

Classifying Ecosystem Services: An Ecosystems Knowledge Network Briefing Paper

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Introduction

Ecosystem services are a key element of an ecosystems approach, which aims to ensure that their value is properly taken into account for decision makers. This is a major task, and success is only likely to be achieved if information can be exchanged and shared effectively. Thus we need to think about how we classify ecosystem services and how this can help ensure that there is consistency in the way they are assessed.

This document¹ aims to set out some of the issues around the problem of classifying ecosystem services so that they can be discussed by Ecosystems Knowledge Network Members. Two questions seem fundamental to the debate:

1. Do we need a common list of services that is sufficiently comprehensive to support a range of different applications?
2. In drawing up this list, can the different types of services be defined clearly enough so that they can be easily understood by different stakeholder groups, as well as being useful for measurement purposes?

Classification approaches

Many people use the framework of the Millennium Ecosystem Assessment (MA)² as a way of defining the services that might be relevant to their work (Appendix 1). Although the MA has provided us with the basic division of services into provisioning, regulating, cultural and supporting, the set of services that were considered is by no means comprehensive. Since the publication of the MA we have seen refinements such as those in *The Economics of Ecosystems and Biodiversity* (TEEB)³ (Appendix 2), and the UK National Ecosystem Assessment (UK NEA)⁴ (Appendix 3). While they all share the same underlying philosophy there are differences between them that can make it difficult for practitioners.

¹ Please refer to this paper as: Haines-Young, R, Potschin, M and Fish, R (2012) Classifying Ecosystem Services. Ecosystems Knowledge Network Briefing Paper No1. Available from: <http://ekn.defra.gov.uk/about/themes/classifying/briefing/> -Contact: roy.haines-young@nottingham.ac.uk

² www.maweb.org/en/index.aspx

³ www.teebweb.org/

⁴ uknea.unep-wcmc.org/

For example, the ways cultural services are defined in the UK NEA are quite different to the way they are handled in the MA or TEEB. The UK NEA refers to cultural services as 'environmental settings', rather than using concepts such as 'recreational' and 'spiritual' uses. In TEEB there is a block of services called 'habitat services' that seems to sit outside the four major groupings used in the MA. Thus the practitioner may well ask how they are to cope with these different ways of looking at ecosystem services.

One approach has been to try to construct a *Common International Classification of Ecosystem Services* (CICES) (Appendix 4). This initiative arose from the recent efforts to develop an integrated System of Environmental and Economic Accounts (SEEA) by the UN⁵. The discussions are still underway, and although some of the debate concerns statistical and accounting issues, it also highlights a number of important questions for those interested in mapping and assessing ecosystem services.

Comparing approaches: some key issues

In addition to the four approaches to classifying ecosystem services summarised in the Appendices, there are clearly others that people might have used, and we certainly do not want to imply these are the only ones or that they should be the accepted standard. CICES itself is still under development⁶ and so the version shown in Appendix 4 is only provisional and can be shaped by networks such as the Ecosystems Knowledge Network. As a starting point, however, the four classifications are useful as a basis for discussion because in reviewing them they do prompt some key questions about the problem of classification.

Thus if we think of ecosystem services as something like *the contributions that ecosystems make to human well-being*, then:

1. Should the classifications include both biotic and abiotic outputs from ecosystems?

In the MA, TEEB and the UK NEA, ecosystem services are seen as outputs that are fundamentally dependent on living processes. This is an important point to note, and reflects the fact that in each initiative the concept of ecosystem services was intended to help make the case for the importance of biodiversity. This idea does not deny that interactions are taking place between organisms and their abiotic environment, but it is only the outputs that are generated by living processes that are described as ecosystem services.

It has been argued by some, however, that in addition to making the case for biodiversity, we also ought to consider the contribution of 'geodiversity' to human well-being. Others have suggested that wind, waves and hydropower potential should also be regarded as ecosystem services, along with products such as salt, for example.

⁵ www.cices.eu; and more generally: unstats.un.org/unsd/envaccounting/seearev/

⁶ The debate can be followed by registering on the CICES website: www.cices.eu

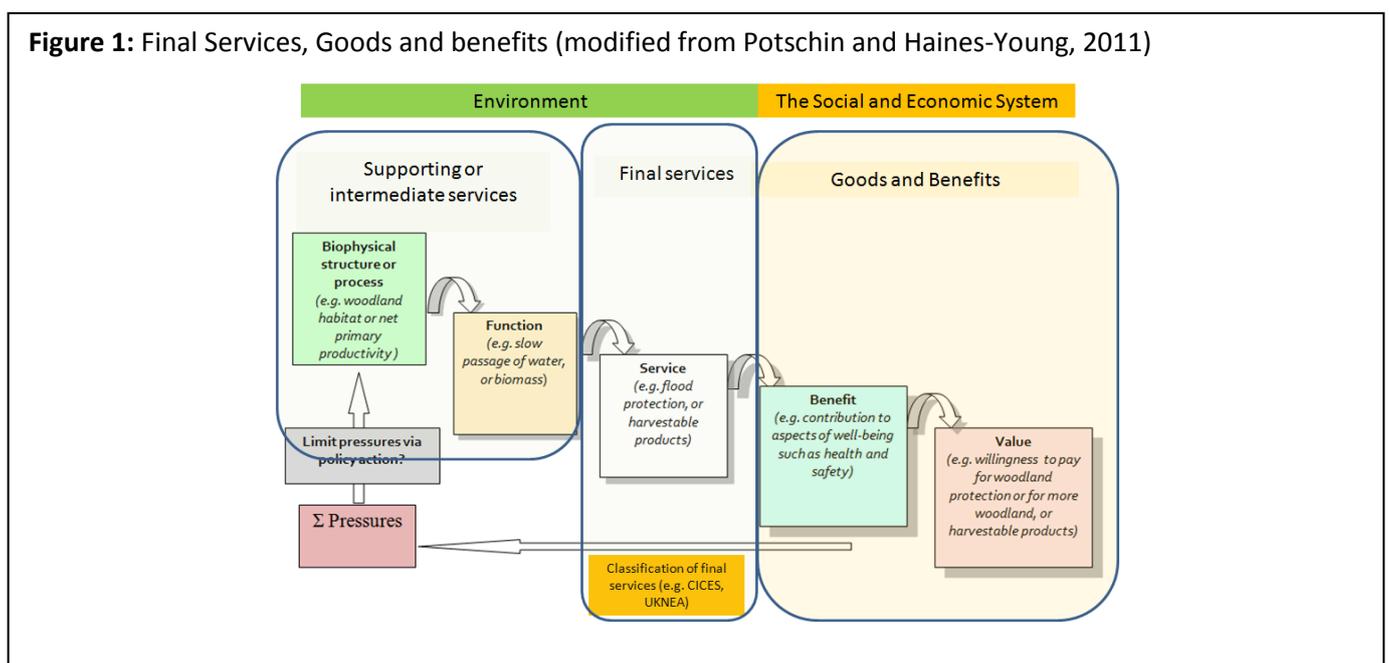
The problem of defining ecosystem services is not a trivial one. If we expand the concept to include abiotic outputs from ecosystems is there a danger that it dilutes the case for biodiversity? On the other hand, does it make an ecosystems approach too narrow, if we ignore these other contributions that ecosystems can make to people's lives? The problem with including abiotic outputs is, of course, deciding where to stop. Do we also include all ores and minerals in an expanded classification? And, if energy sources are included, what do we do about fossil fuels such as coal or oil?

Issue1: It would be interesting to hear how network members are dealing with the ecosystem service outputs that are not mainly dependent on living processes. What kinds of classification system are most helpful in a decision making context?

2. Final Services, Goods and Benefits

Quite apart from the problem of whether a classification of ecosystem services should include abiotic outputs from ecosystems, there is also the problem of what kinds of category should be included in any scheme.

There has, for example, been an active discussion over the need to distinguish between ecosystem services and benefits, which some claim is crucial for economic valuation and for accounting purposes. It is argued that a clear distinction between ecological phenomena (functions), their direct and indirect contribution to human welfare (services), and the welfare gains they generate (benefits) is necessary to avoid the problem of 'double counting'. The rationale for this is that valuation should only be applied to the thing directly consumed or used by a beneficiary because the value of the ecological structures and processes that contribute to it are already wrapped up in this estimate. Figure 1 illustrates the idea.



If one of the primary purposes of any classification is to help us with ecosystem assessments and valuation, then should any system mainly focus on the contributions that these ‘final services’ make to benefits? The CICES system, like TEEB, excludes supporting services and tries to give a comprehensive picture of these final services. The MA and the UK NEA includes them. Do we need to include supporting services so that potential threshold effects and critical levels of natural capital can be considered explicitly?

Whether supporting or intermediate services are included in any classification scheme or not, a key design issue is how we distinguish the final services from benefits. Following the MA many people use the terms ‘goods’ and ‘services’ synonymously and think that both refer to the final outputs from ecosystems. With the publication of the UK NEA, however, a different position on this terminology has developed.

Figure 2: Illustration of how different types of value associated with ecosystem goods might relate to ecosystem services.

Section	Division	Group	Goods				
			Direct use	Indirect use	Option value	Bequest value	Existence Value
Provisioning	Nutrition	Terrestrial plants and animals for food					
		Freshwater plants and animals for food					
		Marine plants, algae and animals for food					
	Water supply	Water for human consumption					
		Water for agricultural use					
		Water for industrial and energy uses					
	[Non-food] Biotic Materials	Plant and animal fibres and structures					
		Chemicals from plants and animals					
		Genetic materials					
	Energy	Biomass based energy					
Regulation and Maintenance	Regulation of bio-physical environment	Bioremediation					
		Dilution, Filtration and sequestration					
	Flow regulation	Air flow regulation					
		Water flow regulation					
		Mass flow regulation					
	Regulation of physico-chemical environment	Atmospheric regulation					
		Water quality regulation					
		Pedogenesis and soil quality regulation					
		Noise regulation					
	Regulation of biotic environment	Lifecycle maintenance, habitat and gene pool protection					
Pest and disease control (incl. invasive alien species)							
Cultural	Physical or experiential use of ecosystems [environmental setting]	Non-extractive recreation					
		Information and knowledge					
	Intellectual representations of ecosystems [of environmental settings]	Spiritual & symbolic					
		Non-use					

The authors of the UK NEA suggested that from an ‘economic’ perspective ecosystem services should be seen as ‘contributions of the natural world which generate goods which people value’. Thus, goods are the things people value and services are the things ecosystems generate that give rise to them. From this perspective, goods can include things that can be traded in markets as well as ecosystem outputs which have no market price; that is, goods can have both use and non-use values. Thus using a classification system like CICES, we might explore the different components of ‘Total Economic Value’ (TEV) for each of the services in terms of the goods they

generate. However, there is no implication that only monetised estimates of value can be used. Moreover in the diagram we do not suggest that all elements of TEV apply to all types of service uniformly – contexts matter.

Issue 2: It would be interesting to hear how network members are dealing with the distinction between ecosystem services, goods and benefits, and the extent to which existing classifications are helpful in their work. It would be especially interesting to hear how useful the classification scheme of the UK NEA is for their work at local scales.

3. Classifying Cultural Services

Cultural ecosystem services are amongst the most difficult to handle. It is an area where it is especially easy to mix up services and benefit concepts. The authors of the UK NEA attempted to clarify the distinction by proposing that cultural ecosystem services were essentially *environmental settings* or places the character of which were defined by the combination of different elements of natural capital found there. Different types of setting are to be found from local through to national scales, and each is potentially able to deliver different kinds of cultural goods such as heritage value or recreational experiences.

Issue 3: It would be useful to hear from network members on the extent to which the distinction made in the UK NEA between settings on the one hand and cultural goods and benefits on the other is useful. The UK NEA does not follow the terminology used on the MA for example, but there has been some attempt to factor it into other classifications like CICES. What kind of classification approach do people find most useful?

An additional complexity recognised in the recent debates around cultural services is that, to some extent, all services potentially have a cultural component. There are, for example, important cultural dimensions to diet and hence what we regard as ‘provisioning services’. The situation is perhaps, analogous to the dependency of services on biodiversity, in that there is probably also a spectrum ranging from services that are wholly dependent on cultural factors to others that are less so.

Finally, the implication of using the non-material character of cultural services in many of the classifications as a way of distinguishing them is that there is difficulty of where to place services that contribute to hunting and angling (sport fishing), for example; that is, things that strongly support a type of cultural practice. Since they involve the extraction of biomass, they could equally be placed in the provisioning sector either as a food if the quarry is eaten (e.g. in CICES in the Nutrition division in the class “Wild plants and animals and their products”) or as

an ornamental service (in the CICES class “biotic materials”) if they are treated more as trophies etc.

Issue 4: It would be useful to hear from network members about how they deal with the cultural aspects of all ecosystem services, or whether they find the existing approaches to classifying them adequate for their work.

Conclusions and next steps

The purpose of this briefing paper is to open up the debate. Undoubtedly it has not covered all the issues, but it may be a way into a complex but fundamental topic. The primary aim of the Ecosystems Knowledge Network is to help people find practical solutions to their work in involving ecosystem services. If we are to ground this work on the best evidence available and communicate our results to others then we have to be clear in the ways we define ecosystem services and measure them. Thus some form of generally accepted classification system is likely to be helpful. *Are our existing approaches fit for purpose? If not, how do we develop better tools?*

If you would like to express your views there is a discussion forum on the Ecosystems Knowledge Network website and an opportunity to join in the webinar. If you do not have an opportunity to join in at this stage, a report on the issues discussed will be posted on the Ecosystems Knowledge Network website:

<http://ekn.defra.gov.uk/about/themes/classifying/briefing/>

Further Reading

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- Church, A. et al. (2011) Cultural Services. In: UK National Ecosystem Assessment, Technical Report. Cambridge: UNEP-WCMC, Chapter 16.
- De Groot R, Fisher B, Christie M, Aronson J, Braat L, Gowdy J, et al. (2010) Integrating the ecological and economic dimensions in biodiversity and ecosystem service valuation. In: Kumar P (ed.) *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*, London: Earthscan, 9–40.
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- Fisher B, Turner RK, Zylstra M, Brouwer R, De Groot R, Farber S, et al. (2008) Ecosystem services and economic theory: Integration for policy-relevant research. *Ecological Applications* 18(8): 2050–2067.

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- MA [Millennium Ecosystem Assessment] (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC.
- Mace GM, Bateman I, Albon S, Balmford A, Brown C, Church A, et al. (2011) Conceptual Framework and Methodology. In: UK National Ecosystem Assessment, Technical Report. Cambridge: UNEP-WCMC, Chapter 2.
- Potschin, M and Haines-Young R (2011): Ecosystem Services: Exploring a geographical perspective. *Progress in Physical Geography* 35(5): 575-594
- SEEA (2012) System of Environmental-Economic Accounting: Central Framework. http://unstats.un.org/unsd/envaccounting/White_cover.pdf

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Appendix 1: Global Status of Provisioning, Regulating, and Cultural Ecosystem Services Evaluated in the MA (MA, 2005)

Status indicates whether the condition of the service globally has been enhanced (if the productive capacity of the service has been increased, for example) or degraded in the recent past. Definitions of “enhanced” and “degraded” are provided in the note below. A fourth category, supporting services, is not included here as they are not used directly by people.

Service	Sub-category	Status	Notes
Provisioning Services			
Food	crops	▲	substantial production increase
	livestock	▲	substantial production increase
	capture fisheries	▼	declining production due to overharvest
	aquaculture	▲	substantial production increase
	wild foods	▼	declining production
Fiber	timber	+/-	forest loss in some regions, growth in others
	cotton, hemp, silk	+/-	declining production of some fibers, growth in others
	wood fuel	▼	declining production
Genetic resources		▼	lost through extinction and crop genetic resource loss
Biochemicals, natural medicines, pharmaceuticals		▼	lost through extinction, overharvest
Fresh water		▼	unsustainable use for drinking, industry, and irrigation; amount of hydro energy unchanged, but dams increase ability to use that energy
Regulating Services			
Air quality regulation		▼	decline in ability of atmosphere to cleanse itself
Climate regulation	global	▲	net source of carbon sequestration since mid-century
	regional and local	▼	preponderance of negative impacts
Water regulation		+/-	varies depending on ecosystem change and location
Erosion regulation		▼	increased soil degradation
Water purification and waste treatment		▼	declining water quality
Disease regulation		+/-	varies depending on ecosystem change
Pest regulation		▼	natural control degraded through pesticide use
Pollination		▼ ^a	apparent global decline in abundance of pollinators
Natural hazard regulation		▼	loss of natural buffers (wetlands, mangroves)
Cultural Services			
Spiritual and religious values		▼	rapid decline in sacred groves and species
Aesthetic values		▼	decline in quantity and quality of natural lands
Recreation and ecotourism		+/-	more areas accessible but many degraded

Note: For provisioning services, we define enhancement to mean increased production of the service through changes in area over which the service is provided (e.g., spread of agriculture) or increased production per unit area. We judge the production to be degraded if the current use exceeds sustainable levels. For regulating and supporting services, enhancement refers to a change in the service that leads to greater benefits for people (e.g., the service of disease regulation could be improved by eradication of a vector known to transmit a disease to people). Degradation of regulating and supporting services means a reduction in the benefits obtained from the service, either through a change in the service (e.g., mangrove loss reducing the storm protection benefits of an ecosystem) or through human pressures on the service exceeding its limits (e.g., excessive pollution exceeding the capability of ecosystems to maintain water quality). For cultural services, enhancement refers to a change in the ecosystem features that increase the cultural (recreational, aesthetic, spiritual, etc.) benefits provided by the ecosystem.

^a Indicates low to medium certainty. All other trends are medium to high certainty.

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Appendix 2: Ecosystem Service classification suggested in TEEB (after De Groot et al., Ch1 in TEEB Assessment Report)

	Main service-types
	PROVISIONING SERVICES
1	Food (e.g. fish, game, fruit)
2	Water (e.g. for drinking, irrigation, cooling)
3	Raw Materials (e.g. fibre, timber, fuel wood, fodder, fertilizer)
4	Genetic resources (e.g. for crop-improvement and medicinal purposes)
5	Medicinal resources (e.g. biochemical products, models & test-organisms)
6	Ornamental resources (e.g. artisan work, decorative plants, pet animals, fashion)
	REGULATING SERVICES
7	Air quality regulation (e.g. capturing (fine)dust, chemicals, etc)
8	Climate regulation (incl. C-sequestration, influence of veg. on rainfall, etc.)
9	Moderation of extreme events (e.g. storm protection and flood prevention)
10	Regulation of water flows (e.g. natural drainage, irrigation and drought prevention)
11	Waste treatment (esp. water purification)
12	Erosion prevention
13	Maintenance of soil fertility -(incl. soil formation)
14	Pollination
15	Biological control (e.g. seed dispersal, pest and disease control)
	HABITAT SERVICES
16	Maintenance of life cycles of migratory species (incl. nursery service)
17	Maintenance of genetic diversity (esp. gene pool protection)
	CULTURAL SERVICES
18	Aesthetic information
19	Opportunities for recreation & tourism
20	Inspiration for culture, art and design
21	Spiritual experience
22	Information for cognitive development

Appendix 3: Classification of Ecosystem Services used for the UK National Ecosystem Assessment (after Bateman et al. 2011, Table 2.2)

Ecosystem services in the UK NEA classified according to both ecosystem service type (provisioning, regulating, cultural and supporting) and whether or not they are final ecosystem services or intermediate services and/or processes. For each final ecosystem service an example of the good(s) it delivers is provided in italics.			
Ecosystem processes/intermediate services		Final ecosystem services (<i>example of goods</i>)	
Supporting services	<ul style="list-style-type: none"> • Primary production • Soil formation • Nutrient cycling • Water cycling 	Provisioning services	<ul style="list-style-type: none"> • Crops, livestock, fish (<i>food</i>) • Trees, standing vegetation, peat (<i>fibre, energy, carbon sequestration</i>) • Water supply (<i>domestic and industrial water</i>) • Wild species diversity (<i>bioprospecting, medicinal plants</i>)
		Cultural services	<ul style="list-style-type: none"> • Wild species diversity (<i>recreation</i>) • Environmental settings (<i>recreation, tourism, spiritual/religious</i>)
	<ul style="list-style-type: none"> • Decomposition • Weathering • Climate regulation • Pollination • Disease and pest regulation • Ecological interactions • Evolutionary processes • Wild species diversity 	Regulating services	<ul style="list-style-type: none"> • Climate regulation (<i>equable climate</i>) • Pollination • Detoxification and purification in soils, air and water (<i>pollution control</i>) • Hazard regulation (<i>erosion control, flood control</i>) • Noise regulation (<i>noise control</i>) • Disease and pest regulation (<i>disease and pest control</i>)

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Appendix 4: **Common Classification of Ecosystem Services V4.1 (Under revision) (Haines-Young and Potschin, 2012)**

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CICES for ecosystem service mapping and assessment						
CICES for ecosystem accounting				Note this section is open in that many class types can potentially be recognised and nested in the the higher level classes, depending onf the ecosystems being considered.	Note: this section is not complete and for illustrative purposes only. Key components could change by region or ecosystem.	
Section	Division	Group	Class	Class types	Examples and indicative good (products) and benefits	
Provisioning	Nutrition	Terrestrial plants and animals for food	<i>Crops</i>	<i>e.g. by type of crop (cereals etc.)</i>	Cereals, vegetables, vines etc.	
			<i>Livestock and dairy products</i>	<i>e.g. by animal type</i>	Sheep, cattle for meat and dairy products	
			<i>Wild plants and animals and their products</i>	<i>e.g. by type</i>	Berries, fungi, honey, game etc.	
		Freshwater plants and animals for food	<i>Fresh water plants</i>	<i>e.g. by type or source (river, lake etc.)</i>	Water cress	
			<i>Aquaculture products</i>	<i>e.g. by type</i>	Salmon, trout etc.	
			<i>Fish (wild populations)</i>	<i>e.g. by fishery</i>	Plaice, sea bass etc.	
		Marine plants, algae and animals for food	<i>Algae</i>	<i>e.g. by resource</i>	Macro and microalgae	
			<i>Plants</i>	<i>e.g. by resource</i>	eg. salicornia	
			<i>Aquaculture products</i>	<i>e.g. by fishery</i>	Includes crustaceans	
			<i>Fish (wild populations including shellfish)</i>	<i>e.g. by fishery</i>	Includes crustaceans	
		Water supply	Water for human consumption	<i>Drinking water</i>	<i>e.g. abstracted surface water, abstracted ground water, or via desalination</i>	Spring or well water, managed supplies from rivers or reservoirs, etc.
				<i>Domestic water use</i>	<i>e.g. abstracted surface water, abstracted ground wate, or via desalination</i>	Water for personal hygiene, water for toilet systems
			Water for agricultural use	<i>Irrigation water (consumptive)</i>	<i>e.g. abstracted surface water, abstracted ground water, or via desalination</i>	For crop production
				<i>Water for livestock (consumptive)</i>	<i>e.g. surface water, abstracted ground water, or via desalination</i>	Natural water sources (brooks, ponds etc.), managed water supplies in stabled livestock systems etc.
			Water for industrial and energy uses	<i>Industrial water (consumptive)</i>	<i>e.g. abstracted surface water, abstracted ground water, or via desalination</i>	For manufacturing in a wide range of industries
	<i>Industrial water (non consumptive)</i>			<i>e.g. abstracted surface water, abstracted ground water, or via desalination</i>	For power production, incl. marine waters for nuclear power plants; cooling	
	[Non-food] Biotic Materials	Plant and animal fibres and structures	<i>Plant and animal materials for fabrication in industrial or domestic settings</i>	<i>eg. by type</i>	Timber, straw, flax; algae for fertiliser, packaging and chemicals, dfooder, compost.	
			<i>Ornamental artifacts</i>	<i>eg. by type</i>	Bulbs, cut flowers, wood, skin, shells, bones, pearls and feathers etc	
		Chemicals form plants and animals	<i>Substances from living organisms used for industrial manufacture or domestic production</i>		<i>eg. by type</i>	Turpentine, rubber
			<i>Medicinal</i>	<i>eg. by type</i>		Bio-prospecting activities; herbal remedies
			<i>Cosmetic</i>	<i>eg. by type</i>		Henna
		Genetic materials	<i>Genetic improvment</i>		<i>eg. by type</i>	Wild species used in breeding programmes
			<i>Genetic structures and processes</i>		<i>eg. by type</i>	Fermentation
		Energy	Biomass based energy	<i>Vegetal based resources</i>	<i>e.g. by type</i>	
	<i>Animal based resources</i>			<i>e.g. by type</i>		Dung, fat, oils

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Section	Division	Group	Class	Class types	Examples and indicative good (products) and benefits	
Regulation and Maintenance	Regulation of bio-physical environment	Bioremediation	<i>Remediation by plants or algae</i>	<i>e.g. by method</i>	Phytoaccumulation, phytodegradation, phytostabilisation, rhizodegradation, rhizofiltration, vegetation cap	
			<i>Remediation by micro-organisms</i>	<i>e.g. by method</i>	In situ (Bioremediation), ex situ (composting), bioreactors	
			<i>Remediation by animals</i>	<i>e.g. by method</i>	Bioremediation e.g. filtration of particles using molluscs	
		Dilution and sequestration	<i>Dilution, decomposition, remineralisation and recycling</i>	<i>e.g. by method</i>	Dilution of municipal wastewater in rivers etc., removal of organic material and nutrients from waste water by biogeochemical processes e.g. marine denitrification	
			<i>Filtration</i>	<i>e.g. by method</i>	Filtration of particulates and aerosols	
			<i>Sequestration and absorption</i>	<i>e.g. by method</i>	Sequestration of nutrients and pollutants in organic sediments, removal of odours	
		Flow regulation	Air flow regulation	<i>Rural microclimatic regulation</i>	<i>e.g. by process</i>	Natural or planted vegetation that serves as shelter belts
				<i>Urban microclimatic regulation</i>	<i>e.g. by process</i>	Ventilation
			Water flow regulation	<i>Attenuation of runoff and discharge rates</i>	<i>e.g. by process</i>	Woodlands, wetlands and their impact on discharge rates
	<i>Water storage for flow regulation</i>			<i>e.g. by process</i>	Flood plains and wetlands	
	<i>Storm protection</i>		<i>e.g. by process</i>	Mangroves, sea grasses, macroalgae, dune systems and coastal wetlands; portection from flood surges and tsunamis.		
	Mass flow regulation		<i>Erosion protection</i>	<i>e.g. by process</i>	Wetlands (including coastal), mangroves, sea grasses, macroalgae, dune systems	
			<i>Avalanche and gravity flow protection</i>	<i>e.g. by process</i>	Stabilisation of mudflows, erosion protection [reduction]	
	Regulation of physico-chemical environment	Atmospheric regulation	<i>Global climate regulation (incl. C-sequestration)</i>	<i>e.g. by process</i>	Atmospheric composition (air quality), hydrological cycle, marine cycle	
			<i>Local & Regional climate regulation</i>	<i>e.g. by process</i>	Modifying temperature, humidity etc.; maintenance of urban climate and air quality, regional precipitation patterns	
		Water quality regulation	<i>Water purification and oxygenation</i>	<i>e.g. by process</i>	Natural or planted vegetation that serves nutrient retention, translocation of nutrients, marine vertical circulation	
			Pedogenesis and soil quality regulation	<i>Maintenance of soil fertility</i>	<i>e.g. by process</i>	Green mulches; N-fixing plants
				<i>Maintenance of soil structure</i>	<i>e.g. by process</i>	Soil organism activity
		Regulation of biotic environment	Lifecycle maintenance, habitat and gene pool protection	<i>Pollination</i>	<i>e.g. by process</i>	By biota
				<i>Seed dispersal</i>	<i>e.g. by process</i>	By biota
	<i>Maintaining nursery populations and habitats</i>			<i>e.g. by process</i>	Habitat refuges	
	Pest and disease control (incl. invasive alien species)		<i>Biological control mechanisms</i>	<i>e.g. by process</i>	By plants and animals, control of pathogens	

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Section	Division	Group	Class	Class types	Examples and indicative good (products) and benefits
Cultural	<i>Physical or experiential use of ecosystems [environmental setting]</i>	Non-extractive recreation	<i>Natural and cultural ecosystems and landscapes used for physical activity</i>	<i>e.g. by landscape type or ecosystem type</i>	Hiking, boating, diving
			<i>Natural and cultural ecosystems and landscapes and habitats for viewing</i>	<i>e.g. by landscape type or ecosystem type</i>	Scenic tours, Whale watching, bird watching
		Information and knowledge	<i>Scientific</i>	<i>e.g. By ecosystem componen(s)</i>	Subject matter for research
			<i>Heritage</i>	<i>e.g. By ecosystem componen(s)</i>	Historic record
	<i>Intellectual representations of ecosystems [of enviornmenal settings]</i>	Spiritual & symbolic	<i>Educational</i>	<i>e.g. By ecosystem componen(s)</i>	Subject matter for wildlife programmes and books etc.
			<i>Sacred or culturally significant places and species</i>	<i>e.g. by location or species or feature</i>	Sense of place, identify, heritage
		Non-use	<i>Existence</i>	<i>e.g. by ecosystem or species</i>	Wild species
			<i>Bequest</i>	<i>e.g. by ecosystem of species</i>	Wilderness