



OpenNESS Glossary

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Notes:

“The aim of OpenNESS (<http://www.openness-project.eu/>) is to “operationalize the concepts of Ecosystem Services (ES) and Natural Capital (NC)”. Besides other on-going activities, designed to investigate this operationalization, the purpose of this glossary was to provide some working definitions of ES and NC related terms (version 1) and then to “test” them (version 2) in the context of OpenNESS-related research.

The Glossary was circulated to the OpenNESS consortium and put online on 05.12.2014, consultation on those terms was open via Survey monkey at:

https://www.surveymonkey.com/s/openness_glossary

till July, 15th 2015. This version 3 forms the final agreed set of Ecosystem services concept related definitions within the OpenNESS consortium.

We furthermore acknowledge contributions to this version of the Glossary from ESMERALDA (<http://esmeralda-project.eu/>) consortium partners.

If you refer to this glossary please quote as:

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This Version 3.0 of the OpenNESS Glossary represents agreed definitions as consulted on in the first version in 2014 and comments up to July 2016 via survey monkey are included.

We do not expect that everyone agrees with these definitions, however they represent ‘the state of art’ of a large group of people at the time. May it form the basis for discussions in your team and encourage developing your own.

Introduction

Background

The aim of OpenNESS (<http://www.openness-project.eu/>) is to “operationalize the concepts of Ecosystem Services (ES) and Natural Capital (NC)”. In addition to other activities designed to advance this operationalization, we have developed this glossary to provide some working definitions of terms related to ES and NC and their applications so that they could be “tested” in the context of OpenNESS.

In using and reviewing the terms it is important to note the scope and purpose of the work:

- Although not always specifically mentioned when defining the terms we mean esp. the use of terms in an ecosystem service context.
- The starting point was the set of ES/NC related terms developed through other initiatives such as the MA¹, TEEB², the UK NEA³, and Rubicode⁴. We consolidated the terms they defined into one list in early 2014, so that the similarities and differences could be reviewed and the applicability to OpenNESS discussed.
- Through a three-month consultation process within the OpenNESS consortium, we asked for comments on the range of terms included in the glossary, the definitions themselves and suggestions for any additional terms.
- As a result of the consultation the glossary now contains about 200 terms. It should be noted, however, that the terms included do not just reflect the ES literature but also the particular subjects that OpenNESS is focusing on covering; there are no clear boundaries. The original list was constructed through a dialogue in the consortium – and in the future we can add or drop terms as required.
- The major changes made were to improve consistency and clarity, especially with the work done through the development of the OpenNESS Synthesis Papers⁵.

Developing the glossary

In preparing the glossary we do not imply that all the terms listed were developed from the ES community, but that they are often used in the ES literature, and potentially within OpenNESS. Although some terms may have been used by other people in other disciplines our main concern is not to trace their origins but to identify their relevance and applicability for OpenNESS. The purpose of the exercise was not to reinvent anything, but to provide a set of working definitions for the consortium. Ultimately we want to develop more of a narrative for each term, picking out the different thinking and the evolution of the concept.

¹ The Millennium Ecosystem Assessment (MA): <http://millenniumassessment.org/>

² The Economics of Ecosystems and Biodiversity (TEEB): <http://www.teebweb.org/>

³ UK National Ecosystem Assessment: <http://uknea.unep-wcmc.org/>

⁴ Rationalising Biodiversity Conservation in Dynamic Ecosystems (RUBICODE): <http://www.rubicode.net/rubicode/index.html>

⁵ <http://www.openness-project.eu/library/reference-book>, see also Appendix A for overview and status of Synthesis Papers

Structure of the Glossary

The entries in the glossary are arranged in a tabular format so that users can see the background to the terms covered. The columns deal with the:

- *'Definition'* reflects agreed working definition for the OpenNESS consortium.
- *'Source'* ('Quelle' in German), that is where we took the direct quote from. Note, this does not mean origin ('Herkunft' in German), that is where it was first used or suggested.
- In the source column, where there is an attribution to TEEB, MA or UK NEA the term appears in their glossary. When we took terms from other sources we mainly acknowledge the first one to define it. So if, for example, TEEB or UK NEA has kept the same definition as MA we have put MA in as source. If UK NEA has changed it, or Rubicode added to the MA or other definitions, we added those as the source. If we changed a single word or changes are very minor we stated this as "slightly modified from [source]".
- Where the word '[OpenNESS]' is used in the source column, we mean that the wording has been changed or different definitions merged to better reflect what has been discussed in OpenNESS. Sometimes the definition is new but sometimes it is a modification of another source. For Shortness in the table "[OpenNESS]" stands for "Adapted from various sources for OpenNESS". We are NOT intending to say "we [OpenNESS or the Glossary Editorial Team]" have invented the term.
- *'Comment'*: → 'see also SP ...' refers to the Synthesis Papers developed with in OpenNESS. They are available via the reference book on the OpenNESS website, see footnote 5.

The current consultation process

The draft glossary was initially circulated to the OpenNESS consortium between the beginning of October and mid-November 2014. The aim was to ask for instant reactions to the working definitions. Comments were received via email and via an on-line survey tool. Altogether 18 people participated in the consultation and comments were considered on 74 terms.

The comments received were discussed within the 'Glossary Working Group' and suggestions, responses on decisions noted. In order to make the consultation process as transparent as possible, Version 1.1 has now been posted on the OpenNESS Intranet with the notes on the editing process. The same terms without the editorial comments have now also been uploaded onto the OpenNESS public website in December 2014 as Version 2.0.

56 comments via survey monkey and over 50 via email were received on Version 2.0 by June 2016 and included in this new version 3.0. Further contributions were made in the years 2015 and 2016 by scientists from the partner project ESMERALDA. This version is also being used in OPPLA (<http://oppla.eu/>), a hub of knowledge about ecosystem services and nature-based solutions.

The consultation within OpenNESS has now stopped. However if readers of this glossary would like to comment on terms or the glossary in general – the link on Survey monkey will stay open

https://www.surveymonkey.com/s/openness_glossary.

A finalised version of the glossary will be prepared in the last few months of the OpenNESS project, in spring 2017. The glossary working group encourages all OpenNESS partners to engage in the process of revision and become part of the working team – perhaps by taking responsibility for managing the development of particular concepts or terms that is close to their specialist area of expertise.

Term	Definition [Source]
Abatement Cost	See 'Marginal Abatement costs' [MA, 2005]
Abiotic	Referring to the physical (non-living) environment, for example, temperature, moisture, light, or natural mineral substances. [Modified from Lincoln et al. (1998: 1)]
Abundance	The total number of individuals of a taxon or taxa in an area, population, or community. Relative abundance refers to the total number of individuals of one taxon compared with the total number of individuals of all other taxa in an area, volume, or community. [MA, 2005]
Adaptation	Adjustment in natural or human systems to a new or changing environment. [MA (2005)]
Adaptive Capacity	The ability of ecosystems and social systems to adjust and renew as a response to contextual changes. The term can be distinguished from coping capacity, which is defined as the ability to deal with changes, especially those relating to climate, as they actually happen. [OpenNESS, draws on Gunderson and Holling (2002); Primmer (2011), Dunford et al. (2014)] → See also SP "Institutional Analysis"
Adaptive Management	A systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, management is treated as a deliberate experiment for purposes of learning and achieving a desired goal. [Adapted from the MA (2005)]
Afforestation	Planting of forests on land that has historically not contained forests (as opposed to <i>reforestation</i>). [MA, 2005]
Agro-biodiversity (or agricultural biodiversity)	The biodiversity in agricultural ecosystems (including domestic animals and cultivated plants, e.g. crop plants). [MA, 2005]
Agro-ecosystem	An ecosystem in which usually domesticated plants and animals and other life forms are managed for the production of food, fibre and other materials that support human life while often also providing non-material benefits. [Common usage]
Alien Species	A plant or animal whose distribution is outside its natural range; alien species are frequently introduced by human activity. [Common usage and consistent with MA (2005)]

Term	Definition [Source]
Alien Invasive Species	➤ See 'invasive alien species'
Analysis	<p>The process of breaking a complex topic or substance into its constituent elements in order to gain a better understanding of the nature and meaning of its essential features and their relations“</p> <p>[OpenNESS, modified from several common usages]</p>
Aquaculture	<p>Breeding and rearing of aquatic organisms (fish, molluscs, crustaceans and aquatic plants) in ponds, enclosures, or other forms of confinement in either fresh or marine waters for direct harvest of the product.</p> <p>[Adapted from MA (2005), extended by FAO yearbook Fishery and Aquaculture Statistics (2011)]</p>
Assemblage	<p>A group of organisms from either one taxon (e.g. birds) or from several different taxa.</p> <p>[Common usage]</p>
Assessment	<p>The analyses and review of information derived from research for the purpose of helping someone in a position of responsibility to evaluate possible actions or think about a problem. Assessment means assembling, summarising, organising, interpreting and possibly reconciling pieces of existing knowledge and communication them so that they are relevant and helpful to an intelligent but inexperienced decision-maker.</p> <p>[Parson (1995), taken from MAES (2014)]</p>
Asset, ecological	<p>Ecological assets are the stocks of potential services an ecosystem might provide, given a specific structure or condition. In economic terms, these represent the 'wealth' of the ecosystem.</p> <p>[modified from UK NEA (2011); Bateman et al. (2011: 182)]</p>
Bayesian Belief Network [a.k.a. Bayesian Network]	<p>A probabilistic graphical model for reasoning under uncertainty, consisting of an acyclic, directed graph describing a set of dependence and independence properties between the variables of the model represented as nodes, and a set of (conditional) probability distributions that quantify the dependence relationship.</p> <p>[Adapted from Kjærulff & Madsen (2013)]</p>
Beneficiary	<p>A person or group whose well-being is changed in a positive way by an ecosystem service.</p> <p>→ See also SP “Concepts and Frameworks”</p>
Beneficiary Approach	<p>The classification of ES according to beneficiary (sub-)categories</p> <p>[OpenNESS]</p>

Term	Definition [Source]
Benefits	<p>The direct and indirect outputs from ecosystems that have been turned into goods or experiences that are no longer functionally connected to the systems from which they were derived. Benefits are things that can be valued either in monetary or social terms.</p> <p>[OpenNESS] → See also SP "Classification", ➤ See also term 'Goods'</p>
Biodiversity	<p>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. Biodiversity is a contraction of 'biological diversity'.</p> <p>[CBD] → See also SP "Link between Biodiversity and Ecosystem Services"</p>
Biodiversity offsets	<p>Conservation activities that are designed to give biodiversity benefits to compensate for losses from development. Offsets seek to enable creation of new, bigger or better nature sites in instances when prevention or mitigation are unable to stop damage to nature. Offsets are different from other types of ecological compensation as they need to show measurable outcomes that are sustained over time.</p> <p>[modified from Gov. UK]</p>
Bioenergy	<p>Renewable energy made available from materials derived from biological sources.</p> <p>[Common usage]</p>
Biofuel	<p>A fuel that contains energy from geologically recent carbon fixation, produced from living organisms, usually plants.</p> <p>[Common usage]</p>
Biogeographic Realm	<p>A large spatial region, within which ecosystems share a broadly similar biota. Eight terrestrial biogeographic realms are typically recognised, corresponding roughly to continents (e.g. Afrotropical realm).</p> <p>[UK NEA (2011)]</p>
Biological Diversity	<p>➤ See term "Biodiversity"</p>
Biomass	<p>The mass of tissues in living organisms in a population, ecosystem, or spatial unit derived by the fixation of energy through organic processes.</p> <p>[Common usage and MA (2005)]</p>

Term	Definition [Source]
Biome	The largest unit of ecological classification that is convenient to recognize below the entire globe. Terrestrial biomes are typically based on dominant vegetation structure (e.g. forest, grassland). Ecosystems within a biome function in a broadly similar way, although they may have very different species composition. For example, all forests share certain properties regarding nutrient cycling, disturbance, and biomass that are different from the properties of grasslands. Marine biomes are typically based on biogeochemical properties. The WWF biome classification is used in the MA. [MA (2005)]
Biophysical Structure	The architecture of an ecosystem that results from the interaction between the abiotic, physical environment and organisms or entire biotic communities. [Modified MA (2005)]
Biophysical Valuation	A method that derives values from measurements of the physical costs (e.g., in terms of labour, surface requirements, energy and material inputs) of producing a given good or service. [TEEB]
Boundary objects	Collaborative products that are both adaptable to different viewpoints, and therefore commonly recognised and relevant for different actors and robust enough to maintain identity across them (Star and Griesemer 1989, Clark et al. 2011). Examples of boundary objects are conceptual frameworks, reports, models, forecasts, scenarios, newsletters and even conferences or workshops (Hauck et al 2014b). → See SP “Transdisciplinarity” → See SP “Indicators”
Boundary concepts	Terms, such as “ecosystem services” that help to structure and ease exchange across policy fields, political-administrative levels, and stakeholder groups by providing the basis for a shared understanding, but are still sufficiently vague, so that they can be integrated into different backgrounds and contexts (Mollinga, 2010). As a boundary concept, the ES concept (see also Potschin and Haines-Young, 2014) enables researchers from other disciplines, policy makers and other stakeholders to speak a common language and each can select knowledge relevant to their particular field (Jordan and Russel 2014). → See SP “Transdisciplinarity” → See SP “Indicators”

Term	Definition [Source]
Boundary facilitators	<p>Individuals with certain skill sets to facilitate the flow of information and communication processes between people or stakeholder groups, which are physically, geographically, cognitively or culturally separated. Boundary facilitators receive different names, such as bridges, brokers, boundary spanners or mediators, depending on their specific role and power in the process (Long et al., 2013). While bridges and brokers facilitate the communication between two unlinked social actors, a boundary spanner is able to overcome a cultural boundary by using an appropriate language and cultural style and, thereby, facilitate the communication across it (Harris and Lyon, 2013). When a boundary spanner is able to facilitate the (epistemic) process of joint knowledge generation plays also the relevant role of 'epistemediator' (Wiek, 2007; Wittmayer and Schöpke, 2014).</p> <p>→ See SP "Transdisciplinarity"</p> <p>→ See SP "Indicators"</p>
Bundles	<p>➤ See term "Ecosystem Service Bundles"</p>
Capacity Building	<p>A process of strengthening or developing human resources, institutions, organisations, or networks. Also referred to as capacity development or capacity enhancement.</p> <p>[UK NEA (2011)]</p>
Carbon Sequestration	<p>The process of increasing the carbon content of a reservoir other than the atmosphere.</p> <p>[MA (2005)]</p>
Choice experiment	<p>A method of valuing goods and services based on their attributes. It is a stated preference technique whereby respondents trade-off different levels of the attributes with payments to reveal the value of changes in the attributes.</p> <p>[Modified according to Hanley et al. (1998)]</p>
Classification System [for ES]	<p>An organised structure for identifying and organising ES into a coherent scheme.</p> <p>[Common usage]</p> <p>→ See SP "Classifications an CICES"</p>
Coastal System	<p>Systems containing terrestrial areas dominated by ocean influences such as tides and marine aerosols, plus near shore marine areas. The inland extent of coastal ecosystems is the line where land based influences dominate, up to a maximum of 100 kilometres from the coastline or 100-meter elevation (whichever is closer to the sea), and the outward extent is the 50-meter-depth contour.</p> <p>[Adapted from UK NEA (2011)]</p>

Term	Definition [Source]
Community (Ecological)	An assemblage of species occurring in the same space or time, often linked by biotic interactions such as competition or predation. [UK NEA (2011), and common usage]
Community (Human, Local)	A group of people who have something in common. A local community is a fairly small group of people who share a common place of residence and a set of institutions based on this fact, but the word 'community' is also used to refer to larger collections of people who have something else in common (e.g., national community, donor community). [Adapted from MA (2005) and UK NEA (2011)]
Competitiveness	The relative advantage of one place, region or country over another, usually in economic and social terms, but in the context of OpenNESS also in terms of access to natural capital and the benefits derived from ecosystem services. [OpenNESS] → See also SP "Competitiveness"
Conceptual Framework [for ecosystem services and biodiversity]	A conceptual framework (or conceptual model) is a model formally describing some aspects of a physical or social system for the purposes of understanding and communication, emphasizing the fundamental principles and basic functionality of the system which it represents. [based on Myopoulos (1992), Kung et al., (1986) and Wikipedia] See also → See SP "Conceptual Frameworks and CICES" ➤ see term 'Framework'
Conceptual model	➤ See term "conceptual framework"
Condition	➤ See "Ecosystem Condition"
Conservation	The protection, improvement, and sustainable use of natural resources for present and future generations. [ESMERALDA]
Conservation Status	The sum of the influence acting on a habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long-term survival of its typical species. [EEC]
Contingent Valuation	Stated preference-based economic valuation technique based on a survey of how much respondents would be willing to pay for specified benefits. [Adapted from MA (2005)]

Term	Definition [Source]
Cost-Benefit Analysis	A technique designed to determine the economic feasibility of a project or plan by quantifying its economic costs and benefits. [MA (2005)]
Cost-Effectiveness analysis/Approach	Analysis to identify the least cost option that meets a particular goal. [MA (2005)]
Critical Natural Capital	That set of environmental resources which performs important environmental functions essential to human well-being, and for which no substitutes in terms of human, manufactured or other natural capital currently exist. [OpenNESS, modified version of Ekins (2003)]
Critically Endangered Species	A species that has been categorised by the International Union for Conservation of Nature as facing) faces a very high risk of extinction in the wild. It is the highest risk category assigned by the IUCN Red List for wild species. [slightly modified from IUCN]
Cultural Landscape	➤ See term 'Landscape'
Cultural Ecosystem Service (CES)	All the non-material, and normally non-consumptive, outputs of eco-systems that affect physical and mental states of people. CES are primarily regarded as the physical settings, locations or situations that give rise to changes in the physical or mental states of people, and whose character are fundamentally dependent on living processes; they can involve individual species, habitats and whole ecosystems. [As defined in CICES] → See SP “Classifications and Cascade”
Decision-Maker	A person, group or an organisation that has the authority or ability to decide about actions of interest. [MA (2005)]
Degradation of an Ecosystem Service	Reduction in the contribution that an ecosystem service, or bundles of services, makes to human well-being as a result of loss of a stock of natural capital or its condition (capacity) to generate service output. [OpenNESS]
Direct Use Value (of Ecosystems)	The economic or social value of the goods or benefits derived from the services provided by an ecosystem that are used directly by an economic agent. These include consumptive uses (e.g., harvesting goods) and non-consumptive uses (e.g., enjoyment of scenic beauty). Agents are often physically present in an ecosystem to receive direct use value. [OpenNESS, adapted from MA (2005) and Rubicode (2010)]

Term	Definition [Source]
Disservice	Negative contributions of ecosystems to human well-being; undesired negative effects resulting for the generation of ecosystem services. [OpenNESS, modified TEEB]
Drivers of Change [Direct & Indirect]	Any natural or human-induced factor that directly or indirectly causes a change in the structure or function of an ecosystem. A direct driver of change unequivocally influences ecosystem structure or processes and can therefore be identified and measured to differing degrees of accuracy. An indirect driver operates by altering the strength of impact of one or more direct drivers. [adapted from UK NEA (2011)]
Ecological Character	➤ See term 'Ecosystem properties'
Ecological Damage	➤ See term 'Degradation of ecosystems'
Ecological Degradation	➤ See 'Degradation of ecosystems'
Ecological Process	An interaction among organisms, and/or their abiotic environment. [shortened from Mace et al. (2012)]
Ecological Status	A classification of ecosystem state among several, well-defined value categories. [Maes et al. (2013)]
Ecological Value	→ We suggest not to use the term
Economic Valuation	➤ See terms 'monetary valuation' ➤ and 'non-monetary valuation'
Ecosystem	Dynamic complex of plant, animal, and microorganisms communities and their non-living environment interacting as a functional unit. Humans may be an integral part of an ecosystem, although 'socio-ecological system' is sometimes used to denote situations in which people play a significant role, or where the character of the ecosystem is heavily influenced by human action. [Modified MA (2005)]
Ecosystem Accounting	The process of organising information about natural capital stocks and ecosystem service flows, so that the contributions that ecosystems make to human well-being can be understood by decision makers and any changes tracked over time. Accounts can be organised in either physical or monetary terms. [OpenNESS]

Term	Definition [Source]
Ecosystem Approach	<p>A strategy for the integrated management of land, water, and living resources that promotes conservation and sustainable use. An ecosystem approach is based on the application of appropriate scientific methods focused on levels of biological organisation, which encompass the essential structure, processes, functions, and interactions among organisms and their environment. It recognises that humans, with their cultural diversity, are an integral component of many ecosystems.</p> <p>[MA (2005)]</p>
Ecosystem Assessment	<p>A social process through which the findings of science concerning the causes of ecosystem change, their consequences for human well-being, and management and policy options are brought to bear on the needs of decision-makers.</p> <p>[UK NEA (2011)]</p>
Ecosystem Attribute	<p>A biological, physical, or chemical characteristic or feature of an ecosystem.</p> <p>[Modified, after Nahlik et al. (2012)]</p>
Ecosystem capacity	<p>Ecosystem capacity refers to the ability of a given ecosystem (or ecosystem asset) to generate a specific (set of) ecosystem service(s) in a sustainable way into the future.</p> <p>[Based on SEEA-EEA]</p>
Ecosystem Change	<p>Any variation in the state, process rates, outputs, or structure of an ecosystem.</p> <p>[MA (2005)]</p>
Ecosystem Condition	<p>Ecosystem condition reflects the overall quality of an ecosystem (or ecosystem asset), in terms of its main characteristics underpinning its capacity to generate ecosystem services. Ecosystem condition should be measured by indicators representing the quality of its key components (such as water, soil, biodiversity, nutrient flow, or landscape configuration) with respect to a reference condition.</p> <p>[based For the purpose of MAES, ecosystem condition is, used as a synonym for ➤ 'Ecosystem Status'.</p> <p>➤ Check also term “Ecosystem Service Potential” for further definitions of potential</p>
Ecosystem Function	<p>The subset of the interactions between biophysical structures, and ecosystem processes that underpin the capacity of an ecosystem to provide ecosystem services. See ecosystem capacity and ecosystem condition.</p> <p>[OpenNESS]</p> <p>→ see SP “Conceptual Frameworks and Cascade”</p> <p>→ see SP “Classification”</p>

Term	Definition [Source]
Ecosystem Functioning	<p>The operating of an ecosystem. Very often, there is a normative component involved, insofar as ecosystem functioning not only refers to (any) functioning/performance of the system but to 'proper functioning' and thus implies a normative choice on what is considered as a properly functioning ecosystem (operating within certain limits).</p> <p>[Based on Jax (2010)]</p> <p>➤ There are manifold ways in which this is assessed and conceptualised, e.g. as (see this glossary) good ecological status, ecosystem health, ecosystem integrity, or implied by the desired state of ecosystem services delivered by the systems. When using ecosystem functioning, the emphasis should be on the overall performance of the system and not as much on selected processes or purposes.</p>
Ecosystem Health	<p>A state of nature (whether managed or pristine) that is characterized by systems integrity: that is, a healthy nature is a largely self-organized system.</p> <p>[Rapport (1992: 145)]</p> <p>➤ See also term, 'Ecosystem condition'</p>
Ecosystem Integrity	<p>Integrity is often defined as an environmental condition that exhibits little or no human influence, maintaining the structure, function, and species composition present, prior to, and independent of human intervention [i.e., integrity is closely associated with ideas of naturalness, particularly the notion of pristine wilderness (Angermeier and Karr 1994, Callicott and others 1999)]</p> <p>[Hull et al. (2003: 2)]</p> <p>➤ See also term, 'Ecosystem condition'</p>
Ecosystem Management	<p>A direct and conscious intervention (or agreement to refrain from interventions) in an ecosystem by people that is intended to change or maintain its structure or functioning for some benefit.</p> <p>[Adapted from MA (2005)]</p>
Ecosystem Process	<p>A dynamic ecosystem characteristic that is essential for the ecosystem to operate and develop. Examples of ecosystem processes are fluxes of nutrients and energy (production and decomposition) and characteristics determining population dynamics such as seed dispersal and migration. (See also ecosystem structure and biophysical characteristic).</p> <p>[OpenNESS]</p>
Ecosystem Properties	<p>Attributes which characterize an ecosystem, such as its size, biodiversity, stability, degree of organization, as well as its functions and processes (i.e., the internal exchanges of materials, energy and information among different pools).</p> <p>MA (2005) and UK NEA (2011)</p>

Term	Definition [Source]
Ecosystem Services (ES)	are the contributions of ecosystem structure and function – in combination with other inputs – to human well-being. [Burkhard et al. (2012)]
Ecosystem Service Antagoniser	An organism, species, population, functional group, or community which by virtue of their traits can disrupt the provision of ecosystem services. [OpenNESS, adapted from Harrington et al. (2010)]
Ecosystem Service Bundle (supply side)	A set of associated ecosystem services that are linked to a given ecosystem and that usually appear together repeatedly in time and/or space. [OpenNESS] → See also SP “Bundles of ES”
Ecosystem Service Bundle (demand side)	A set of associated ecosystem services that are demanded by humans from ecosystem(s). → See also SP “Bundles of ES”
Ecosystem service demand	The amount of a service required or desired by society [Based on Villamagna et al. (2013)]
Ecosystem Service Flow	A measure for the amount of ES that are actually mobilized in a specific area and time. It includes a dynamic temporal dimension and conceptually links ES supply with demand. [ESMERALDA]
[Ecosystem service] mapping	The process of creating a cartographic representation of (quantified) ecosystem service indicators in geographic space and time. [OpenNESS, ESMERALDA]
Ecosystem service model	A scientific model (usually computer-based) for quantifying various socio-ecological indicators of an ecosystem service. [OpenNESS]
Ecosystem Service Potential	The natural contributions to ES generation. It measures the amount of ES that can be provided or used in a sustainable way in a certain region. It is recommendable to regard this potential for a sufficiently long time period. [ESMERALDA]
Ecosystem Service Provider	The ecosystems, component populations, communities, functional groups, etc. as well as components such as habitat type, that are the main contributors to ES output. [Modified from Harrington et al. (2010) after Kremen (2005)] ➤ See also term ‘service providing unit’
Ecosystem Service Supply	the provision of a service by a particular ecosystem, irrespective of its actual use. It can be determined for a specified period of time (such as a year) in the present, past, or future. [ESMERALDA]

Term	Definition [Source]
Ecosystem Service Typology	<p>A classification of ecosystem services that defines the various types and subtypes of service (e.g. MA, TEEB, CICES)</p> <p>[OpenNESS]</p> <p>→ See also SP “Classifications and CICES”</p>
Ecosystem Service Valuation	<p>The process whereby people express the importance, preference or principles and core beliefs they have for the service or benefits that ecosystems provide. Values can be expressed in monetary or non-monetary terms. See 'monetary valuation' and 'non-monetary valuation'.</p> <p>[IPBES (2016)]</p> <p>→ See also SP “Non-monetary valuation”</p>
Ecosystem State	<p>The physical, chemical and biological character of an ecosystem at a particular point of time.</p> <p>[OpenNESS]</p> <p>➤ See also term ‘Ecosystem condition’</p>
Ecosystem Status	<p>➤ See term ‘Ecosystem condition’</p>
Ecosystem Structure	<p>A static characteristic of an ecosystem that is measured as a stock or volume of material or energy, or the composition and distribution of biophysical elements. Examples include standing crop, leaf area, % ground cover, species composition (cf. ecosystem process).</p> <p>[OpenNESS]</p>
Enabling Condition	<p>Critical preconditions for success of responses, including political, institutional, social, economic, and ecological factors.</p> <p>[MA (2005)]</p>
Endangered Species	<p>➤ See term ‘threatened species’</p>
Environmental Accounting	<p>➤ See term ‘Natural Capital Accounting’</p>
Environmental Liability	<p>Obligation based on the principle that a polluting party should pay for any and all damage caused to the environment by its activities (also known as polluter pays principle).</p> <p>[OpenNESS]</p>

Term	Definition [Source]
Environmental Policy Integration	<p>The incorporation of environmental objectives into all stages of policy making in non-environmental policy sectors, with a specific recognition of this goal as a guiding principle for the planning and execution of policy, accompanied by an attempt to aggregate presumed environmental consequences into an overall evaluation of policy, and a commitment to minimize contradictions between environmental and sectoral policies by giving principled priority to the former over the latter.</p> <p>[Lafferty and Hovden (2003)]</p>
Environmental Settings	<p>Locations or places where humans interact with each other and nature that give rise to the cultural goods and benefits that people obtain from ecosystems.</p> <p>[UK NEA (2011)]</p>
Equity	<p>Fairness of rights, distribution, and access. Depending on context, this can refer to resources, services or power.</p> <p>[MA (2005)]</p>
Evolutionary Process	<p>A series of events that produce changes in gene frequencies within a population. Such changes can result in the appearance of new species (speciation) or new infraspecific taxa.</p> <p>[Modified from Mace et al. (2012)]</p>
Existence Value	<p>The value that individuals place on knowing that a resource exists, even if they never use that resource (also sometimes known as conservation value or passive use value).</p> <p>[MA (2005)]</p>
Explorative Scenario	<p>The projection of the state and condition of an ecosystem into the future, based on the anticipated impacts of the direct and indirect drivers of change, designed to help people understand the consequences of different sets of assumptions. See 'normative scenarios'.</p> <p>[OpenNESS] → See also SP "Scenarios"</p>
Externality	<p>A consequence of an action that affects someone other than the agent undertaking that action and for which the agent is neither compensated nor penalized through the markets. Externalities can be positive or negative.</p> <p>[MA (2005)]</p>
Extrapolation	<p>A projection, extension, or expansion of information from what is known into an area not known or experienced, providing conjectural knowledge of the unknown area.</p> <p>[OpenNESS]</p>

Term	Definition [Source]
Final Ecosystem Service	<p>The outcomes from ecosystems that directly lead to goods or benefits that are valued by people.</p> <p>[Potschin and Haines-Young, 2011]</p> <p>➤ See also Term 'Goods'</p> <p>→ See also SP "Conceptual Frameworks and Cascade"</p>
Flow	<p>➤ See term 'Ecosystem Service Flow'</p>
Framework	<p>A structure that includes the relationship amongst a set of assumptions, concepts, and practices that establish an approach for accomplishing a stated objective or objectives.</p> <p>[Nahlik et al. (2012)]</p> <p>➤ see also term 'Conceptual Framework'</p> <p>→ See also SP "Conceptual Frameworks and Cascade"</p>
Functional Diversity	<p>The value, range, and relative abundance of traits present in the organisms in an ecological community.</p> <p>[UK NEA (2011)]</p>
Functional Group	<p>A collection of organisms with similar functional trait attributes. Some authors use 'Functional Type' in the same way. Groups can be associated with similar responses to pressures and/or effects on ecosystem processes. A functional group is often referred to as a guild, especially when referring to animals, e.g. the feeding types of aquatic organisms having the same function within the trophic chain, e.g. the group (guild) of shredders or grazers.</p> <p>[Harrington et al. (2010)]</p>
Functional Richness	<p>This includes two components, which authors have used selectively or jointly to denote: a) the range of trait attributes represented in the community, i.e. the amount of niche space filled by species in the community (Mason et al. 2005); or, b) the number of functional groups or trait attributes in the community (Petchey et al., 2004).</p> <p>[Harrington et al. (2010)]</p>
Functional Traits	<p>Those characteristics (e.g. morphological, physiological etc.) of organisms that either related to the effect of organisms on community and ecosystem processes or their response to these processes and the physical environment.</p> <p>[OpenNESS]</p>
Futures Thinking	<p>Thinking about how our understandings of the past and present can be used to understand the future, using a range of approaches such as forecasts, projections, predictions and scenarios. See exploratory and normative scenarios.</p> <p>[OpenNESS]</p>

Term	Definition [Source]
Geographic Information System	A computer-based system for the Input, Management, Analysis and Presentation (IMAP) of spatially referenced data. [ESMERALDA]
Goods	The objects from ecosystems that people value through experience, use or consumption, whether that value is expressed in economic, social or personal terms. Note that the use of this term here goes well beyond a narrow definition of goods simply as physical items bought and sold in markets, and includes objects that have no market price (e.g. outdoor recreation). The term is synonymous with benefit (as proposed by the UK NEA), and not with service (as proposed by the MA). [UK NEA (2011)] → See SP “Conceptual Frameworks and Cascade”
Governance	The process of formulating decisions and guiding the behaviour of humans, groups and organisations in formally, often hierarchically organised decision-making systems or in networks that cross decision-making levels and sector boundaries. [Adapted from Rhodes (1991) and Saarikoski et al. (2013)]
Green Infrastructure (GI)	A strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services (ES). It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings. [EC (2013: 3)] → see also SP “Green Infrastructure”
Habitat	The physical location or type of environment in which an organism or biological population lives or occurs. Terrestrial or aquatic areas distinguished by geographical, abiotic and biotic feature, whether entirely natural or semi-natural. Note the Council of Europe definition is more specific: the habitat of a species, or population of a species, is the sum of the abiotic and biotic factors of the environment, whether natural or modified, which are essential to the life and reproduction of the species within its natural geographic range. [MA (2005)]
Health (Human)	A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. The health of a whole community or population is reflected in measurements of disease incidence and prevalence, age-specific death rates, and life expectancy. [UK NEA (2011)]

Term	Definition [Source]
Heritage [Cultural and Natural]	<p>Our legacy from the past, what we live with today, and what we pass on to future generations. Physical objects produced and used by past generations, ranging from small-scale domestic utensils to large-scale buildings, monuments, places and landscapes, may become valued as cultural heritage by their descendants. Equally, symbolic products of human creativity and imagination such as music, visual arts, poetry and prose, knowledge and know-how contribute to a society or group's understanding of its cultural heritage.</p> <p>[UK NEA (2011)]</p>
Human inputs:	<p>Encompass all anthropogenic contributions to ES generation such as land use and management (including system inputs such as energy, water, fertiliser, pesticides, labour, technology, knowledge), human pressures on the system (e.g. eutrophication, biodiversity loss), and protection measures that modify ecosystems and ES supply.</p> <p>[ESMERALDA]</p>
Human Well-Being	<p>A state that is “intrinsically and not just instrumentally valuable” (or good) for a person or a societal group In the MA components (or drivers) of human well-being have been classified into: basic material for a good life, freedom and choice, health and bodily well-being, good social relations, security, peace of mind, and spiritual experience, not precluding other classifications.</p> <p>[Adapted from Alexandrova (2012) and MA (2005)]</p>
Impact	<p>Negative or positive effect on individuals, society and/or environmental resources resulting from environmental change.</p> <p>[Modified after Harrington et al. (2010)]</p>
Indicator	<p>An indicator in policy is a metric of a policy-relevant phenomenon used to set environmental goals and evaluate their fulfilment.” (cf. Heink & Kowarik, 2010).</p> <p>An indicator in science is a quantifiable metric which reflects a phenomenon of interest (the indicandum).</p> <p>[OpenNESS, modified from Heink & Kowarik (2010)]</p>
Indirect Use Value	<p>The benefits derived from the goods and services provided by an ecosystem that are used indirectly by an economic agent. For example, an agent at some distance from an ecosystem may derive benefits from drinking water that has been purified as it passed through the ecosystem. (Compare Direct use value.)</p> <p>[MA (2005)]</p>

Term	Definition [Source]
Intensification / disintensification	<p>Intensification of agricultural land use aims at raising crop yields per unit area and per unit time, in other words to increase productivity. To achieve this goal, usually the inputs, labour or capital (in terms of fertilizers, pesticides, energy, or technology) are increased. To raise crop yields, a broad range of methods is being applied, often in combinations, including breeding, irrigation, organic and inorganic fertilization, green manure and cover crops, pest and weed management, multi-cropping, crop rotation and the reduction of fallow periods.</p> <p>[Geist (2006)]</p>
Intermediate Ecosystem Service	<p>An ecological function or process not used directly by a beneficiary, but which underpins those final ecosystem services which are used directly. See also supporting services and ecological functions.</p> <p>[OpenNESS]</p> <p>➤ In OpenNESS we suggest not used the term - see 'Final Ecosystem Service' and SP "Conceptual Frameowrks and Cascade"</p>
Interdisciplinarity	<p>The act of combining of two or more academic disciplines into one integrated activity to create new insights by crossing knowledge boundaries and linking ideas.</p> <p>[OpenNESS]</p>
Institution (Informal)	<p>The conventions, norms and rules that formally or informally regulate the interactions between people and between people and their environment.</p> <p>[Vatn (2005)]</p> <p>→ See also SP "Institutional Analysis"</p>
Institutional analysis	<p>An analysis of the rules regulating the behaviour people, groups or organizations, paying attention to formal regulations and laws and/or informal rules about customs and practices. The interest lies in what rules have produced current behaviour, or what rules might produce targeted behaviour. Institutional analysis merges approaches from law, economics and organizational studies.</p> <p>[OpenNESS, draws on Ostrom, (1990), Scott, (2001); Vatn, (2005); Paavola, (2007); Primmer, 2011)]</p> <p>→ See also SP "Institutional Analysis"</p>
Instrumental Value	<p>Value that something has as a means to an end (e.g. game animals used for food).</p> <p>[Modified after Harrington et al. (2010)]</p>
Integrated Coastal Zone Management	<p>Approaches that integrate economic, social, and ecological perspectives for the management of coastal resources and areas.</p> <p>[UK NEA (2011)]</p>

Term	Definition [Source]
Integrated Responses	Responses that address degradation of ecosystem services across a number of systems simultaneously or that also explicitly include objectives to enhance human well-being. [UK NEA (2011)]
Interventions	➤ See term 'Response'
Intrinsic Value	The value something has, independent of any interests attached to it by an observer or potential user. This does not necessarily mean that such values are independent of a valuer (i.e. values which exist 'as such'). They may also require a (human) valuer (but this is a matter of disagreement among philosophers). [OpenNESS, adapted from various sources]
Invasive Species	Invasive species is a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health. [ISAC (2006)]
Land Cover	The physical coverage of land, usually expressed in terms of vegetation cover or lack of it. Related to, but not synonymous with, land use. [UK NEA (2011)]
Landscape	An area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. The term “landscape” is thus defined as a zone or area as perceived by local people or visitors, whose visual features and character are the result of the action of natural and/or cultural factors. Recognition is given to the fact that landscapes evolve through time and are the result natural and human activities. Landscape should be considered as a whole - natural and cultural components are taken together, not separately [(European Landscape Convention Article 1)]
Land Use	The human use of a piece of land for a certain purpose such as irrigated agriculture or recreation. Influenced by, but not synonymous with, land cover. [UK NEA (2011)]
Limit (regulatory)	Points in some variable or state that should not be exceeded or underrun (like in regulations of nitrate or pesticides levels in drinking water). While ecological thresholds (see threshold, ecological) are largely descriptive, regulatory limits involve societal choices and negotiation of values and aims. [OpenNESS, following Johnson (2013)] → See SP “Thresholds”

Term	Definition [Source]
Mapping	➤ See term “[Ecosystem service] mapping”
Marginal Abatement Costs	The cost of reducing an incremental unit of an undesirable substance, such as a pollutant or carbon. [Modified from UK NEA (2011)]
Market-Based Instruments	Mechanisms that create a market for ecosystem services in order to improve the efficiency in the way the service is used. The term is used for mechanisms that create new markets, but also for instruments such as taxes, subsidies, or regulations that affect existing markets. [Adapted from MA (2005) and UK NEA (2011)]
Market Failure	The inability of a market to capture the full value of ecosystem services and/or the costs of their loss/degradation. ➤ See also term “Externality” [OpenNESS]
Marine System	Marine waters from the low-water mark to the high seas that support marine capture fisheries, as well as deepwater (>50 meters) habitats. Four sub-divisions (marine biomes) are recognized: the coastal boundary zone, trade winds, westerlies and, polar. [MA (2005) and UK NEA (2011)]
Mechanistic Model	A system representation with hypothesized relationships between variables specified in terms of system processes, thus simulating the internal functioning of the system. All of the main variables and parameters in a mechanistic model correspond to real (physical, biological) elements and characteristics of the system. Also called process-based or agent-based models. [OpenNESS, based on Hiborn & Mangel (1997)]
Mitigation	The action of making the consequence of an impact less severe. [OpenNESS]
Model (scientific model)	A simplified representation of a complex system or process including elements that are considered to be essential parts of what is represented. Models aim to make it easier to understand and/or quantify by referencing to existing and usually commonly accepted knowledge. [OpenNESS, based partly on Wikipedia]
Monetary Valuation	The process whereby people express the importance or preference they have for the service or benefits that ecosystems provides in monetary terms. See 'Economic valuation'. [OpenNESS, modified from TEEB] → See also SP ‘Non-monetary valuation’

Term	Definition [Source]
Multi-Criteria Analysis (MCA)	<p>Multi-Criteria Decision Analysis (MCDA) is a general framework for supporting complex decision-making situations with multiple and often conflicting objectives that stakeholders groups and/or decision-makers value differently. MCDA methods are integrative evaluation methods in the sense that they combine information about the performance of the alternatives with respect to the criteria with subjective judgments about the relative importance of the evaluation criteria in the particular decision-making context.</p> <p>[Belton and Stewart (2002)]</p>
Multi-Disciplinarity	<p>Linking several academic disciplines or professional specializations in an approach to a topic or problem; however, the disciplines retain their identity and perspective, unlike the situation with interdisciplinary approaches.</p> <p>[OpenNESS]</p>
Multifunctionality	<p>The characteristic of ecosystems to simultaneously perform multiple functions, that might be able to provide a particular ES bundle or bundles.</p> <p>[OpenNESS]</p> <p>→ see also SP “ES bundles”</p>
Multiple-use management	<p>Management of land or resources for more than one purpose.</p> <p>[ESMERALDA]</p>
Natural Asset	<p>A component of Natural Capital.</p> <p>[OpenNESS]</p>
Natural Capital	<p>The elements of nature that directly or indirectly produce value for people, including ecosystems, species, freshwater, land, minerals, air and oceans, as well as natural processes and functions. The term is often used synonymously with natural asset, but in general implies a specific component.</p> <p>[Modified after MA (2005)]</p> <p>➤ Note: ecosystem capital and ecosystem assets are sometimes used to refer to the parts of nature that produce benefits for people.</p>
Natural Capital Accounting	<p>A way of organising information about natural capital so that the state and trends in natural assets can be documented and assessed in a systematic way by decision makers.</p> <p>[OpenNESS]</p>
Natural Capital Stock	<p>The tangible biotic and abiotic structures that make up the natural world and which support processes and functions that can contribute to human well-being. Stocks can be represented in various ways, but are more often measured in terms of the areas, volumes or numbers.</p> <p>[Modified after MA (2005)]</p>

Term	Definition [Source]
Net Primary Production	➤ See term 'production, biological'
Non-Monetary Valuation	<p>The process whereby people express the importance or preference they have for the service or benefits that ecosystems provide in terms other than money. See monetary or economic valuation.</p> <p>[OpenNESS]</p> <p>→ See SP 6 “Non-Monetary Evaluation”</p>
Operationalization	<p>The process by which the ecosystem service concept is made usable by decision makers.</p> <p>[OpenNESS]</p>
Opportunity Costs	<p>The benefits forgone by undertaking one activity instead of another.</p> <p>[MA (2005)]</p>
Participatory Approach	<p>Family of approaches and methods involving people in ecosystem services research for the purpose of sharing, analysing and enhancing their knowledge to empower them to improve, plan, act, monitor, and evaluate decisions from the global to the local level concerning ecosystem services and human well-being.</p> <p>[OpenNESS based on Chambers (1997)]</p>
Payments for Ecosystem Services (PES)	<p>Conditional payments offered to providers (e.g., farmers or landowners) in exchange for employing management practices that enhance ES provision.</p> <p>[Modified from Tacconi (2012)]</p>
Policy Coherence	<p>An attribute of policy that systematically reduces conflicts and promotes synergies between and within different policy areas to achieve the outcomes associated with jointly agreed policy objectives.</p> <p>[Nilsson et al. (2012: 396)]</p>
Policy Consensus	<p>Agreement on an overall plan that embraces goals and procedures.</p> <p>[OpenNESS]</p>
Policy Maker	<p>A person with the authority to influence or determine policies and practices at an international, national, regional or local level.</p> <p>[Modified UK NEA (2011)]</p>
Population (Biological)	<p>A group of organisms of the same species, which either occupies a particular area (geographic population), is genetically distinct (genetic population) or fluctuates synchronously (demographic population).</p> <p>[slightly modified from Harrington et al. (2010)]</p>

Term	Definition [Source]
Precautionary Principle	<p>The management concept stating that in cases 'where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'.</p> <p>[Modified from UK NEA (2011)]</p>
Prediction [in the context of scenarios]	<p>A description or estimate of the state of a variable or system in the future with a high degree of certainty (in contrast to ➤ <i>projection</i>).</p> <p>[OpenNESS]</p> <p>→ See SP "Scenarios",</p> <p>➤ See term 'Projection' ➤ See term 'Forecast', ➤ See term 'Scenario'</p>
Pressure	<p>The endogenous variables that quantify the effect of drivers within an ecosystem. They are equivalent to the 'direct drivers' and 'endogenous drivers' of the MA (2005)].</p> <p>[Harrington et al. (2010)]</p>
Production (biological)	<p>Rate of biomass generated by an ecosystem, generally expressed as biomass produced per unit of time per unit of surface or volume. Net primary productivity is defined as the energy fixed by plants minus their respiration.</p> <p>[slightly modified from UK NEA (2011)]</p>
Production (economic)	<p>Output of a system</p> <p>[OpenNESS]</p>
Program Theory	<p>A systematic configuration of stakeholders' prescriptive assumptions (what actions are required to solve a problem) and descriptive assumptions (why the problem will respond to the action) underlying a program – whether explicit or implicit assumptions are made by stakeholders. As the success of a program in reaching its goals depends on the validity of its program theory, an evaluation based on the conceptual framework of program theory provides information not only on whether a program is effective or ineffective but the reasons for either.</p> <p>[slightly modified from Chen (2005: 340)]</p>
Projection	<p>A potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Projections are distinguished from 'predictions' in order to emphasise that projections involve assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realised; they are therefore subject to substantial uncertainty.</p> <p>[UK NEA (2011)]</p>

Term	Definition [Source]
Provisioning Services	<p>Those material and energetic outputs from ecosystems that contribute to human well-being.</p> <p>[Shortened from CICES]</p> <p>→ see also SP “Classification and CICES”</p>
Public Good	<p>A good where access to the good cannot be restricted.</p> <p>[Modified from UK NEA (2011)]</p> <p>→ See SP “Public Good”</p>
Reforestation	<p>Action to restock forest cover, either through artificial planting, natural seeds or other forms of propagation, in an area that previously had forest cover.</p> <p>[OpenNESS]</p>
Regime Shift	<p>A large, persistent change in the structure and function of (social-) ecological systems, with substantive impacts on the suite of ecosystem services provided by these systems. The transition is characterised by a lack of re-tractability or hysteresis.</p> <p>[???</p> <p>→ See SP “Thresholds, tipping points and limits”</p>
Regulating Services	<p>All the ways in which ecosystems and living organisms can mediate or moderate the ambient environment so that human well-being is enhanced. This therefore includes the degradation of wastes and toxic substances by exploiting living processes (<i>bioremediation</i>).</p> <p>[Modified after CICES V4.3]</p> <p>→ see also SP “Classification and CICES”</p>
Resilience	<p>The capacity of a (eco) system to cope with variability—including hazardous events, trends or disturbances—in ways that maintain the system’s essential structure, identity, internal processes and corresponding ability to deliver services. Also relates to the system’s rate of return to stability following a specified perturbation, and presupposes a degree of stability prior to the perturbation.</p> <p>[Modified from Holling (1973); Dawson et al. (2010), Harrington et al. (2010), and IPCC (2014)]</p> <p>➤ See Brand & Jax (2007) for the variety of definitions of this concept.</p> <p>→ See SP “Resilience”</p>
Resistance	<p>The capacity of an ecosystem to with-stand the impacts of drivers without displacement from its present state</p> <p>[UK NEA (2011)]</p>

Term	Definition [Source]
Responses (in the context of scenarios)	<p>Human actions, including policies, strategies, and interventions, to address specific issues, needs, opportunities, or problems. In the context of ecosystem management, responses may be of legal, technical, institutional, economic, and behavioural nature and may operate at various spatial and time scales. Such responses aim to minimise negative impacts or maximise positive impacts by acting on some pressure or driver of change.</p> <p>[OpenNESS, based on UK NEA (2011) and Harrington, et al. (2010)]</p>
Rich Picture Modelling	<p>A qualitative method designed to explore, acknowledge and define a situation and express it through diagrams to create a preliminary mental model. A rich picture helps to open discussion and come to a broad, shared understanding of a situation.</p> <p>[Following Checkland (2000)]</p>
Risk [Uncertainty]	<p>The product of the probability of an occurrence and the magnitude of the damage.</p> <p>[Klöpffer (1994: 49)]</p>
Rivalry	<p>the degree to which the use of one ES prevents other beneficiaries from using it Non-rival ES in return provide benefits to one person that do not reduce the amount of benefits available for others</p> <p>[ESMERALDA, after Schröter et al. (2014), Kemkes et al. (2010), Costanza (2008), Burkhard et al. (2012)].</p>
Robustness	<p>An ecosystem's ability to adapt to or maintain its function under chronic exogenous drivers and pressures. An ecosystem is robust when it is capable of resisting changes caused by long-term drivers or pressures that are external to the ecosystem, such as global warming, nutrient loading or hunting pressure. Robust ecosystems demonstrate adaptability to external forces, for example if a keystone species goes extinct, surviving species can compensate for the loss of function over physiological, demographic, or evolutionary time scales.</p> <p>➤ also see term "Resilience"</p> <p>[Harrington et al. (2010), after Lenski et al. (2006); Dawson et al. (2010)]</p>
Scale (spatial and temporal)	<p>The physical dimensions, in either space or time, of phenomena or observations. Regarding temporal aspects of ES supply and demand, hot moments are equally important to be identified as spatially relevant hotspot .</p> <p>[ESMERALDA, after Burkhard et al. 2013, Reid et al. 2006].</p>
Scale (on a map)	<p>Represents the ratio of the distance between two points on the map to the corresponding distance on the ground.</p> <p>[ESMERALDA}</p>

Term	Definition [Source]
Scenario	<p>Plausible, but simplified descriptions of how the future may develop, based on a coherent and internally consistent set of assumptions about key driving forces and relationships. Scenarios are not predictions of what will happen, but are projections on what might happen or could happen given certain assumptions about which there might be great uncertainty.</p> <p>[OpenNESS, modified from UK NEA (2011)]</p> <p>→ See also SP “Scenario”</p>
Security	<p>Access to resources, safety, and the ability to live in a predictable and controllable environment.</p> <p>[UK NEA (2011)]</p>
Service	<p>➤ See term 'Ecosystem Service'</p>
Service Benefiting Area (SBA)	<p>spatial unit to which an ecosystem service flow is delivered to beneficiaries. SBAs spatially delineate groups of people who knowingly or unknowingly benefit from the ecosystem service of interest.</p> <p>[ESMERALDA]</p>
Service Connecting Area (SCA)	<p>: connecting space between non-adjacent ecosystem service-providing and service-benefiting areas. The properties of the connecting space influence the transfer of the): benefit.</p> <p>[ESMERALDA]</p>
Service-Providing Unit	<p>The collection of individuals from a given species and the metrics of trait attributes (e.g., abundance, phenology, distribution) that are necessary for delivery of an ecosystem service at a desired level. The SPU must be quantified in terms of metrics such as abundance, phenology and distribution.</p> <p>[After Luck et al. (2003) and Harrington et al. (2010).]</p>
Shared Social Value	<p>The fulfilment, meaning or significance of the collective needs of society in relation to social, health and cultural services.</p> <p>[UK NEA (2011)]</p>
Societal Choice	<p>Collective decisions based on a decision-making process that identifies preferences or processes arguments.</p> <p>[OpenNESS]</p>
Socio-Economic System	<p>A system consisting of individuals, groups, and organizations and their economic and social interactions.</p> <p>[OpenNESS]</p>
Social-Ecological System	<p>Interwoven and interdependent ecological and social structures and their associated relationships.</p> <p>[OpenNESS]</p> <p>➤ Sometimes referred to as ‘Socio-Ecological System’</p>

Term	Definition [Source]
Species [taxonomic rank only]	A taxon of the rank of species; in the hierarchy of biological classification the category below genus; the basic unit of biological classification. [Lincoln et al. (1998: 280)]
Species Diversity	Biodiversity at the species level, often combining aspects of species richness, their relative abundance, and their dissimilarity. [UK NEA (2011)]
Species Richness	The number of species within a given sample, community, or area. [MA (2005), UK NEA (2011)]
Stability	“[A] kind of overarching meta-concept, comprising very different and more specific concepts such as persistence, resilience, constancy, elasticity [also robustness], etc., each of which also has several different meanings.” (Jax 2010: 168). Precise meaning should be specified for each use. [Jax (2010: 168) and Grimm and Wissel (1997)]
Stakeholder	Any group, organisation or individual who can affect or is affected by the ecosystem’s services. [OpenNESS] → See also SP “Stakeholder”
Stakeholder Analysis	A process that: i) defines aspects of a social and natural phenomenon affected by a decision or action; ii) identifies individuals, groups and organisations who are affected by or can affect those parts of the phenomenon (this may include nonhuman and non-living entities and future generations); and iii) prioritises these individuals and groups for involvement in the decision-making process. [Reed et al. (2009)] → See also SP “Stakeholder”
Stakeholder Typology	Classification of stakeholders according to the attributes: power, legitimacy, and urgency. [Mitchell et al. (1997)] → See also SP “Stakeholder”
State [of a social-ecological system]	Collection of variables that describe the overall physical condition of a social ecological system, including attributes of both ecosystem service providers and ecosystem service beneficiaries. [Modified from Harrington et al. (2010)] ➤ see also term ‘Ecosystem State’
Statistical Model	A model establishing a statistical relationship between a response variable and a set of predictor variables that indicates the degree of correspondence and uncertainty, and the kind of relationship. The relationship does not seek to conform to real system processes, only to best describe the data that have been collected following statistical principles. [OpenNESS, based on Hiborn & Mangel (1997)]

Term	Definition [Source]
State-and-transition model	<p>A conceptual model of ecosystem dynamics that incorporates multiple successional pathways, multiple steady states, thresholds of change, and discontinuous and irreversible transitions. State-and-transition models can be implemented as Bayesian belief networks.</p> <p>[Adapted from Stringham et al. (2003)]</p> <ul style="list-style-type: none"> ➤ See also term 'Conceptual model' ➤ See also term 'Threshold' ➤ See also term 'Bayesian belief network'
Story Boarding	<p>A verbal description of a problem or situation or system usually developed through qualitative, deliberative methods.</p> <p>[OpenNESS]</p> <ul style="list-style-type: none"> ➤ See also term 'Rich Picture Modelling'
Storyline	<p>A narrative description of a scenario, which highlights its main features and the relationships between the scenario's driving forces and its main features.</p> <p>[UK NEA (2011)]</p>
Structure [of an Ecosystem, Habitat, Community]	<p>The aggregate of elements of an entity in their relationships to each other. The component parts of an ecosystem; see 'natural capital asset' or 'natural capital stock'.</p> <p>[Common usage, adapted]</p>
Supporting Services	<p>Ecological processes and functions that are necessary for the production of final ecosystem services. See also 'intermediate services'.</p> <p>[OpenNESS]</p> <ul style="list-style-type: none"> ➤ Term not used in OpenNESS, see term "Function" → see SP "Conceptual Framework and Cascade"
Sustainable Use of ES	<p>Human use of an ecosystem so that it may yield a continuous benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations.</p> <p>[UK NEA (2011)]</p>
Sustainability	<p>A characteristic or state whereby the needs of the present and local population can be met without compromising the ability of future generations or populations in other locations to meet their needs. Weak sustainability assumes that needs can be met by the substitution of different forms of capital (i.e. through trade-offs); strong sustainability posits that substitution of different forms of capital is seriously limited.</p> <p>[UK NEA (2011)]</p>

Term	Definition [Source]
Synergies	Ecosystem service synergies arise when multiple services are enhanced simultaneously. [Raudsepp-Harne et al. (2010)]
System	A construct for a reporting unit at a level of aggregation generally above that which is applied to an ecosystem. Systems may include many ecosystems with varying degrees of interaction and spatial connectivity, in addition to their associated social and economic components. Systems are not mutually exclusive and can overlap both spatially and conceptually. [Modified from MA (2005)]
Taxon (Pl. Taxa)	The named classification unit to which individuals or sets of species are assigned. Higher taxa are those above the species level. For example, the common mouse, <i>Mus musculus</i> , belongs to the Genus Mus, the Family Muridae, and the Class Mammalia. [UK NEA (2011)]
Threatened Species	Species that face either a high (vulnerable species), very high (endangered species), or extremely high (critically endangered species) risk of extinction in the wild. [slightly modified from UK NEA (2011)]
Threshold, ecological	A point at which an ecological system experiences a qualitative change, mostly in an abrupt and discontinuous way. In the context of OpenNESS we use ecological threshold and tipping points as synonyms. See also 'regime shift' and the distinction with 'limit'. [OpenNESS] → See also SP "Threshold"
Tiered approach	A classification of available methods according to level of detail and complexity with the aim to provide advice on method choice. The provision and integration of different tiers enables ES assessments to use methods consistent with their needs and resources. [OpenNESS, ESMERALDA, based on Grêt-Regamey et al., 2016)
Tiers	➤ See term 'tiered approach'
Tipping Point	Used here as being synonymous with 'ecological threshold'. [OpenNESS] → See also SP "Threshold"
Total Economic Value (TEV)	A widely used framework to disaggregate the components of utilitarian value in monetary terms, including direct use value, indirect use value, option value, quasi-option value, and existence value. [OpenNESS]

Term	Definition [Source]
Trade-off	<p>Situations in which one service increases and another one decreases. This may be due to simultaneous response to the same driver or due to true interactions among services.</p> <p>[OpenNESS] → See also SP “Trade-offs”</p>
Transdisciplinarity	<p>A reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge including local, place-based knowledge and practitioners' knowledge.</p> <p>[Modified based on Lang et al. (2012) and Turnhout et al. (2012)] → See also SP “Transdisciplinarity”</p>
Travel Costs Analysis	<p>Economic valuation techniques that use observed costs to travel to a destination to derive demand functions for that destination.</p> <p>[MA (2005)]</p>
Uncertainty	<p>An expression of the degree to which a condition or trend (e.g. of an ecosystem) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from quantifiable errors in the data to ambiguously defined terminology or uncertain projections of human behaviour. Uncertainty can therefore be represented by quantitative measures (e.g. a range of values calculated by various models) or by qualitative statements (e.g. reflecting the judgment of a team of experts).</p> <p>[Modified from UK NEA (2011)]</p>
Urban	<p>Environmental condition linked to high population density, extent of land transformation, or a large energy flow from surrounding area.</p> <p>[OpenNESS, (after McIntyre 2000)]</p>
Urbanisation	<p>An increase in the proportion of the population living in urban areas or systems. See 'Urban systems'.</p> <p>[UK NEA (2011)]</p>
Urban Systems	<p>The total of functional interlinkages within an area designated as “urban” (see definition of “urban”).</p> <p>[OpenNESS]</p>
Valuation	<p>➤ See term ‘Ecosystem Service Valuation’ → See also SP “non-monetary valuation”</p>

Term	Definition [Source]
Value	<p>The worth, usefulness, importance of something. Thus value can be measured by the size of the well-being improvement delivered to humans through the provision of good(s). In economics, value is always associated with trade-offs, i.e. something only has (economic) value if we are willing to give up something to get or enjoy it.</p> <p>[After UK NEA (2011), Mace et al. (2012) and De Groot, (2010)]</p>
Value System	<p>Norms and precepts that guide human judgments about value and action.</p> <p>[Shortened from Farber et al. (2002)]</p>
Well-Being (Human)	<p>➤ See term 'Human well-being'</p>

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Appendix 1: Synthesis Papers

Synthesis Papers as developed in/for OpenNESS and referred to in this version (3.0) of the Glossary V3.0– see <http://www.openness-project.eu/library/reference-book>.

OpenNESS Ecosystem Service Reference Book (2016) edited by M. Potschin and K. Jax. Grant Agreement No 308428

Bundles of ecosystem services by P. Berry, F. Turkelboom, W. Verheyden and B. Martín-López	Human well-being by K. Jax and U. Heink
Classification of ecosystem services by R. Haines-Young and M. Potschin	Indicators for ecosystem services by B. Czúcz and I. Arany
Competitiveness by R. Haines-Young, C. Kretsch and M. Potschin	Institutional analysis by E. Primmer, C. Schleyer, G. Bela, I. Bouwma, C. Görg, H. Keune, D. Mortelmans and H. Saarikoski
Ecosystem service trade-offs and synergies by F. Turkelboom, M. Thoonen, S. Jacobs, M. García-Llorente, B. Martín-López and P. Berry	Link between biodiversity and ecosystem services by R. De Groot, K. Jax and P. Harrison
Ecosystem services: a gender perspective by E. Kelemen, M. Potschin, B. Martín-López and G. Pataki	Multi-Criteria Decision Analysis by H. Saarikoski, D.N. Barton, J. Mustajoki, H. Keune. E. Gomez-Baggethun and J. Langemeyer
Ecosystem services and human health by C. Kretsch and H. Keune	Nature-based solutions by M. Potschin, C. Kretsch, R. Haines-Young, E. Furman, P. Berry and F. Baró
Ecosystem services and resilience by C. Kretsch and E. Stange	Non-monetary valuation by E. Kelemen, M. García-Llorente, G. Pataki, B. Martín-López and E. Gómez-Baggethun
Ecosystem services and social justice by C. Kretsch and E. Kelemen	Public goods by C. Kretsch, J. van Dijk and C. Schleyer
Ecosystem services and transdisciplinarity by J. Hauck, M. Potschin, S.-R. Saarela, E. Carmen, J. Dick, B. Martín-López, E. Kelemen and H. Keune	Scenario building and its application by J.A. Priess and J. Hauck
Effectiveness by U. Heink, C. Görg and K. Jax	Stakeholder involvement by J. Hauck, H. Saarikoski, F. Turkelboom and H. Keune
Good governance by C. Görg, H. Keune, E. Primmer and C. Schleyer	Sustainable ecosystem management by A. Smith, P. Berry, P. Harrison and S. Jacobs
Green infrastructure by F. Baró, R. Bugter, E. Gómez-Baggethun, J. Hauck, L. Kopperoinen, C. Liqueste and M. Potschin	Thresholds, tipping points and limits by K. Jax