

Discussion Paper on Ecosystem Services for the Department of Agriculture, Fisheries and Forestry

Final Report



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Glossary of key terms and acronyms

DAFF	Australian Government Department of Agriculture, Fisheries and Forestry
DSEWPaC	Australian Government Department of Sustainability, Environment, Water, Population and Communities
Ecosystem	<p>A system in which a range of species interact with one another and with the non-living <i>environment</i>. Although ecosystems rarely have clearly defined boundaries and are constantly changing, this term is used to convey the fact that species often interact with one another in complex ways that result in processes that would not happen if individual species functioned in isolation from one another. This is an example of the total outcomes from ecosystems being more than the sum of the parts. Consequently, <i>ecosystem services</i> are services that could not be produced by individual species operating alone.</p>
Ecosystem services	<p>Broadly, benefits to humans from ecosystems. More specifically, the latest thinking has tightened up the definitions used when strict accounting of ecosystem services is required (e.g., in economic valuation, environmental accounting, or planning decisions that involve tradeoffs between services and/or between environmental and other factors). Firstly, some have argued that the term ‘ecosystem services’ should be reserved for services that come from ecosystems without any human input (e.g., water filtration through native vegetation systems in catchments). Human inputs are often required to turn ecosystem services into benefits (e.g., ecosystems might make opportunities for angling possible but turning this into the benefit of recreation required the actions of the angler). This clearly separates some actions by land managers (e.g., planting exotic plants to stabilize soil or fight salinity) from ecosystem services (without denying the potential value of those actions). Where land managers recreate natural ecosystems (e.g., replanting riparian vegetation) it might be argued that ecosystem services are generated <i>after</i> the human actions have been completed.</p> <p>Secondly, to avoid confusion and double-counting of benefits and to better align ecosystem services with theory in economics and ecology, the latest definitions distinguish between ecosystem services that can be turned directly into benefits (commonly called ‘final ecosystem services’) and those that support other services (commonly called ‘intermediate ecosystem services’). A further extension is to identify the specific beneficiary of the benefit to assist with its valuation and the avoidance of double counting.</p> <p>Ecosystem services have been classified under many different headings but the three most commonly used to encompass final ecosystem</p>

services are: Provisioning services (e.g., provision of the conditions for food, fibre, water, natural medicine and genetic resources); Regulating services (e.g., regulation of climate, water flows, erosion and pollination); and Cultural services (e.g., recreation, ecotourism, aesthetic and heritage values). A further heading — Supporting services (e.g., soil formation, photosynthesis, water and nutrient cycling) — is commonly used to describe services that usually are intermediate. Some services can be final in some situations and to some beneficiaries but intermediate in other situations.

Ecosystem approach or ecosystem management

Broadly, environmental management at an ecosystem scale (i.e., a focus on ecosystems rather than individual species). An ecosystem approach usually includes a focus on ecosystem services. The UK Department for Environment, Food and Rural Affairs, for example, states:

The ecosystems approach has been defined in various ways, but the core of the approach lies in integrating and managing the range of demands placed on the natural environment in such a way that it can indefinitely support essential services and provide benefits for all.²²⁴

The recent review of the *Environment Protection and Biodiversity Conservation Act 1999*²² recommended that environmental management in Australia should adopt an ecosystem approach and defined that approach to include such elements as: management decentralised to the lowest appropriate level; considering the effects of management activities on adjacent and other ecosystems; where ecosystems are managed in an economic context, reducing market distortions that adversely affect biological diversity, aligning incentives to promote biodiversity conservation and sustainable use, and internalising costs and benefits in the given ecosystem to the extent feasible; conserving ecosystem structure and functioning in order to maintain ecosystem services; managing at appropriate spatial and temporal scales; setting objectives for the long term, recognising the varying temporal scales and lag- effects that characterise ecosystem processes; seeking an appropriate balance between conservation and use of biological diversity; considering all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices; and involving all relevant sectors of society and scientific disciplines.

When defined in this way, the ecosystem approach is virtually identical to an ecosystem stewardship approach.

Ecosystem services approach

An approach to considering the full range of potential benefits to humans from ecosystems in a strategic way using language and concepts that are understandable to a wide range of people. The essence of an ecosystem services approach is to engage specialists and stakeholders in identifying the nature of potential benefits and to consider the full suite of benefits and implications strategically before

focusing on actions that might involve some stakeholders and some services. The intent is to avoid unintended consequences that often arise when only a narrow range of benefits and beneficiaries are considered. These unintended consequences range from inefficient and ineffective use of natural resources to undermining of biodiversity and/or human social and economic wellbeing. Economists call them ‘externalities’ – impacts that occur external to the scope of the transactions being considered. While a range of classifications of ecosystem services have been developed and approaches to assessing ecosystems services in monetary and other terms have been proposed, the essence of an ecosystem services approach is to not be wed to any established scheme but to consider the particular situation and apply the most appropriate methods from disciplines like economics, ecology, psychology and others. An ecosystem services approach, therefore, is not an alternative to economic, ecological or other disciplinary approaches, but rather an approach that seeks to integrate these disciplines to encourage strategic conversations about ecological, social and economic dimensions of complex issues facing society.

Ecosystem stewardship

Ecosystem scale management that also considers social and other factors relating to the resilience of coupled ecosystems and human social systems and the ability of those systems to adapt or transform in response to change — explored more fully in Chapter **Error! Reference source not found.**

Stewardship

This is the concept of responsible caretaking or a duty of care. It is based on the premise that land managers have responsibilities to manage land and natural resources for future generations.

Environment

Used in this report to mean ‘natural environment’ unless indicated otherwise. This is intended to mean all aspects of climate, soils, water and biodiversity, including landscapes managed for agriculture and urban landscapes where native species are present and interact with one another to form *ecosystems*.

IPBES

IPBES stands for ‘Intergovernmental Platform on Biodiversity and Ecosystem Services’. IPBES will be an interface between the scientific community and policy makers that aims to build capacity for and strengthen the use of science in policy making.¹²⁵ IPBES will be a mechanism that addresses the gaps in the science policy interface on biodiversity and ecosystem services globally. IPBES was formed in 2010 as a merging of the follow-up processes from the Millennium Ecosystem Assessment and the International Mechanism of Scientific Expertise on Biodiversity. The United Nations Environment Programme (UNEP) is cooperating with the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Food and Agriculture Organisation of the United Nations (FAO), the United Nations Development Programme (UNDP) and other organizations to

operationalise IPBES. Australia has been involved in the establishment of IPBES.²⁰

Market	A market is any process by which things are traded between people. Markets develop when goods or services have clear value, it is clear who has rights to that value, and the conditions exist for those rights to be traded with others. Prices for goods and services are determined by what participants in markets are prepared to pay versus what those selling are prepared to accept. <i>Non-market values</i> are a reflection of the worth that people seem to place on things that don't pass through markets (e.g., rare species that no-one owns and no-one can sell).
Market-based instruments (MBI)	Ways of achieving policy outcomes by encouraging the development and/or direction of markets. In relation to ecosystem services, This usually involved use of regulations, caps on resource use and/or incentive payments to create demand for services that otherwise would not be traded in <i>markets</i> and/or to create a degree of temporary or permanent ownership of a natural resources so that trading in a market can occur (e.g., giving an investor the right to own and sell the carbon accumulated in trees under certain conditions).
Millennium Ecosystem Assessment	The Millennium Ecosystem Assessment (MA) was called for by the United Nations Secretary-General Kofi Annan in 2000. Initiated in 2001 and completed in 2005, the objective of the MA was to assess the consequences of ecosystem change for human well-being and the scientific basis for action needed to enhance the conservation and sustainable use of those systems and their contribution to human well-being. The MA involved the work of more than 1,360 experts worldwide. Their findings, contained in five technical volumes and six synthesis reports, provide a state-of-the-art scientific appraisal of the condition and trends in the world's ecosystems and the services they provide (such as clean water, food, forest products, flood control, and natural resources) and the options to restore, conserve or enhance the sustainable use of ecosystems. ¹⁴⁴
National Environmental-Economic Accounts	As part of the System of National Accounts, the Australian Bureau of Statistics is exploring ways to improve collection of information on the environment ¹⁰
National Plan for Environmental Information	On 11 May 2010 the Minister for Environment Protection, Heritage and the Arts announced a new initiative to address the environmental information needs of the nation. The National Plan for Environmental Information is the first step toward a long-term commitment to reform Australia's environmental information base and build this critical infrastructure for the future. The plan is a whole-of-government initiative implemented jointly by the Department of Sustainability, Environment, Water, Population and Communities and the Bureau of

Meteorology.¹⁹

Natural resources

All resources that come from nature, including not only native genes, species and ecosystems but also soils and water that play a role in supporting industries and societies.

Natural resource management (NRM)

The management of natural resources, including management for conservation, agriculture, urban consumption and any other purposes. Note that some groups and agencies define NRM more narrowly to either mean conservation management or management for agricultural production but not both. In this paper we take the term at face value – to mean the management of all resources that are part of the natural *environment*.

Non-market values

Non-market values are a reflection of the worth that people seem to place on things that don't pass through markets (e.g., rare species that no-one owns and no-one can sell). Economists have devised a range of techniques to estimate what this worth is. These are all based on gauging what people would be willing to pay if there were a market or what tradeoffs they are willing to make in terms of *market*-based values (e.g., how much more they might pay for food or water to protect biodiversity or maintain soil health). There has been a long debate about how to use non-market values in decision-making (for example, how well do people's stated preferences match their actual behaviour and decisions?).

SEEA

The System of Environmental-Economic Accounts (SEEA) is the statistical framework that provides internationally agreed concepts, definitions, classifications, accounting rules and standard tables for producing internationally comparable statistics on the environment and its relationship with the economy. The SEEA approach is being revised under the guidance of the United Nations Statistics Division.²³¹ This revision is likely to include an ecosystem assessment approaches based on ecosystem services.¹¹⁴

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WAVES

The Wealth Accounting and Valuation of Ecosystem Services (WAVES) programme (World Bank, United Nations Environment Programme and various partners) is the mechanism by which ways to include environmental information into SEEA are being investigated.¹³⁷

Executive summary

Ecosystems are complex interactions among living and non-living components of the environment (e.g., forests, grasslands, riverine ecosystems, marine ecosystems). These interactions mediate processes that achieve major transformations of resources, many of which rival or exceed what can be achieved cost-effectively by humans (e.g., maintenance of atmospheric gases, large-scale filtration and purification of water, or widespread control of potential pest species). These transformations support and enrich human life, but are often overlooked and/or undervalued in decision-making because decision-makers lack relevant information about them and because they do not pass through markets and therefore do not have economic value attached to them.

The term ‘ecosystem services’ has been used to denote the transformations of resources that can be turned into benefits by humans (Box 1). A typical definition is “... the direct and indirect contributions of ecosystems to human well-being”).

Box 1: Examples of ecosystem services (adapted from Maynard et al.¹⁵⁰)

Provision of:

- Food
- Water for Consumption
- Building and Fibre
- Fuel
- Genetic Resources
- Biochemicals, medicines and pharmaceuticals
- Ornamental Resources
- Transport Infrastructure

Regulation of:

- Air Quality
- Habitable Climate
- Water Quality
- Arable Land
- Buffering Against Extremes
- Pollination Pests and Diseases
- Productive Soils
- Noise Abatement

Support for human culture and social values by provision of:

- Iconic species
- Diverse environmental characteristics of cultural significance
- Support for spiritual and religious beliefs
- Systems from which humans can increase their knowledge
- Inspiration
- Aesthetically satisfying experiences
- Mediation of social interactions
- Sense of place
- Iconic landscapes
- Recreational opportunities
- Therapeutic landscapes

Since the late 1990s, a large body of literature has developed focusing on how to categorise and assess ecosystem services and how to integrate ecosystem services analyses with other approaches to planning and decision-making. An ecosystem services approach does not seek to replace other approaches or be a new discipline — it simply aims to name and categorise benefits from ecosystems, and the processes that lead to those benefits, in ways that enable diverse stakeholders to then apply the tools of ecology, economics and social science in an informed way and to interpret what those tools are telling them in straightforward language.

An ecosystem services approach is an integrative approach to analysing environmental benefits and beneficiaries. It draws on tools from diverse disciplines, including economics (e.g., benefit-cost analysis, total economic value, non-market valuation) and ecology (e.g., energy and material balances, resource utilisation analyses, population regulation) and social sciences (e.g., understanding of how interactions between people and the environment affect physical and mental health and wellbeing).

The key contributions of an ecosystem services approach are to provide an holistic framework for considering all benefits from the environment in an integrated way and to use language and concepts that allow stakeholders from across societies to take part in meaningful dialogue about environmental-social planning and policy. As such, the concept of ecosystem services it is potentially an important component of approaches taken by governments, non-government organisations, businesses and community groups for thinking strategically about investments in natural resource management. This is particularly important when dealing with complex, social-ecological issues like population, climate change, food security and water use, that have no easy solution and require collaborative dialogue among stakeholders to build understanding, trust and support for hard decisions.

The past decade has seen intense debate about how to characterise ecosystem services so that this style of thinking can be aligned with other approaches to assessing resource-use by humans. Most recent typologies have concentrated on:

- separating the contributions from ecosystems from those of humans (e.g., an ecosystem might provide clean water and fish but humans provide vehicles, boats, fishing lines and other inputs that lead to the benefits of commercial and recreational angling) (Figure 1)
- categorising ecosystem services and benefits in ways that avoid double-counting in environmental accounting and/or benefit-cost analyses (e.g., pollination of crops by native insects contributes to the value of those crops along with contributions from soil organisms that maintain soil fertility, so it is important that these two types of ecosystem services are considered as input to a ‘final service’ of ‘support for crop production’).

Ecosystem services assessments are an integral part of what has been termed ‘the ecosystem approach’ to natural resource management, which is now advocated by major governments around the world, including the UK, USA, Canada the EU, New Zealand and Australia. Recent approaches to ecosystem services assessments have incorporated advances in understanding resilience and adaptability of social and ecological systems – an approach sometimes called ‘ecosystem stewardship’. Ecosystem services approaches are now making important

contributions internationally and within Australia to the development of environmental-economic accounts.

This report reviews recent developments in thinking about ecosystems services, in Australia and internationally, and considers how this concept can contribute to policy and management in relation to natural resources and human well being in Australia. It concludes that there are still issues to be addressed in relation to how an ecosystem services approaches might be put into practice, but that the concept already has several unique contributions to make.

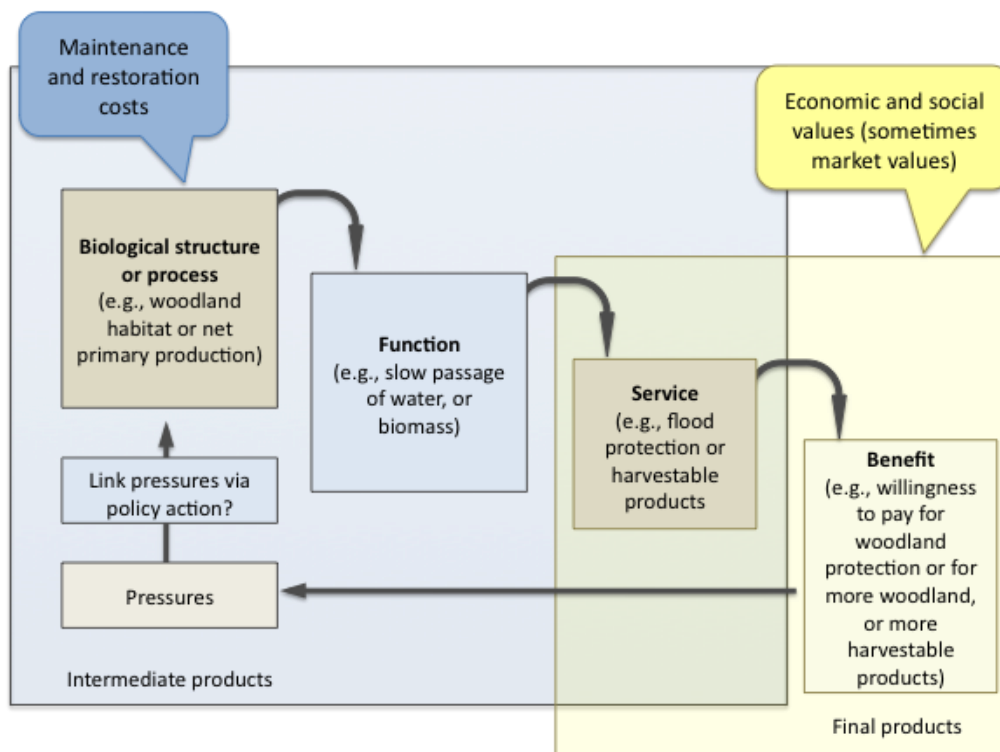


Figure 1: The conceptual framework used by The Economics and Ecosystems and Biodiversity project to link ecosystems and human wellbeing.²¹⁵

The issues to be addressed include:

- there is still some disagreement among experts about defining and operationalising ecosystem services frameworks (although consensus is emerging that different definitions and approaches are probably needed for different situations and applications, and there are now numerous examples of successful applications around the world)
- methods for measuring the outputs from ecological systems in relation to human needs, and/or predicting the impacts of policies and management decisions on these outputs, are still not adequate for many purposes (although this is a problem common to all approaches to environmental policy and management and is not uniquely relevant to ecosystem services approaches)
- methods for assessing the economic implications of ecosystem services that do not pass directly through markets (e.g., cultural or spiritual values of landscapes or the influence of scenic views on where people live or how much they are prepared to pay for houses or for the right to visit remote places) are still not developed or accepted to the point that they carry weight in decision-making in Australia).

This report concludes that one powerful contribution of ecosystem services approaches is to cross-societal dialogue in relation to major, complex environmental-social challenges facing this country. People across Australian society are demanding greater involvement in decisions about such issues and they want to know that the different parts of governments are thinking strategically about the role of the environment in these issues. The language and concepts of ecosystem services offers a platform for this sort of dialogue, but it requires some steps to be taken by governments:

- developing and promoting a common understanding across governments and society about the nature of ecosystem services and the benefits that can be drawn from them
- using that understanding to promote strategic dialogue among disciplines, government departments and across society about priorities for managing human-environmental interactions in the short and longer-term future
- considering how responsibilities for management ecosystem services can be shared across society (i.e., moving away from the model of governments taking all of the responsibility).

Australia has a very good record of using ecosystem services as the focus for constructive dialogue between scientists, communities and government decision makers, which has led to tangible planning outcomes. Regional communities have shown they are able to consider sophisticated biophysical, economic and social information in these dialogues and to develop robust, defensible and monitorable plans as a result. This, together with moves to include this sort of information in national accounts, should give governments confidence that there are sufficient skills in communities, academia, non-government organisations and governments to support much better national strategic dialogue than has been had previously.

Recommendations

Further explanation of these recommendations can be found in Section **Error! Reference source not found.** of the report.

Recommendation 1: Develop a process for strategic dialogue and planning within the Australian Government that considers the full range of potential benefits from ecosystems along with other information relevant to strategic decisions.

Recommendation 2: Explore improvements to governance arrangements to encourage appropriate sharing of responsibility for strategic alignment of human wellbeing and ecosystem management across society

Recommendation 3: To support all of the above, continue and enhance initiatives to establish an appropriate and accessible set of information capable of supporting strategic dialogue about ecosystem management and human wellbeing

Recommendation 4: Build on and enhance Australia's investments in innovative ways to link ecological and economic research with business to drive desirable environmental change