Ecosystem service concept and classification systems
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DEFINITION AND CONCEPT
Definition of Ecosystem Services

Ecosystem services (ES) are contributions of ecosystem structure and function (in combination with other inputs) to human well-being.


Categories of Ecosystem Services

Provisioning services

*Products directly used by people*

- **Food:**
  - Crops, wild plants, tea, honey etc.
  - Reared and wild animals and their outputs

- **Materials:**
  - Timber, hey, fibbers, herbs for medicine etc.
  - Genetic material

- **Energy:**
  - Biomass for energy

Regulating services

*Related to the way ecosystems regulate environmental media or processes*

- **Mediation of waste, toxics and other nuisances**
  - Filtration, accumulation

- **Mediation of flows**
  - Erosion control and water flow maintenance

- **Maintenance of nature processes**
  - Lifecycle and habitat maintenance;
  - Water conditions, soil formation, climate control etc.

Cultural services

*Related to the cultural or spiritual needs of people*

- **Physical and intellectual interactions**
  - Recreation
  - Educational and scientific value
  - Landscape, cultural heritage

- **Spiritual, symbolic interactions**
  - Symbols and traditions
  - Existence and bequest value
The ES cascade model

Components of the cascade model

- **biophysical structure** – land cover or habitat type (e.g. woodland, wetland, grassland etc.)
- **ecosystem processes** - dynamics and interactions forming the ecological system (e.g. primary production)
- **ecosystem functions** - the characteristics or behaviours of the ecosystem that underpins its capacity to deliver an ecosystem service (e.g. ability of the woodland or grassland to generate a standing stock of biomass)
- **‘final’ ecosystem service** – products which can be harvested (e.g. hey, timber) or gains from ecosystem functions (e.g. flood protection, beautiful landscape etc.).
- **benefits** – contribution of ES human well-being (e.g. health, nutrition, safety, accommodation, leisure, employment, progress etc.).
- **value** – that is assigned to benefits and expressed either in monetary or in moral, aesthetic or other qualitative criteria
Impact of management practice on ES supply: trade-off analysis

Unmanaged nature

Intensively managed cropland

Sustainable managed croplands
Role of biodiversity in ES supply

Biodiversity has essential role in ES supply:
- Mostly related to ‘**supporting or intermediate services**’ - biodiversity determines the biophysical structure and condition of ecosystem as well as different ecosystem functions.
- In some cases direct relationship exists between **species diversity** and ecosystem productivity, biomass production, nutrient cycling:
  - evidence that high levels of plant species diversity increases grassland productivity
  - productivity is an ecosystem function that underpins a range of ES (e.g. biomass production, soil formation and erosion control).
- **Functional traits** - presence of particular species or species groups with particular features, that have certain function in ecosystem or its performance:
  - e.g. ability of vegetation to store nutrients might depend on presence of species with the particular feature and their abundance
- **Functional groups** - groups of species with similar functions:
  - ecosystems, where functional groups are formed by ecologically similar species with different reactions on environmental pressures, are more resistant to adverse effects.
Interrelation between biodiversity, ecosystem and socio-economic system

HISTORY OF THE ES CONCEPT DEVELOPMENT AND ITS ROLE IN POLICY MAKING
The first most significant publications

de Groot (1992)

Daily (1997)

The Millennium Ecosystem Assessment

- The study lead by the United Nations, involving 1360 international experts
- Implemented from 2001 to 2005
- Assessment of human impacts on ecosystems and consequences in relation to human well-being

http://www.millenniumassessment.org

Source: Millennium Ecosystem Assessment (2003, 2005)
The Economics of Ecosystems and Biodiversity — TEEB

- Global initiative targeted at assessment of:
  - economic value of biodiversity
  - costs arising from biodiversity loss and ecosystem degradation

- Initiated by the European Commission and the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, responding to proposal of environment ministers from the G8+5 countries meeting in Potsdam, 2007

http://www.teebweb.org
The Economics of Ecosystems and Biodiversity — TEEB

The findings of TEEB were published in several reports:

- TEEB Ecological and Economic Foundations
- TEEB in national and International Policy making
- TEEB in Local and Regional Policy
- TEEB in Business and Enterprise
- the TEEB Synthesis Report

http://www.teebweb.org

The TEEB initiative has been followed up by several national TEEB studies in order to demonstrate the value of ecosystems for national policy makers
EU Biodiversity Strategy 2020

Target 2: By 2020, ecosystems and their services are maintained and enhanced by establishing green infrastructure and restoring at least 15% of degraded ecosystems

Action 5: Improve knowledge of ecosystems and their services in the EU

- By 2014 MS will map and assess the state of ecosystems and their services in their national territory
- By 2020 MS will assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national level
Working Group:
Mapping and Assessment of ecosystem services - MAES

- Established by the European Commission (EC) to support implementation of the Action 5 of the EU Biodiversity Strategy 2020
- MAES working group involves experts of the EC, the member states and the research community
- Analytical framework for the MAES process involves:
  1) mapping of the ecosystems;
  2) assessment of the ecosystem condition;
  3) assessment of ecosystem services;
  4) integrated assessment

International cooperation networks

Ecosystem Service Partnership:
- launched in 2008
- formed by institutional and individual members from all over the world
- aims to enhance cooperation in the field of ES by organising international conferences, trainings, data and experience exchange

https://www.es-partnership.org/

Intergovernmental Science-Policy Platform on Biodiversity and ES
- established in 2012, administered by UNEP
- aims to strengthen the science-policy interface for biodiversity & ES
- works on biodiversity and ES assessments at regional and global level

https://www.ipbes.net/
Information exchange platforms

The Biodiversity Information System for Europe:
- holds the information on completed as well as ongoing initiatives at EU and national level with regard to mapping and assessment of ecosystems and services they supply
  
  http://biodiversity.europa.eu/

OPPLA is an open platform:
- a new knowledge marketplace, where the latest thinking on ES, natural capital and nature-based solutions is brought together
- provides online database on ES assessment case studies, publications, projects that can be filtered by scale, ecosystem type, applied methods, etc.
  
  https://oppla.eu/about
Leading international projects

Operationalisation of natural capital and ecosystem services:
- aims to translate the concepts of Natural Capital (NC) and ES into operational frameworks providing tested, practical and tailored solutions for integrating ES into land, water and urban management and decision-making.

http://www.openness-project.eu/

OPERAs is a European research project:
- produces, refines and integrates ES science into policy and practice.
- provides stakeholders with user-friendly tools and instruments to enable them to apply ES science and knowledge in their work

http://operas-project.eu/

Enhancing ecoSysteM sERvices mApping for poLicy and Decision mAking
- aims to deliver a flexible methodology that provides building blocks for ES mapping and assessment
- to share experience through an active process of knowledge co-creation that will enable EU member states to achieve the aims of Action 5, biodiversity Strategy 2020
EC CLASSIFICATION SYSTEMS
Variety of approaches to classify ecosystem services using different criteria:

- spatial character and scale
- service flow – cascade model
- service beneficiary (private vs public)
- type of benefit (‘use’ vs ‘non-use’)
- does the use of a service by one individual or group affects the use by others (‘rival’ vs ‘non-rival’)
- describing the variety of benefits to humans
The Millennium Ecosystem Assessment Classification of ES

- Includes four ES categories:
  - Supporting services:
  - Provisioning services;
  - Regulating services;
  - Cultural services

- Demonstrates the links between ecosystem services and human well-being
TEEB classification:

Based on similar approach as used Millennium Ecosystem Assessment:
- Provisioning services
- Regulating services
- Cultural services
- Habitat or supporting services (*habitats for species and maintenance of genetic diversity*)
The Common International Classification of Ecosystem Services - CICES

- Developed for the System of Environmental - Economic Accounting – SEEA, led by the United Nations Statistical Division (UNSD)
- First proposed in 2009; revised in 2013
- New version under development

http://cices.eu/
The hierarchical structure of CICES

- Three major ‘sections’ of services - ‘provisioning’, ‘regulating’ and ‘cultural’
- sections are into ‘divisions’, ‘groups’ and ‘classes’
- allows to go down to the most appropriate level as well as combine results for generalised reports
- in the cascade model refers to the ‘final services’
IPBES approach for classification of ES

Provides an overarching typology of values, arising from different worldviews:

- **intrinsic value of nature** - including individual organisms, biophysical assemblages, biophysical processes and biodiversity

- **nature’s benefits to people**:  
  - biosphere’s ability to enable human endeavor (energy; net primary production; total material consumption; life cycles, etc.);  
  - nature’s ability to supply benefits (habitats for fisheries, contribution of soil biodiversity to sustenance of long-term yields, etc.);  
  - nature’s gifts, goods and services (regulating, provisioning and cultural services);

- **good quality of life** – security and livelihoods; sustainability and resilience; diversity and options; living well and in harmony with nature and Mother Earth
ES classification approaches in relation to cascade model
Read more about ES in:


Available online:
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