their measurement (see TURNER 1993; STEWART-ROPER and PARK 1999). These include:

use values which can be

- direct or
- indirect

non-use values, also embodying existence values, which include

- option values
- bequest values

Some economists would also argue that there are, in addition, intrinsic values in nature – a right for natural phenomena to exist that is independent of any direct or indirect value derived from that use.

Traditionally, forest economists have tended to look almost exclusively at use values and, within this, predominantly and understandably at timber values. This has focussed their attention on modelling the relationship between the biological production possibilities and the economic context, leading (hopefully) to better decision-making about rotation length, harvesting strategy etc. This is the domain of production economics.

The broadening of forest economics into the field of applied environmental economics is a logical step forward in seeking out the wider socio-economic values attributable to forests. The substantial work that has been conducted in this field in relation to forestry, which involves estimating monetary values for non-market goods and services such as biodiversity and landscape, water quality, flood and avalanche protection and carbon storage is evidence of a broadening of economic analysis (STEWART-ROPER and PARK 1999). Some of these developments in methods have been controversial, for at least two reasons. First, some critics have argued that it is not possible to reduce certain values to the measuring rod of money (LAWRENCE 2004). Second, others, usually from within the discipline of economics have argued that the methods used are not always sufficiently robust or accurate.

Within the rapidly developing field of environmental economics, there are two central concepts of interest to natural resource managers (PEARCE and TURNER 1990). The first of these is critical natural capital and the second is the precautionary principle. Critical natural capital can be seen as the keystone species and natural processes on which human and planetary life ultimately depends. Where irreversible adverse changes might occur, or where there are major uncertainties about adverse environmental effects, it is argued that a precautionary approach should be adopted to ensure that critical natural capital is not eroded or damaged.

However, there are also other strands of economic analysis that are relevant to forestry. There is a growing body of work that explores the regional impacts of forestry. Typically these have been constrained in looking only at employment and income creation at regional or national level arising from the wood supply chain, both upstream and downstream from the forest. Forestry activity does not take place unconnected to other economic activities and, from a regional development perspective, these other connected activities need to be explored to obtain insight into the wider economic impacts of forests.

Until recently, there has been no attempt to formally connect such economic analysis (often within an input output (I-O) or Keynesian framework) to the amenity goods and services provided by forests. In recent work for the UK Forestry Commission, SLEE *et al.* (2003) have developed techniques for exploring the wider sub-regional economic consequences of what they term 'shadow values' or the halo effect. These are not the shadow values of traditional cost-benefit analysis, but the 'real' economic values of jobs and income arising because certain types of firm, most especially tourist and recreation businesses, operate under a beneficial shadow or halo effect from the surrounding forests. This shadow effect is well illustrated by the case of a mountain biking trail developed in state forests in North Wales, which now draws an annual injection into the local economy of £4 million through expenditure at camp sites, hotels, etc. Although the case of tourists and recreationists is perhaps the most obvious example, the value of trees and forests in creating more highly valued residential space is also important. Especially in more developed countries, tree-rich areas are likely to attract

commuters and retirees into an area who would not otherwise be there. As indicated in hedonic pricing studies, residential property values are enhanced (MORALES 1980; TYRVÄINEN 1999, 2000). In addition, spending in shops and for other goods and services will re-circulate and leak out of local economies to varying degrees, thereby creating multiplier effects.

Evidence from two case study areas in England shows that the so-called shadow values are substantially greater than the timber values (SLEE *et al.* 2003). This is also likely to be the case in high amenity areas, in tourist areas and in peri-urban areas. Natural forests might be expected to exhibit higher levels of these shadow values, although there may be limitations imposed on development as a result of legislation protecting such forests from exploitation, either directly or nearby, which might compromise the high capacity to marketise the natural values.

Further evidence from an EU study (MANTAU *et al.* 2001) shows that where property rights can be established, there is substantial scope for market development of environmental and recreational goods and services. Such enterprises may be based on water quality, recreational facilities or even mushroom picking permits. The possibilities can be constrained by the existing system of property rights but more often the lack of entrepreneurial vision and marketing skills of forest owners. Such opportunities indicate the wider socio-economic values of forests beyond timber production.

SAASTAMOINEN (1997) has estimated that of the total value of forests in Finland in the late 1990s, only about two thirds of the total derives from timber production. Other market elements such as berries and mushrooms and non-market elements such as recreation and carbon storage account for the rest. Exploration of the full suite of economic values thus increasingly exposes forests as multifunctional resources with many facets of economic value.

### 2.3 Social values

Whereas some economists adopt a rather positivistic and rationalist perspective on their subject area, social scientists from within the fields of sociology, geography and cultural studies have adopted more reflexive approaches. Rather than seeing values as some kind of outcome from the forces of supply and demand, (distorted in some cases by market failure), values are seen as socially and culturally constructed, shaped by power structures, negotiated, mutable and non-aggregatable and are seen to differ substantially from the additive values of economists. These social values go beyond the values recognised by economists and include spiritual values, symbolic values and a sense of place. Such non-economic values may be very important for some natural forests.

In addition to the acknowledgement of reflexivity, social theorising is often explicitly engaged in trying to improve the condition of mankind (see GIDDENS 1986). Much research takes place within an action research or constructivist format with researchers engaging with practitioners both to understand their actions and outcomes and to create alternative and better futures (see for example RÖLING and WAGERMAKERS 1998).

Much work on social values requires the identification of different stakeholder groups with an interest in forests. In both developed and developing countries there have been wide-ranging attempts to elicit stakeholder values (RICHARDS *et al.* 2003). Stakeholders can be defined as 'groups or organisations that have an interest in or are active players in a system such as a forest' (LAWRENCE 2004). Property rights necessarily mediate the capacity of different stakeholder groups to shape forest outcomes, but in an era of low profitability of the timber-related market elements and a rise in the relative importance of non-market

elements of value of forests, the intermediation of the state through policy and regulatory instruments can be profoundly important. Stakeholders can and will engage rent-seeking behaviour, seeking enhancement of those forest outputs that interest them, and neglecting those outputs which offer little interest.

WIERSUM (1998) has argued that as foresters move from being resource managers to facilitators there is a need for them to better understand the perceptions and attitudes of different stakeholders. He notes that 'the role of foresters is changing from an 'inform and educate' model, whereby professionals managed forests for the public good, to a model of facilitation and negotiation with foresters setting goals, managing and monitoring together with the public with a focus on both the ecosystem and social concerns of the various interest groups' (WIERSUM 1998). Other studies of forestry include the comparative work of HELLSTRÖM and RYTILÄ (1998), based on case study and comparative methods that explore different layers or levels of conflict between different stakeholders in both France and Sweden. Out of the resolution of such conflicts, better multifunctional management should emerge.

KOCH and KENNEDY (1991) and KENNEDY and KOCH (2004) have advocated a shift from a narrowly productivist model of forestry to one that embraces the plurality of values derived from forests. Paradoxically, they term the utilitarian-productivist model 'sacred deer, water or tree stuff'<sup>1</sup>, and identify an alternative human ecology perspective, which they advocate as the basis for contemporary forestry education. Their 2004 paper builds on recognition in their 1991 paper that the communication of values via the economic system is partial and that the non-utilitarian values are seen to be increasing in importance. They trace a transition towards a more people-friendly forestry in which the multiple values of different stakeholders are expressed through economic, political legal and socio-cultural systems. A principal challenge arising from this more complex mix of socio-economic values is how to mediate between competing claims over a resource, whether or not it is in public or private hands. This shift to a post-industrial, multi-purpose forestry is also noted by MATHER (2001) who notes the significant upward shift in values of old growth forest in the post-productivist phase.

### 3 The case of natural forests

Natural forests present two principal challenges to the social scientist studying their value. The first challenge is whether or not naturalness in itself has value in itself, or only because, associated with that naturalness, products and services with identifiable utilitarian economic values may be found that are not found (or are less abundant) in other types of forest. In such analysis, the social scientist's judgement may conflict with the conservation forester who believes that there are intrinsic values in naturalness which merit a strong protection strategy. A second challenge is to establish the relative importance of the range of values associated with natural forests which, because of the multifunctionality of such forests, are likely to be considerable and perhaps highly spatially variable. Whereas the production forester sees values in trees and timber, the conservation forester in biodiversity and landscape, the social scientist (as economist) is interested in the relative values of different elements, the trade-offs involved if one value is to be increased and another reduced and the

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<sup>1</sup> Elsewhere they describe the same paradigm (perhaps more appropriately) as 'wood-focused silviculture' (p. 498).

opportunity costs of pursuing one management strategy rather than another. Alternatively, the sociologist or geographer may be interested in the social and cultural values of the forest and how these differ among different social groups, and how they are constructed and modified over time.

The first question of the intrinsic (or existence) value of natural forests raises different questions, depending on the methodological perspective of the social scientist. The market economist might deny the legitimacy of such values, arguing that such values as exist should be accounted for by other more or less easily measured values (biodiversity, landscape etc.) and that to attempt to measure existence values would lead to double counting. The sociologist or cultural geographer might be interested in the way in which these values are socially constructed and how they inform and shape forest use.

The second question of establishing the full array of multi-functional values requires recourse to some of the relatively new methods that have been used to assess the non-market values, as well as a need to consider the shadow effects (or halo effects) of the various positive amenity effects of the forest. These values are both normally considered in monetary terms (or in the latter case also in terms of employment creation) but they are addressing different questions and the values have fundamentally different meanings, and are therefore non-additive.

In the first case, the value being sought is the value to society of all the market and non-market elements that the forest 'produces'. These include any timber sales, Non-timber forest products (NTFP) sales, NTFP self-consumption (fuel and food), ecosystem values, landscape values and watershed and snow protection values. Of course, these are gross values. In managed forests, there are costs associated with the delivery of these functions, although at times the attribution of costs (e.g. to regulating access in the interests of nature conservation or delayed felling in avalanche prone areas) may be problematic. In many cases, the timber values of natural forests may be much less than the assemblage of non-timber values, and amongst the non-timber values, non-market values may predominate.

In the second case, we might expect the shadow or halo effects of natural forests to exceed those of artificial forests, other factors held constant. However, natural forests are more likely to be remotely located (their naturalness is often likely to be a function of a lack of prior timber exploitation and subsequent silvicultural management) and in consequence the creation of employment opportunities through shadow/halo effects may be more difficult. Further, if these remote natural forests, (as in parts of Transcarpathia), are also areas where there are large numbers of poor people, there may be pressure to compromise non-market values for either timber exploitation or shadow-related developments such as ecotourism. Such issues lead naturally to questions of how natural forest management can be negotiated and implemented at local level to accommodate the range of societal needs and demands and different stakeholder interests.

## **4 Mechanisms for achieving balanced consideration of the full range of values of natural forests**

### **4.1 Introduction**

Past literature on how resources should be managed often make a distinction between regulatory instruments and economic instruments. More recent literature, particularly in the case of natural forests in Australia (SLEE 2001), also points out the potential for suasive instruments. Each will be considered in turn.

## 4.2 Regulatory instruments

Regulatory instruments are those such as laws and designation orders (often with associated sets of rules) that specify how forests should be managed and exploited and lay down a list of 'dos and don'ts', i.e. actions that must be undertaken and those cannot be undertaken. Examples of regulatory instruments include national park (and other types of) designations at national level, and EU regulations (for example under Habitats and Species Directives), which prescribe certain obligations on governments to protect particular species and habitats within the EU.

Environmental protection is carried out predominantly through regulatory instruments, and many environmentalists are profoundly mistrustful (or disbelieving) of economic logic and its consequences on environmental decision-making. From a social sciences perspective, the regulatory process is one that is driven more by political than economic logic. Indeed, from an economic perspective, regulation can be seen as illogical, in that sometimes the opportunity forgone by the regulation (say timber exploitation) is greater than the value of what is being regulated (say the biodiversity values).<sup>2</sup>

## 4.3 Economic instruments

Economic instruments are regarded (by economists) as more efficient forms of shaping environmental decision-making than regulatory instruments. Economic instruments are those that penalise the generator of negative amenity (typically pollution) or reward the provider of positive amenity. Such instruments can thus overcome the problem of market failure and are argued for by bodies such as the OECD (OECD 1999).

Typical examples of economic instruments are pollution taxes, set at a level that reflects the economic cost of the damage arising from the pollution, or environmental payments to farmers or forest owners for providing environmental goods or services. Such instruments follow the 'polluter pays' or 'provider paid' principles.

Although economic instruments have the merit of increasing economic efficiency, they depend on full knowledge of the environmental costs and benefits and an ability to apply such instruments at reasonable cost. In many situations, neither condition is fulfilled.

## 4.4 Suasive instruments

Suasive instruments are those in which the various stakeholders can be persuaded of the merits of particular courses of action. In both developed and developing countries a more participatory approach to forest management has emerged which challenges the professional timber producing forestry discourse with an array of different values, ranging from the recreational to the spiritual. Central to these new approaches is the negotiation of outcomes through recognition of competing claims.

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<sup>2</sup> In fact, from an environmental perspective, regulatory instruments can work either in favour of or against the environment and natural values. Weak regulation of agriculture in western Europe has probably caused higher levels of environmental degradation of wetlands, mountain areas etc and higher levels of pollution than if economic instruments had prevailed. However, in the field of forestry, environmental protection may have been greater than economic logic would have dictated in the high natural value forests of central Europe.

The term *suasive* has been used in the context of Regional Forest Agreements (RFA) in Australia, where federal-level legislation has created a new framework for allocating native forests into different management regimes, including significant areas into regimes in which old growth forests are fully protected. Regional Forest Agreements have been highly controversial policy instruments, not least because they are open and negotiated and can leave either environmentalists or timber processors feeling that they have lost out.

One interesting feature of the RFA process is that although some economic appraisal is conducted in the preparatory phase before the agreement is reached, many of the well-tried techniques (such as the Contingent Valuation Method [CVM]) for measuring non-market benefits have not been used. The typical outcome is allocation of some natural woodland to productive use (normally under natural regeneration regimes), negotiation over the extractive use of some other areas and an embargo on exploitation of timber in a significant percentage of woodland.

Critics of the policy instrument point to the uneven-handedness and unfairness of the treatment of certain interests (including Aboriginal people) and the tendency of many agreements to still allow some timber exploitation in high natural value forests. This suggests that some state governments have tended to support productivist forest interests rather than the post-productivist sectors such as tourism.

There is much in common between the operation of *suasive* instruments in the Australian case and the stakeholder engagement which is now prevalent in many developing country models of forest management and which have also been widely advocated and implemented in a number of developed countries (see RICHARDS *et al.* 2003; BUCKLES 1999). The International Development Research Centre (IDRC) defines stakeholder analysis as 'a range of tools for the identification and description of stakeholders on the basis of their attributes, interrelationships, and interests related to a given issue or resource.' The principal case for stakeholder analysis and engagement is based on the perceived desirability of ascertaining stakeholder demands and values before instituting participatory forest management.

However, more recently, the social arguments for engagement with users have been supplemented by a demand for economic literacy amongst forest managers. RICHARDS *et al.* (2003) make a persuasive case for increased economic literacy of those managing forests in developing countries, whilst maintaining the advocacy of participatory stakeholder-based approaches.

In work for the Council of Europe in the Ushanski National Park in Ukraine (SLEE 2000), it was evident that engagement with local communities was an essential precondition to the effective multifunctional management of the high value natural and semi-natural forests within the park. Given the substantial populations that inhabit the park and the significant demands placed on the forest for subsistence needs, a process of engagement with local stakeholders is likely to be a prerequisite for effective resource management. The optimal development strategy for such areas is likely to involve increasing the opportunity to extract shadow values at local level, through cultural and eco-tourism. Such activities can be imposed or parachuted in from outside with support of outside investors, or they can develop endogenously. Whilst the latter is more likely to generate sustainable outcomes and better resource management, the former may allow tourist developments to proceed faster and thus create more short-term jobs.

Elsewhere in Europe, there are many examples of development partnerships that seek to establish sustainable rural development that embodies good environmental management. Many of the most successful of such projects recognise the new values of rural areas for recreation and tourism, but are rooted in sustaining and developing the livelihoods of the resident population, in maintaining cultural distinctiveness and in building local capacity to adapt to the changing market place.

In natural forests, which are often protected by legislation, there is a clear need to zone forests into areas in which the natural values are given the highest level of protection, through buffer zones, into production zones where multi-functional management can be practised in ways that gives succour and support to local communities through the generation of wages and employment, directly in the forest in conservation and management tasks, upstream and downstream in the forest supply chain and indirectly in tourism and recreational industries.

#### **4.5 Blending the instruments**

The management of natural forests to maximise socio-economic values is a complex task. Increasingly, an argument is made for the co-evolution of economic development and sustainable ecosystem management approaches. This requires an understanding of both socio-economic and ecosystem systems (KENNEDY *et al.* 1998). From a socio-economic perspective, the blend of appropriate instruments cannot be pre-specified, as different socio-political and cultural contexts may respond differently to different instruments. In general, there is a preference for the use of suasive instruments that are often associated with high levels of stakeholder engagement. This accommodation of competing and varied values is central to the human ecology view of forests, but suasive approaches can break down, be distorted by power structures or result in what may be perceived as unreasonable restrictions on owners or rights holders. Regulatory instruments are often easier to employ, but require monitoring to ensure compliance. In remotely located, lightly peopled natural forests regulatory instruments may be insufficient to control livelihood-supporting incursions by surrounding populations. Economic instruments can only work where the full range of forest values are associated with market prices or where proxy prices (or costs) can be measured with accuracy. Doubts about the capacity of economists to capture all the elements of value using economic instruments remain, but the cost-effectiveness of economic instruments is unquestionable. Further, economic analysis can expose the opportunity cost of regulation, where opportunities for economic activity in natural forests are constrained by regulation.

### **5 Conclusions**

Values drive behaviour and resource allocation. Economists have tended to seek to reduce all values to the measuring rod of money. Methods such as cost benefit analysis (CBA) and more recent techniques for measuring environmental values (such as the Contingent Valuation Method) represent ways in which economists have had to adjust market prices or estimate absent values. The rationale behind such approaches is to offer from a utilitarian perspective, a better framework for decision-making.

Other social scientists have often been extremely suspicious and dismissive about economists, not least because of some significant theoretical and epistemological differences between economics and the other social sciences disciplines, especially sociology and geography. Central to the difference of opinion between the economists and the other social scientists is the notion of reflexivity, in which the objects of inquiry – people – become interactive agents in the determination of the world in which they live and the theories which attempt to understand and explain it, rather than passive consumers or producers in a narrowly conceived market model. Notions of value are seen not only in market prices but also as socially constructed and malleable conceptions that evolve over time.

Out of the unease about the primacy of economic values, two forms of criticism have emerged: first, that economic values cannot be estimated with sufficient accuracy for certain elements (natural environment values tend to be used as an example of such elements); and second, that the assumed primacy of economic values over others has no real legitimacy. Even some highly regarded economists (LAYARD 2003) have begun to question the assumption that greater wealth leads to greater happiness and improved feelings of well-being.

In the context of natural forests, it is evident that many decisions are still guided more by legislation and other non-economic drivers than by economic analysis alone. This can be variously interpreted. First, it can be seen as a common-sense approach to dealing with complex multi-functional resources, where the economist's tool-kit for estimating the full array of values is still incomplete or at least incompletely trusted by all stakeholders. Second, it can be seen as the ability of a different type of (non-economic) decision making to prevail, based either on the softer, more qualitative social sciences, or on beliefs by bio-physical scientists of the desirability of conserving or exploiting particular bio-physical resources.

These alternative decision models tend to produce different responses. The first leads towards more participatory and inclusive approaches to natural resource management and is strongly favoured by development agencies such as the Department for International Development and even some departments in the World Bank and is embedded in post Rio, Helsinki and Lisbon guidelines for sustainable forest management. The second leads to a more traditional exclusionary research-driven approach to the protection and management of highly valued natural resources.

In both situations, an argument for greater understanding of economics can be made, not least because those making policies and decisions about natural forests have major responsibilities that must be undertaken in an informed way. Often they face limited resources with which to carry out their demanding tasks.

The multiple socio-economic values associated with natural forests, the conflicting theories and epistemologies of different groups of social and bio-physical scientists and the need to devise management strategies which are sensitive to both social and economic need and the demand for responsible stewardship at global level create an enormous challenge to those responsible for natural forests. Understanding socio-economic values, understanding the theories associated with these values and feeding them into strategic and local policy and practice constitute an important part of the challenge of informed management of natural forests.

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Economic Value of Forest Ecosystem Services: A Review. E. XECUTIVE. Goods provided by natural ecosystems are the basic building blocks of human welfare. Natural ecosystems provide much of the food we eat, the water we drink, the clothes we wear, material for shelter, fuel to keep us warm and inspiration and experiences that enrich our lives. The ability of ecosystems to provide these goods depends on the less obvious ecosystem services or processes through which the goods are created and maintained. Forests help manage natural systems. Trees, for example, absorb harmful particles and help provide clean water by filtering it. They also help prevent or regulate natural disturbances, providing protection from soil erosion, rock falls, and high tides, for example. In coastal areas, forests such as mangroves shelter local populations from tsunamis. Interestingly, Europe and Asia jointly account for almost half of forest economic value but only 20% of global forest area. That's because they each hold a relatively high share of the world's productive forests and have very efficient commercial forestry operations. Further, both hold a large share of temperate forest, which provides the best conditions for productive use in terms of accessibility and rate of tree growth. While most forestry has been concerned with the management of forests to provide wood for timber, globally the greatest demand for wood is as firewood. Some forests are managed specifically for firewood production, but this is generally rare. Firewood is often collected as a subsistence product, and its valuation is therefore difficult. Consequently, most attempts to assess the economic contribution of wood from forests concentrate primarily on timber and, to a lesser extent, fibre. Non-timber forest products is a catch-all term intended to include all forest products other than timber. You will see indirect use values: values arising from various forest services, such as protection of watersheds and the storage of carbon; and option values: values reflecting a willingness to pay to conserve the option of making use of the forest even though no current use is made of it. The higher the discount rate, the less market value is attached now to yields in the future. If logging can take place in natural forests with maximum harvest now, this will generate more near-term revenues than sustainable timber practice. Similarly, sustainable timber management involves higher costs, e.g., in avoiding damage to standing but noncommercial trees. The Value of Forest Ecosystem Services to Developing Economies. Katrina Mullan University of Montana. Forest conservation is easy to view as a trade-off between local income generation, through clearing land for agriculture or logging for timber, and global environmental benefits such as biodiversity protection and carbon sequestration. Modern development has been based historically on the destruction and exploitation of natural ecosystems, from conversion of wild land for agriculture to urban construction and overfishing. As human populations grow and natural ecosystems become more scarce, the importance of these ecosystem benefits increases (e.g. Koch et al. 2009; Ghermandi et al.