



From microbes to mountains

Understanding and debating the role of ecosystem services in environmental management – Volume 2

May 2013





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The images throughout this report are a selection from CIWEM's Environmental Photographer of the Year competition: www.epoty.org (credits on pg. 31)

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Who we are and what we do?

Working for the public benefit for a clean, green and sustainable world, CIWEM (The Chartered Institution of Water and Environmental Management) is the only independent, chartered professional body and registered charity with an integrated approach to environmental, social and cultural issues.

CIWEM:

- Supports thousands of members worldwide in nearly 100 countries.
- Is a powerful evidence-based lobbying force in the UK and overseas
- Provides training and professional development opportunities
- Provides a forum for debate through conferences, events and publications
- Works with governments, international organisations, businesses, NGOs, the creative industries and faith groups for a holistic approach to environmental issues
- Develops partnerships with like minded organisations across the world
- Supplies independent advice to governments, academics, the media and the general public
- Unites the environmental professions under common cause for public understanding and wellbeing.
- Inputs directly into European and UN policy development
- Promotes and celebrates excellence through a varied awards portfolio
- Is committed to improving its own environmental performance.

Purpose

The terms 'ecosystem services' and 'natural capital' are increasingly used across the environment sector and within policy circles. They are the 'goods' on which our economic, social, mental and cultural wellbeing are built, forming a core part of our heritage. However, due to their complexity and relatively recent conception, understanding of their definitions and purpose remains weak. Alongside this, the debate surrounding the adoption of this approach is often reduced to discussions surrounding the highly controversial role of monetary valuation techniques. This document consolidates CIWEMs existing publications in this area, and seeks to inform environmental professionals through summarising the wealth of information available into one easily digestible document, which:

- Defines the terminology;
- Provides the environmental and political context through which the terminology has developed;
- Highlights where the strengths and weaknesses lie
- Addresses what values are considered and how they are defined
- Discusses the appropriateness of valuation tools, and the ethical and moral implications of monetary valuation
- Illustrates their application through case studies
- Offers suggestions for further discussion; and
- Makes policy recommendations

In doing so this report provides the background to these 'new' approaches whilst furthering the current debate surrounding the complexity of, and controversy surrounding their adoption.

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Definitions

Ecosystems approach:

- *A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way, and which recognises that people with their cultural and varied social needs, are an integral part of ecosystems.¹*

Ecosystem services:

- *The benefits provided by ecosystems that contribute to making human life both possible and worth living.²*
- *Components of nature, directly enjoyed, consumed, or used to yield human well-being.³*
- *The aspects of ecosystems utilised (actively or passively) to produce human well-being.⁴*
- *Ecosystems are complex systems of living and non-living elements that interact as a unit. They vary significantly in type and scale. Examples include a river system or moorland area. Ecosystems provide a stream of valuable ecosystem services to people, such as fish, timber, pollination and recreation opportunities. They will do this indefinitely if used sustainably.⁵*

Ecosystem Goods:

- *Ecosystem services are the conditions and processes through which natural ecosystems, and the species which make them up, sustain and fulfil human life. They maintain biodiversity and the production of **ecosystem goods**, such as seafood, forage, timber, biomass fuels, natural fiber, and many pharmaceuticals, industrial products, and their precursors⁶.*

¹ Maltby, E. (1997): *Ecosystem management: the concept and the strategy*. IUCN World Conservation 3/97:3-4

² Millennium Ecosystem Assessment, 2005

³ Boyd, J and Banzhaf, S. What are Ecosystem services? Resources for the Future, 2006

⁴ Fisher, B, Turner, R.K. and Morling, P. Defining and classifying ecosystem services for decision making. Ecological Economics 68 (2009) 643-653

⁵ <http://www.defra.gov.uk/naturalcapitalcommittee/files/NCC-Information-Sheet-080413.pdf>

⁶ Daily, G. C. 1997. Introduction: what are ecosystem services? In G. C. Daily (Ed.), *Natures services: societal dependence on natural ecosystems*

Biodiversity:

- The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.⁷
- Biodiversity is the variety of all forms of life, from genes to species, through to the broad scale of ecosystems.⁸

Natural Capital:

- The stock and flow of Earth's ecosystem services.⁹
- Natural capital refers to the elements of nature that produce value (directly and indirectly) to people, such as the stock of forests, rivers, land, minerals and oceans. It includes the living aspects of nature (such as fish stocks) as well as the non-living aspects (such as minerals and energy resources). Natural capital underpins all other types of capital (man-made, human and social) and is the foundation on which our economy, society and prosperity is built.¹⁰

Introduction

Integral to an ecosystems approach is the proper reflection and consideration of ecosystem services. More recently, ways in which ecosystem services may be assigned an economic value have become a focus for attention, often as a means of translating ecological understanding of value into the language of economics so that it may be more readily appreciated by policy and decision-makers less well versed in environmental issues. Whilst biodiversity is not the focus of this report it is important to recognise that it underpins most, if not all ecosystem services, and that many definitions, including the ones above are contested¹¹.

The importance of ecosystem services and the role of whole ecosystems, rather than individual species in delivering essential services for humankind was surmised by Bateman *et al* (2010):

*"...the importance of incorporating ecosystems services within policy appraisal and decision making techniques cannot be understated; it is literally a life and death issue for the future of human society and the difficulties raised cannot be shirked or the task ignored. Many would argue that there is no more important issue facing the natural and social sciences today."*¹²

⁷ United Nations Convention on Biological Diversity. Article 2: Use of terms, 1992

⁸ <http://www.defra.gov.uk/naturalcapitalcommittee/files/NCC-Information-Sheet-080413.pdf>

⁹ United Nations Environment Programme Finance Initiative: Natural Capital Declaration, October 2011.

¹⁰ <http://www.defra.gov.uk/naturalcapitalcommittee/files/NCC-Information-Sheet-080413.pdf>

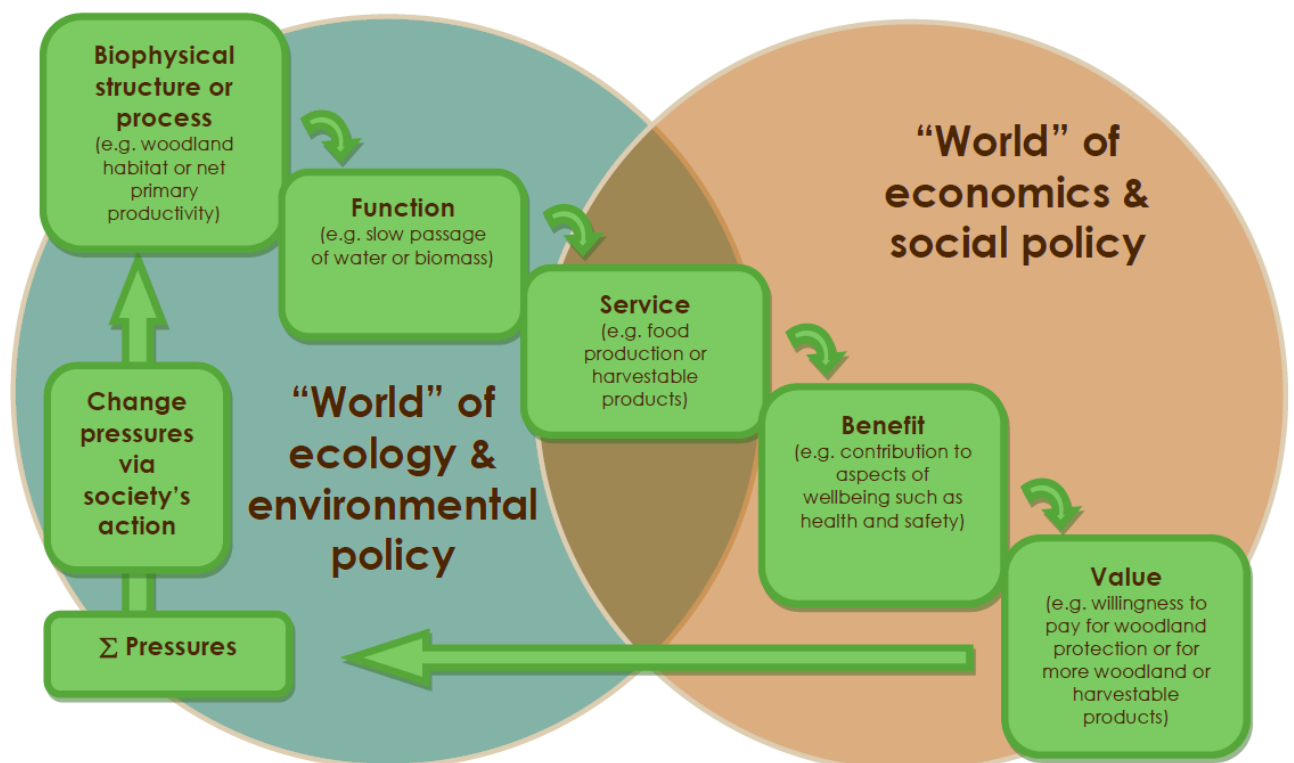
¹¹ Feest, A., et al., Biodiversity quality: A paradigm for biodiversity. *Ecol. Indicat.* (2010), doi:10.1016/j.ecolind.2010.04.002

¹² Bateman et al (2010). Economic Analysis for Ecosystem Service Assessments: CSERGE Working Paper EDM 10-10

Making distinctions

The figure below¹³ illustrates the process through which ecosystems give rise to a flow of benefits for environmental, societal and economic use. It helps to illustrate how the topic bridges the two worlds of environmental and economic policy whilst simultaneously speaking the language of neither. Currently ecosystem services are only paid for indirectly via 'goods' such as timber and the additional benefits in terms of contribution to human wellbeing are not considered.

What are ecosystem services?



¹³ Adapted from: Haines-Young, R. & Potschin, M. (2010): The links between biodiversity, ecosystem services and human well-being. In: Raffaelli, D. & C. Frid (eds.): Ecosystem Ecology: a new synthesis. BES Ecological Reviews Series, CUP, Cambridge



The environmental and political context

Ecosystems are valuable and under threat

Ecosystems provide the goods and services upon which each nation's heritage is built, providing the fundamental economic and spiritual resource to development, culture and mental well-being. However, this value is commonly neglected by governments and other decision makers as it is rarely incorporated into basic economic assessments. As the natural world provides the services for creating and sustaining human life and well-being, the inability of economic frameworks to properly reflect this value over recent decades has resulted in their erosion and over-exploitation, most eloquently described by the Tragedy of the Commons¹⁴. This inability of present markets to handle such services was recently highlighted by The UK National Ecosystem Assessment (UK NEA) which demonstrated a failure to deliver the best outcomes for society¹⁵.

What are the threats?

Ecosystems have suffered more human-induced fragmentation in Europe than in any other continent as a result of development¹⁶. Built-up areas have increased by 20 percent in the last 20 years alone. As a result, almost half of European wildlife is in serious decline and valuable ecosystems have become degraded and fragmented. In 2001, the European Union set itself the ambitious goal of halting the rate of loss of biodiversity by 2010. Whilst the policy framework is largely in place at a community level the pace of change and extent of implementation was insufficient to meet this target.

SIGNPOST:

For more details on environmental threats please see:

The Natural Choice: Securing the Value of Nature (NEWP) June 2011: <http://www.official-documents.gov.uk/document/cm80/8082/8082.asp>

The National Ecosystems Assessment (NEA) June 2011: <http://uknea.unep-wcmc.org/>

Making Space for Nature, September 2010: <http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf>

¹⁴ Hardin, G. 1968. The Tragedy of the Commons". *Science* **162** (3859): 1243–1248.

¹⁵ <http://uknea.unep-wcmc.org/>

¹⁶ EUROPEAN COMMISSION. 2008. The European Union's Biodiversity Action Plan.

Fragmentation and degradation are likely to increase due to a number of threats including pollution, urbanisation, infrastructure development and increased land take for agriculture. An increasing human population will exacerbate the many pressures the natural environment faces. This will increase competition for resources such as land, water, food and fuel, and threaten the ecosystems that support our survival.

Climate change amplifies these threats, posing a significant challenge globally through altering habitat type, migration patterns and increasing extinction. This makes ecosystems more vulnerable to extreme events that are likely to increase in intensity and frequency.

Facilitating the natural environment's adaptation to many of the changes it now faces is vital if we are to enjoy the many services it provides for society. The failure of current economic models to recognise the many benefits that ecosystem services provide increases the risk of further over exploitation and rapid depletion of resources. The natural environment can play a vital role in protecting us from the unavoidable effects of climate change through carbon sequestration, flood mitigation and the cooling effects of evapo-transpiration. These 'services' have significant economic value and their continued destruction will result in a damaging feedback process accelerating climate change and limiting the ability of species to adapt to such changes.

*Making space for Nature*¹⁷ identified the importance of addressing fragmentation and degradation in order to build ecological resilience to threats such as climate change. A restorative approach was advocated and summarised by just 4 words: more, bigger, better, joined.

Social and political response

Within the UK the importance and value of ecosystems has received increased attention due to the ability of ecosystem services and 'natural capital' to add new depth and context to existing policy debates. Driven by the continuing desire of UK governments for economic growth, an ability to place a monetary value on the services provided by ecosystems has become increasingly recognised by the broader policy and business communities. It is believed that this has the potential to provide a tool that can better reflect the importance and finite nature of environmental services and resources which, under current decision making procedures, are often prescribed an economic value of zero.

It is therefore no surprise that the concept is already widely used. The Natural Environment White Paper (NEWP) launched in summer 2011 codifies this process, noting that the "*government and society need to account better for the value of nature, particularly the services and resources it provides*"¹⁸. NEWP led to the establishment of the Natural Capital Committee, which acts as an independent advisory body to Government and reports directly to the Chancellor of the Exchequer on the state of English natural capital¹⁹.

¹⁷ Lawton (2010) *Making Space for Nature: A review of England's Wildlife Sites and Ecological Network*

¹⁸ *The Natural Choice: securing the value of nature*, HM Government, June 2011

¹⁹ <http://www.defra.gov.uk/naturalcapitalcommittee/about/>

This process has been simultaneously supported through the UK NEA²⁰ which charted and mapped the nation's natural asset base, in order for it to be measured and protected. Other existing policy at the European level also seeks to promote the importance of the natural environment, this includes the EU Biodiversity Strategy which outlines a long-term vision of ensuring that by 2050 European Union biodiversity and the ecosystem services it provides are protected, valued and appropriately restored.

This increasingly dominant discourse of valuing the critical role of ecosystem services and functions, and their role in economic and societal wellbeing has led to the presumed logical and somewhat inevitable development of valuation methodologies and ecosystem markets, which aim for the true value of these services and functions to be realised and accounted for in decision making. It is believed that without an appreciation of 'worth' these vital services will continue to be abused and exploited in the marketplace. Through transforming the language and approach of ecologists in this sense, increased engagement with previously uninterested and hard to reach communities is possible. It is important to note that economic valuation can take many forms, the most controversial of which is monetary valuation; the specific debate surrounding this will be addressed in this report.

At a broader political scale, this discourse has developed at a time when environmental legislation in the UK is threatened by the Government's de-regulation agenda. HM Treasury requires departments to employ Cost Benefit Analysis (CBA) as a tool to support policy decision making. Ecosystem services valuation is compatible with CBA and given the de-regulation drive, its more widespread adoption could help to mitigate the more damaging proposals to environmental protection currently being considered. It also comes at a time where discussion at the international level surrounding environmental protection is filled with increasing disillusionment and conflict. The Rio +20 conference was the latest in a series of perceived failures of national governments to make serious commitments to protecting the natural capital on which human prosperity relies. Within this context, valuing ecosystem services is of increasing interest and its potential to chart a new way forward during a period of economic hardship which ensures the natural world is protected, is an important development.

Charting the development of ecosystem services and valuation

Eliciting market valuations for non market goods is not a new theory and was first proposed in 1947 by Ciriacy-Wantrup²¹. 'Contingent valuation surveys' gained popularity in the 1980s as a means to protect environmental resources from damage. The technique has since been developed and adopted further.

²⁰ <http://uknea.unep-wcmc.org/>

²¹ Ciriacy-Wantrup 'The Economics of Environmental Policy' http://www.kysq.org/docs/C-W_LE71.pdf

A time line charting the development of ecosystem services and valuation





Application

What is an ecosystems approach?

“An ecosystems approach is a way of looking at the natural environment throughout your decision making process that helps you to think about the way that the natural environment works as a system. In doing so you will also be thinking about the spatial scale of your interactions with the natural environment, the range of constraints and limits at play and the people involved in supplying and receiving ecosystem services and benefits. Carrying out economic valuation of the ecosystem services involved will help you to incorporate the value of the natural environment in your decision.”²²

The phrase ‘Ecosystems Approach’ was first coined in the early 1980s, but found formal acceptance at the Rio Earth Summit in 1992 where it became an underpinning concept of the Convention on Biological Diversity²³.

Traditional systems of environmental management have tended to focus on individual species or habitats and have not achieved an integrated approach to the conservation and sustainable use of resources. Consequently the economic activity that the ecosystem supports has been compromised.

²² <https://www.gov.uk/ecosystems-services>

²³ <http://www.cbd.int/>

The first steps in establishing a guide for ecosystem valuation in the UK were undertaken by Defra in 2007. 'An Introductory Guide to Valuing Ecosystem Services'²⁴ identified the need for continued development in order to operationalise this approach in policy appraisal. 'Ecosystem thinking' is now being embedded into policy-making and delivery on the natural environment.

Strengths and weaknesses of an ecosystems approach

Strengths	Weaknesses
<p>Grounded in a holistic view of the environment, which attempts to include those aspects of the environment which are commonly not included in decision making; (such as indirect impacts on water regulation or purification functions or on the social use of sites.)</p>	<p>Relatively new concept for many decision makers.</p> <p>Terminology used is variable and can be confusing, especially to the general public.</p>
<p>A readily understood concept amongst environmental practitioners.</p>	<p>Interactions and dependencies between services and functions can be complex and often difficult to assess at a larger scale. Easiest to apply at a local level where more site specific information is available.</p>
<p>Promoted heavily by Defra for inclusion within decision making at all levels.</p>	



²⁴ Defra. An introductory guide to valuing ecosystem services. 2007

Example Applications

Defra has undertaken a number of case studies to investigate how the approach could be made operational. These included:

- [Guiding development in the Kent Thameside development area](#)
- [The selection of the M6-Heysham link road route, Lancashire](#)
- [Management of the Parrett Catchment Somerset](#)
- [Management of the Otmoor protected area \(Oxfordshire\)](#)

Case studies were also completed as part of another Defra project – ‘A Valuation of England’s Terrestrial Ecosystem Services’. One of these examined how health related benefits are provided by urban trees in two London Boroughs and valued these benefits based on a damage costs avoided approach. A discussion of other benefits provided by urban trees is also provided here.

The key points which came from the assessment were:

- Ecosystem services are not restricted to natural or semi-natural locations; green spaces, specifically trees, in an urban environment provide numerous benefits. Direct and indirect benefits arise from the effect on air quality (gaseous and particulate), temperature, and the aesthetics of an area.
- Using complex air quality, emission and transpiration modelling, it is possible to infer the following:
 - Mature, mixed woodland sequesters airborne particulates at three times the rate of grassland;
 - Trees at the edge of woodland are more efficient at sequestering particulates than those in the centre; and
 - Evergreens are more efficient than deciduous trees at providing pollution removal benefits.
- To value the benefits provided by urban trees, the damage cost values are applied. These are estimated for each pollutant based on avoided deaths brought forward and avoided hospital admissions. PM₁₀ (particulate matter) has the greatest damage cost per tonne per annum therefore the greatest benefit arises from its removal.
- A conservative central estimation of the health benefits of pollutant removal by urban trees in two London Boroughs is approximately £22K and £67K per year.

See O’Gorman and Bann (2008²⁵) for more information on this and other case studies including health and pollination.

What are ecosystem services?

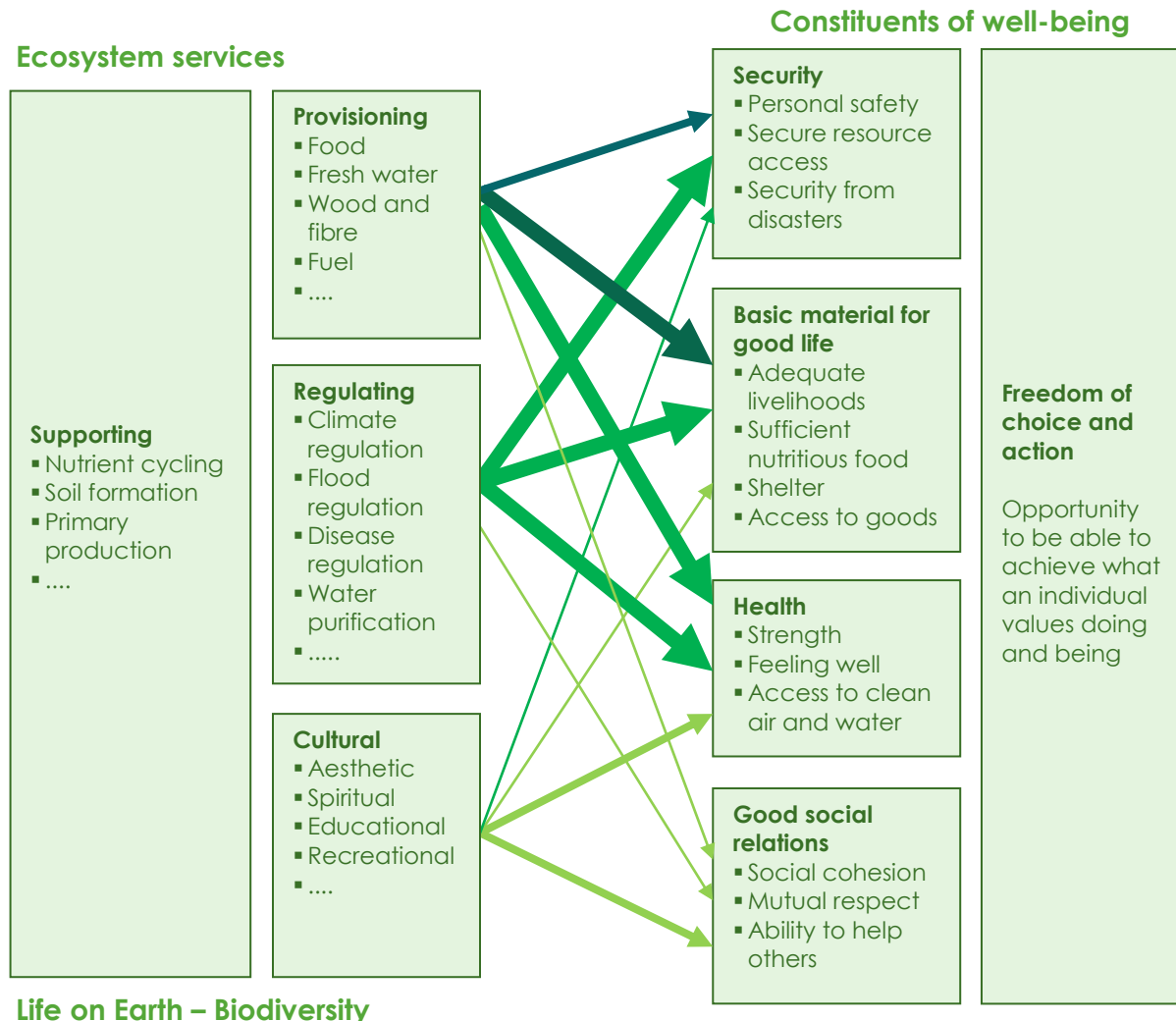
Ecosystem services are services provided by the natural environment that benefit people, including:

- Resources for basic survival, such as clean air and water;
- A contribution to good physical and mental health, for example through access to green spaces, both urban and rural, and generic resources for medicines;
- Protection from hazards, through regulation of the climate and water cycles;

²⁵ O’Gorman, S. and Bann, C. (2008) A Valuation of England’s Terrestrial Ecosystem Services, a report to Defra

- Support for a strong and healthy economy, through raw materials for industry and agriculture, or through tourism and recreation; and
- Social, cultural and educational benefits, and well-being and inspiration from interaction with nature.

Linkages between Ecosystem Services and Human Well-being.



Arrow's colour

Potential for mediation by socioeconomic factors

Low
 Medium
 High

Arrow's width

Intensity of linkages between ecosystem services and human well-being

Weak
 Medium
 Strong

This figure depicts the strength of linkages between categories of ecosystem services components of human well-being that are commonly encountered and includes indications of the extent to which it is possible for socioeconomic factors to mediate the linkage. (For example, if it is possible to purchase a substitute for a degraded ecosystem service, then there is a high potential for mediation.) The strength of the linkages and the potential for mediation differ in different ecosystems and regions. In addition to the influence of ecosystem services on human well-being depicted here, other factors – including other environmental factors as well as economic, social, technological, and cultural factors – influence human well-being, and ecosystems are in turn affected by changes in human well-being. (Millennium Ecosystem Assessment)²⁶

²⁶ MA (Millennium Ecosystem Assessment). 2005. *Ecosystems and human well-being: Policy responses*.

The widely accepted categorisation of ecosystem services comes from the Millennium Ecosystem Assessment conceptual framework as shown on the preceding page. This defines four broad categories of provisioning, regulating, cultural and supporting services and how they relate to constituents of well-being.

The manner in which these services relate to constituents of human well-being are also shown and this demonstrates the way in which they relate to peoples' everyday lives.





Valuation

The design of effective valuation tools and concepts which reflect the role of ecosystem services has allowed the concept of 'natural capital' to begin to be mainstreamed across environmental, political and economic thinking.

Through the valuation of ecosystem services and the use of an ecosystems approach the economic and ecological worlds can be joined

The Economics of Ecosystems and Biodiversity (TEEB)²⁷ is a global initiative which aims to help decision-makers recognise, demonstrate and capture the values of ecosystems including how to incorporate these values into decision-making. TEEB states that: *"Failure to incorporate the values of ecosystem services and biodiversity into economic decision making has resulted in the perpetuation of investments and activities that degrade natural capital. Including the full value of biodiversity and ecosystem services in decision making can be achieved if their sustainable management is recognised as an economic opportunity rather than a constraint on development."*

The study highlights annual environmental externalities of the world's top 3,000 companies equate to around US\$2.2 trillion annually. Action to prevent such losses could hold a benefit: cost ratio of 100:1.

²⁷ TEEB (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB.

What is meant by valuation?

The UK NEA was the first assessment of the UK's natural environment and the social and economic benefits that it provides.²⁸ It is a leading example of a national-level employment of an ecosystems approach to the future management of the environment as a key component of the economy. The UK NEA reiterates that total value (both intrinsic and instrumental) is

Intrinsic value is the value something has in itself or for its own sake, independent from its value to anyone, or anything else.

Instrumental value refers to both the direct and indirect value as a means to achieving something else.

impossible to calculate as without the vital services ecosystems provide, life would not exist. The key difference here is between total system value and total economic value (TEV); the former not being wholly focussed on anthropocentric values. However, incremental or marginal changes to these services can be valued based upon changes from a baseline. Future scenarios can be mapped against this to reflect actual and potential changes in societal well-being. The UK NEA highlights 3 different values – economic, health and shared, which can overlap and be expressed quantitatively, qualitatively and in monetary terms.

Economic £

“Seeks to determine the monetary value of goods to individuals”

Willingness to pay refer to what people are prepared to give up to obtain the goods/services (WTP)

However, methods for valuation do not exist for many environmental goods, as such different methods can be applied as appropriate, these include:

- Market prices: often with adjustments (timber)
- Production function methods: role of the ecosystem service in a goods production (crops)
- Damage costs avoided (storm protection)
- Revealed preference methods: (WTP i.e.: cost and time involved in visiting recreation site)
- Stated preference: direct question i.e.: higher water bills for cleaner rivers

The above can measure benefits, future improvements and losses.

Shared (social) 😊 / 😞

“Many argue...ethical and aesthetic principles cannot be meaningfully expressed in monetary terms. At the same time, environmental decision-makers do have to make choices which require trade-offs to be made between them...it is important that decision-makers are able to demonstrate knowledge and understanding of the philosophical and theoretical bases upon which researchers in the humanities and social sciences present evidence of the cultural values individuals and social groups attribute to their interactions with the natural world”

Whilst this can be valued in part monetarily, it goes beyond this to include 'The Human-Scale Development Index' which has been adapted by the NEA as a deliberative tool for participatory engagement.

Health +/-

“Health is a state of complete physical, mental and social (individual) well-being and not merely the absence of disease or infirmity” (taken from WHO 1948)

The NEA recognises the importance of ecosystems in promoting not only immediate health and well being but lifelong welfare.

²⁸ <http://uknea.unep-wcmc.org/>

Valuation can come in many forms. However, increasing efforts are being made to place specific economic values on ecosystems and their services in order to obviate the previous and ongoing failures of current economic models to factor in such value. This science is still rapidly evolving but recognition of the need to reflect it in a metric that is commonly understood and directly comparable by decision makers is now widespread. Haynes-Young and Potschin (2009)²⁹ state: “a review of the content of the recent literature suggests that it is the valuation issue which is now driving the field forwards”.

How is monetary valuation calculated?

One of the key influential UK approaches to monetary valuation of ecosystem services is outlined in HM Treasury's Green Book³⁰. It explains how an ecosystem services framework can be used in Social Cost Benefit Analysis (SCBA). This signifies a move away from traditional Cost Benefit Analysis (CBA), which considers only financial flows and is ineffective at informing decisions around the management of long term environmental change or risks.

SCBA seeks to inform policy and project appraisal decisions by expressing the full costs and benefits of a proposal in monetary terms through deploying techniques to elicit the value of both market and non-market impacts (both positive and negative in nature). Methods which have been developed over a number of decades are available to access non-market values. The ecosystem services framework helps to frame this valuation through the provision of a clear set of services, for which values are sought. However, first these services must be considered in both qualitative and quantitative terms, as the application of monetary valuation techniques to the consideration of environmental effects should be proportionate to the potential scale of costs and benefits identified. Where the level of environmental impact is not deemed significant, monetary valuation may not be required. It should be noted that there is no absolute requirement to do this. The TEV Framework provides a useful framework for understanding whether values are use values (both direct and indirect) and non-use values.

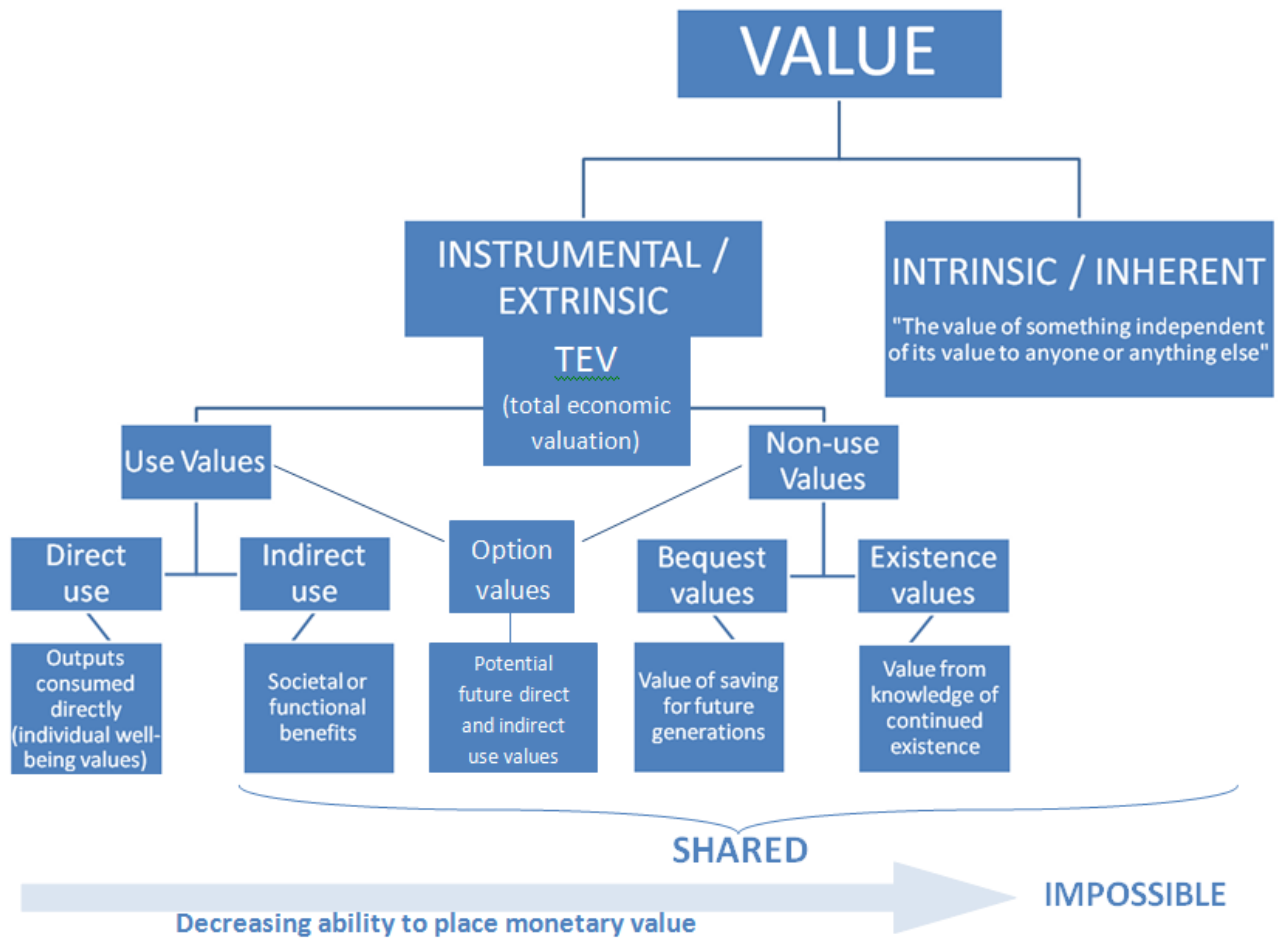
The figure below is adapted from the UK NEA and outlines the components of TEV. A key criticism of the application of monetary valuation concerns the intrinsic value of the natural environment, however the UK NEA³¹ clearly recognises intrinsic value which is not included or considered as something that can be monetised whilst giving it equal weighting alongside TEV.

²⁹ Roy Haines-Young and Marion Potschin, 2009. Methodologies for assessing and defining ecosystem services. Final report.

³⁰ http://www.hm-treasury.gov.uk/d/accounting_environmental_impacts.pdf

³¹ <http://uknea.unep-wcmc.org/LinkClick.aspx?fileticket=KSXkgw7AKSY%3d&tabid=82>

The different values that people may hold for biodiversity and ecosystems



The diagram illustrates the different nature of the values people hold for biodiversity and ecosystems and demonstrates the ability to place a monetary value on them. For example, ecosystem goods which are directly consumed such as timber can be valued based on their market price. Indirect use values are increasingly becoming ascribed a monetary value; this includes regulating services such as carbon sequestration, though the success of which, to date, is limited. However the ability to place monetary values on the bequest value of a woodland (the value we hold for saving it for future generations) and its existence value (which is not associated with any use of the environment) remains increasingly difficult. It is recognised that it is impossible to place a monetary figure on intrinsic and inherent values.

Recent estimates of the value of the natural environment to UK society include:

Business and the economy	<ul style="list-style-type: none">• An estimate of the total value of natural resources to the UK economy was over £15bn in 2007
Health and well-being	<ul style="list-style-type: none">• Recent estimates suggest that air pollution reduces life expectancy over the UK population by an average of 6 months at a social cost of £15 billion per year• If every household in England were provided with good access to quality green space it could save an estimated £2.1 billion per year in health care costs
Places and transport	<ul style="list-style-type: none">• On the Humber, increased flood protection worth over £400k per year has been achieved by converting 170 hectares of land to intertidal habitats
Climate change mitigation and adaptation	<ul style="list-style-type: none">• The annual value of carbon sequestration from UK woodlands is estimated to be £770 million

From Defra Ecosystems services – what nature gives us³²

It is important to reiterate that valuation is most effective in assessing the consequences of changes to an ecosystem as a result in a change in management, as opposed to valuation of the entire ecosystem *per se*. This makes it useful as a decision-making tool.



³² Defra Ecosystems services – what nature gives us (<https://www.gov.uk/ecosystems-services>)

South West Water case study – Valuation as a tool in facilitating a change in resource management

Placing a market valuation on ecosystem services allows companies to incorporate a number of factors within their decision making process. **South West Water** sought to reduce water treatment costs, provide flood protection and halt water quality deterioration through reinstating river habitat and the storage ability of upland ecosystems. The £8.8 million programme was deemed to be cost effective over a 30 year period for water consumers whilst sustaining long term water supplies³³.



(Photo copyright South West Water)

Whilst this method helps to rebalance decision and policy making towards consideration of long term environmental change and risk there remains a need to consider wider alternative indicators of social and economic progress in place of Gross Domestic Product (GDP).

Methodologies for the wider assessment of the economic values include:

- Market analysis
- Cost methods
- Production function
- Contingent valuation
- Hedonic pricing
- Replacement cost method
- Mitigation cost method
- Avoided cost method

³³ POSTNOTE 378 May 2011 Ecosystem Service Valuation

Challenges with this approach

As noted above the wider range of values cannot always be captured in monetary terms. Analysis of ecosystem services must *demonstrate* value appropriately when it cannot be captured in this way.

“Biodiversity loss is important in its own right because biodiversity has cultural values, because many people ascribe intrinsic value to biodiversity, and because it represents unexplored options for the future (option values). People from all walks of life value biodiversity for spiritual, aesthetic, recreational and other cultural reasons.”³⁴

However it is important to recognise that the difficulty in ascribing monetary value should not result in nominal values being ascribed to such services to aid decision-making, but *different* values.

There are many instances where such monetary valuation of ecosystem services may be counterproductive where it fails to recognise a diversity of values and/or where it runs counter to cultural norms.³⁵ In certain notable instances such as existing protected areas, parks and reserves, charismatic species or particular natural features, strong recognition of the cultural, spiritual and heritage value of the existing landscape and biodiversity have been sufficient to ensure their protection and conservation. If it is not possible to monetise the value of certain services because the techniques are not available, it is essential that these services are still identified as part of any analysis and their value and validity recognised. In certain circumstances where habitats are rare and important, valuation will be impossible as would any resultant aim to compensate for loss and re-create such habitat elsewhere. TEV does recognise this; however these elements are in danger of being ignored when placed alongside the balance of financial flows.

It is this concern that divides professional opinion over the appropriateness of monetising the value of ecosystem services.

³⁴ WORLD RESOURCES INSTITUTE. 2005. Millennium Ecosystem Assessment: ecosystems and human well-being.

³⁵ TEEB (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB.



The ethical and moral debate surrounding monetary valuation

The argument for economic valuation states that natural capital, like all other forms of capital, is impossible to manage properly if it is not measured. Economically speaking, failing to put a value on nature equates to ignoring a large part of a balance sheet, the result of which would make the profit and loss ratio significantly out of balance. However under this new approach, businesses that currently (or may, in some future scenario) exploit the natural environment, can be provided with incentives that not only account for the cost of exploitation but also provide an incentive for protection and enhancement. It is hoped that this will change decision makers' mindsets from short-term gains, particularly financial, towards longer term, potentially lower rate but sustained payback. It is widely recognised that such monetary valuation cannot be exact. However, expressing the environment in these terms creates the ground for cooperation and the space in which other potential policy or project options can be considered.

“Replacing our obsolete economic compass could help economics become part of the solution to reverse our declining ecosystems.” Pavan Sukhdev, 2010.³⁶

³⁶ <http://www.guardian.co.uk/commentisfree/cif-green/2010/feb/10/pavan-sukhdev-natures-economic-model>

It is this process of framing the environment in monetary terms – according to critics – that leads to its commoditisation and ownership. This approach perpetuates and extends the current failing capitalist economic system, masking real and tangible action, and shoehorning the environment into a flawed economic model. Trying to fit the natural world's system of complex interdependencies and linkages into a linear economic model is not possible. The recent financial crash has highlighted that markets cannot protect sectors, and as prices fluctuate, ecosystems will become vulnerable and their social and economic value increasingly volatile and uncertain.

The transformation of ecological language to the business world rebalances the importance of the environment in relation to 'us' not within its own right; merely its 'capital' worth and the 'services' it can provide. And, without an evidence base, there is a concern that when monetary valuation is transferred to real world examples, the idea will be hijacked for short term financial gains over long term sustainability. It is this potential for the concept to be exploited or used without the good intentions and motivations to safeguard its effective implementation that raises concerns.

Where environmental protection is not at the heart of this approach it should be questioned. Taken in isolation, those elements of an ecosystem that cannot be valued are likely to be edited out of discussions and overlooked, and the incomplete valuation is thus likely to lose out to more attractive commercial returns. Without a complete valuation, which is impossible to achieve, we continue to fail to protect the environment.

"The concept of a balanced budget....seems an alien concept when the consumption of natural resources and the production of waste is concerned. Yet it is far more important to achieve a balanced environmental budget than an

economic one. You can always print more money, but you can't print more planet." Andrew Simms, 2010.³⁷

Whilst it is widely recognised that the application of a TEV framework is beneficiaries-led and that UKNEA states: *"we make no claims that all environmental goods and their benefits can be monetised"*, such terminology can instil fear in some about the direction in which such an approach can take us, where everything can be bought and exchanged through neo-liberal market mechanisms and even intrinsic value can be calculated³⁸. Due to the need to compartmentalise to facilitate monetary valuation, some consider that this model does not fit well with the natural world, where functions and processes cannot be disaggregated or 'unbundled'. Such an approach is symptomatic of a perceived human removal from nature. However, as part of a wider complex functioning ecosystem, we cannot remove ourselves from our position within it. It is for this reason that it is difficult to define where the line may be drawn between what can be valued and what cannot. Attempts have been previously made to place a monetary value on a human life, though this is not considered to be absolute and is offered as a mere indication as part of a decision making tool kit and will vary depending on context and use. Whether the same would be done for ecosystem services is questionable.

³⁷ <http://www.guardian.co.uk/environment/2010/feb/18/price-of-environmental-destruction>

³⁸ <http://www.guardian.co.uk/commentisfree/2012/aug/06/price-rivers-rain-greatest-privatisation>

Monetisation again appears problematic when considering the complexity of ecosystems, their interdependencies, and our continuing lack of knowledge surrounding the functions and services they provide. The natural world continues to provide us with new resources which further support human development, particularly within the field of medicine. How we can place a value on something which we are yet to understand in isolation as well as in relation to a broader process is extremely problematic.

This lack of understanding is not confined to the scientific community. Whilst the issue is a hot topic within the environment sector its relative importance warrants a much broader discussion and understanding. This is vital when considering the value of nationally and internationally important species, landscapes, and ecosystems. Who should be the arbiter of these and their existence and bequest value cannot be determined purely by technocrats and policymakers. Ultimately, it can be argued that this lack of appreciation and understanding is what creates environmental problems and as such, a much broader societal understanding of ecosystems would make such an approach unnecessary. Increased engagement with social science communities may help to address this and to investigate human behaviour and attitudes toward the natural world.

In the meantime proponents continue to point to the justified position of engaging with business communities, ensuring the environment is 'accounted' for in decision making and the limited role of valuation as one method in the tool kit for policy and project proposals.



Public forest estate case study - Valuation in policy formation and consultation

One of the most prominent examples of valuation in action is the Coalition Government's proposal in 2011 to sell some of the public forest estate. The Government placed a monetary figure on this resource, which formed the basis for much of the subsequent debate and criticism.

The public backlash centred on willingness to pay (WTP) for this vital resource based upon the figures provided (see text box).

Cost of public forest estate

- Forestry commission costs 30p per taxpayer
- Maintenance of the public forest estate costs the forestry commission £10 million a yr
- Sell off was predicted to raise £150 to £250 million over a 10 year period

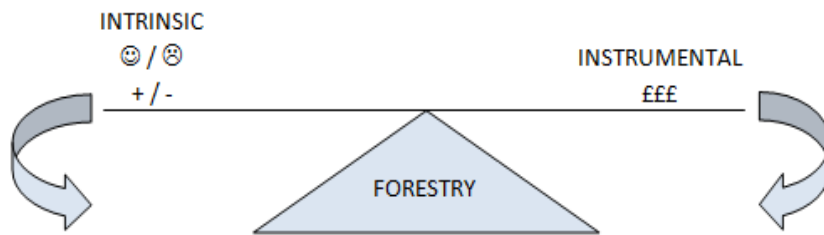
Organisations such as the National Trust and 30 Degrees produced large petitions, and parliamentarians received an unprecedented amount of correspondence from their constituents highlighting the cultural, recreational, and health benefits of the nation's forests which were deemed to be largely undervalued and not fully reflected in the proposed figures. As a result the Government was forced into a very public and embarrassing u-turn on this policy.

The Independent Panel on Forestry was established to review this position and the wealth of consultation responses received. Whilst the findings go some way to protecting the nation's forests, they recommend a policy approach based around monetisation, reasserting the role of forests as 'natural capital' and noting that the Government:

"needs to adopt policies, and encourage new markets, which reflect the value of the ecosystem services provided by woodland. These include carbon storage, flood protection, biodiversity and habitat provision, and wider ecosystem services."

"...We want to harness the potential for such markets, and in the future ensure attractive trading and investment opportunities that go beyond existing boundaries to businesses that have not traditionally been involved in the forestry sector... Government should continue to frame and evaluate its policies in ecosystem terms, taking account of their impact on social and natural capital, alongside traditional economic costs and benefits. The public forest estate in particular represents a vast national bank of natural, social and economic capital... To achieve this, it needs to be managed using a balance sheet that takes full account of all the benefits it delivers. This will help highlight where investment should be targeted, and help resolve difficult management decisions."³⁹

³⁹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/183095/Independent-Panel-on-Forestry-Final-Report1.pdf



The approach recommended above raises a number of concerns. Firstly, it frames the forestry sector as a business opportunity. Whilst this may be the case in commercial forests, it reaffirms its 'value' in direct reference to what it provides us as opposed to its intrinsic right to exist. This example highlights both the positive and negative aspects of the debate. It is encouraging that the electorate felt engaged and chose to oppose a decision made without democratic consent, thus helping to ensure both instrumental and intrinsic value was accounted for and considered in government policy. However, there will not always be such a high profile opportunity to engage and the subsequent findings of the panel once again reasserted the emphasis on monetary valuation. It remains to be seen whether there will be further 'swings' in the balance of this debate.



In summary

Ecosystem services provide the 'goods' on which our economic, social, mental and cultural well-being are built. This report has provided a breakdown of current debates and definitions through summarising its context, strengths and weaknesses, and application.

In doing so it highlights how valuation tools could assist in the consideration of ecosystems in cost benefit analysis. This allows environmental concerns and the reflection of environmental 'value' to reach a new and historically sceptical audience. As such, a more holistic cost benefit analysis can be adopted in decision making, helping to deliver improved environmental outcomes. As TEEB⁴⁰ notes:

“Economic assessment should be seen as a tool to guide biodiversity management, not as a precondition for taking action. However, the framework of economic analysis and decision making described in the TEEB reports, if widely implemented, could go a long way towards making pro-biodiversity investment the logical choice for a much wider range of actors in the future.”

However, it is important to consider the limitations of valuation methods and their criticisms when employing these tools. The application of valuation methods to ecosystem services is a developing discourse. Whilst this approach receives broad

⁴⁰ TEEB (2010) The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB

support, a number of serious ethical and moral challenges remain. Many critics point to the inability of these new methods to speak either the language of ecologists or economists, criticising the adoption of economic tools to environmental management on the basis that it 'pollutes' valid ecological concerns.

How an ecosystem or species can be valued is subjective, and varies spatially and temporally. Managing these disparities will prove a huge challenge and makes the pragmatic application of the concept problematic. It also ignores a specie's intrinsic right to exist regardless of its provisioning service to human beings. However, it is important to note that monetary valuation is a complementary tool in decision making, which aims to recognise the contribution that ecosystems make to economic and social well being, thus helping to sustain and potentially enhance them. This is increasingly important in an economic climate where the Government is unwilling to commit sums of money to ecological resilience.

Whilst the economic system in which business operates will not radically change soon, this debate provides an opportunity for influence and the space in which to reconsider the potential opportunities for 'ecological growth', thereby revaluing economics in service to the natural environment.

CIWEM's position:

CIWEM welcomes measures to increase engagement, professional understanding and efforts to include a more integrated consideration of ecosystems in decision making; a concept espoused in the Ecosystems Approach.

The Ecosystems Approach is defined as *"a way of looking at the natural environment throughout your decision making process that helps you to think about the way that the natural environment works as a system. In doing so you will also be thinking about the spatial scale of your interactions with the natural environment, the range of constraints and limits at play and the people involved in supplying and receiving ecosystem services and benefits. Carrying out economic valuation of the ecosystem services involved will help you to incorporate the value of the natural environment in your decision."*⁴¹

CIWEM warns that putting a price on nature is highly contentious with a number of unanswered moral and ethical questions. There is a debate to be had surrounding the consequences of adopting this approach. As a relatively new concept to the broad environmental disciplines within the UK, there is a lack of experience and an insufficient evidence base to provide certainty on what this approach offers and what it may lead to (though this varies across sectors). As such there is a need to proceed with caution on the specific element of monetary valuation.

⁴¹ <https://www.gov.uk/ecosystems-services>

CIWEM calls for:

- **Adoption of an Ecosystems Approach** that recognises the fundamental significance of ecosystems to human survival and well-being.
- **A high profile public debate** on the appropriateness of placing a monetary value on ecosystem services. (CIWEM, as an independent professional body will help facilitate this debate.)
- **An evidence base formed of UK and worldwide case studies** to assess the monetary valuation of nature and natural resources against sustainability criteria.
- **Safeguards, procedures and criteria to be established** to ensure that valuation tools are not exploited by interests indifferent to the environment.
- **An independent assessment of the moral and ethical implications of placing a monetary value on ecosystem services.** An assessment should explain how ecosystems will be protected and which organisation will perform the duties of a publically accountable arbiter of their economic value. Within the UK the assessment should be led by the House of Commons Environmental Audit Committee. Internationally, the UN should encourage other national governments to follow the UK's lead and institute their own independent assessments.
- A whole curriculum review of environmental education alongside enhanced public education measures. **A good level of understanding and knowledge across society is vital when making decisions** on the importance of services the natural world provides and their value to societal wellbeing. Without this understanding a representative value cannot be effectively ascribed.
- A move towards **the economy serving ecology rather than the ecology serving the economy.** This means a commitment to invest in the future health of the environment for societal benefit and a move away from unsustainable GDP-centric and perpetual economic growth models.
- **The continued exploration of alternative ways of doing things,** whether these are specific methods and tools such as Ecosystem Impact Assessments, or examination of much broader and more challenging issues such as redressing and reframing our failing economic system.

Key documents for further research

The Economics of Ecosystems and Biodiversity (TEEB) Synthesis Report:
<http://www.teebweb.org/TEEBSynthesisReport/tabid/29410/Default.aspx>

The Natural Choice: Securing the Value of Nature (NEWP): <http://www.official-documents.gov.uk/document/cm80/8082/8082.asp>

The National Ecosystems Assessment (NEA): <http://uknea.unep-wcmc.org/>

POSTnote Ecosystem Service Valuation:
<http://www.parliament.uk/business/publications/research/briefing-papers/POST-PN-378>

POSTnote The Ecosystem Approach:
<http://www.parliament.uk/business/publications/research/briefing-papers/POST-PN-377>

POSTnote Natural Capital Accounting:
<http://www.parliament.uk/business/publications/research/briefing-papers/POST-PN-376>

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