

Classification of ecosystem services (Issue 8)

Discussant: Haripriya Gundimeda

IIT Bombay

Joint Coordinator TEEB D2

Key objective of this session

- (i) Review recent developments related to the ecosystem services classification (CICES) and propose final version;

Issue Papers

- Common International Classification of Ecosystem Services (CICES) 2011 - Update (R. Haines-Young and M. Potschion)
- Classification and prioritisation of ecosystem services (S. Manyard and S. Cork)
- Linking the Ecosystem Accounting Framework with country specific indicators (A. Hauser, B. Schweppe-Kraft E. Schwaiger, M. Nagy, C. Schlatter)

Structure of discussion?

What is common between the papers and different

How do we use information on these papers to deliver in the next few months

- Can we agree on a classification which can feed into developing accounting system

Comparison of Papers

- Objective
- Definition
- Functions
- Services
- Benefits
- Boundaries for classification

Definition of ecosystem services

- CICES (2009):
- Objective – Propose a new standard classification of ecosystem services that is both consistent with accepted categorization and allows easy translation of statistical information between different applications
- Defines ecosystem services as contributions that ecosystems make to human well-being. They arise from the interactions of biotic and abiotic processes, and refer specifically to the ‘final’ outputs or products from ecological systems.

Definition

- The classification recognises these outputs to be provisioning, regulating and cultural services, but it does not cover the so-called ‘supporting services’ originally defined in the MA.
- Supporting services are treated as part of the underlying structures, process and functions that characterise ecosystems.
- They are indirectly consumed or used and simultaneously facilitate the output of many ‘final outputs’,
- Hence they were best dealt with in environmental accounts in other ways

Definition of Themes

- ✓ Provisioning theme includes all material and energetic outputs from ecosystems- They are tangible as well as consumed and used directly
- Both biotic and abiotic outputs considered but in the context of minerals subsoil assets are excluded
- Regulating and Maintenance – all ecosystem outputs that are not consumed but affect the performance of individuals, communities and populations and their activities
- Cultural and social – includes all non-material ecosystem outputs that have symbolic, cultural or intellectual significance

Positive features

- Hierarchical structure followed
- 3 familiar service themes, 9 principal class of services
- 23 service groups, 59 service types
- The classes are as generic as possible
- Cross-referencing feasible with other ecosystem service classifications and to UN common products classification, international standard international classification and classification of individual consumption by purpose.
- Both biotic and abiotic outputs from ecosystems included
- The regulation and maintenance theme include habitat services
- The service descriptors become progressively more specific at lower levels
- Is capable of handling the issue of spatial scale

Table 2: The CICES Classification (V3, 2011)

| Theme | Service Class | Service Group | Service Type | Sub-types | Examples and indicative benefits |
|---------------------|---------------------------------|-------------------------------------|---|-----------------------|---|
| Provisioning | Nutrition | Terrestrial plant and animal | Commercial cropping | eg. by crops | Cereals, vegetables, vines etc. |
| | | | Subsistence cropping | eg. by crops | Cereals, vegetables, vines etc. |
| | | | Commercial animal production | eg. by animal | Sheep, cattle for meat and dairy products |
| | | | Subsistence animal production | eg. by animal | Sheep, cattle for meat and dairy products |
| | | | Harvesting wild plants and animals for food | eg. by resource | Berries, fungi etc |
| | | Freshwater plant and animal | Commercial fishing (wild populations) | eg. by fishery | By species |
| | | | Subsistence fishing | eg. by fishery | By species |
| | | | Aquaculture | eg. by fishery | By species |
| | | | Harvesting fresh water plants for food | eg. by resource | Water cress |
| | | Marine plant and animal | Commercial fishing (wild populations) | eg. by fishery | Includes crustaceans |
| | | | Subsistence fishing | eg. by fishery | Includes crustaceans |
| | | | Aquaculture | eg. by fishery | Includes crustaceans |
| | | | Harvesting marine plants for food | eg. by resource | Seaweed |
| | | Potable water | Water storage | eg. by feature | Spring, well water, river, reservoir, lake |
| | | | Water purification | eg. by habitat | Wetlands |
| | Materials | Biotic materials | Non-food plant fibres | eg. by resource | Timber, straw, flax |
| | | | Non-food animal fibres | eg. by resource | Skin, bone etc., guano |
| | | | Ornamental resources | eg. by resource | Bulbs, cut flowers, shells, bones and feathers etc. (Stones? Gems?) |
| | | | Genetic resources | eg. by resource | Wild species used in breeding programmes |
| | | | Medicinal resources | eg. by resource | Bio prospecting activities |
| | | Abiotic materials | Mineral resources | | Salt, aggregates, etc. (EXCLUDE subsurface assets) |
| | | Energy | Renewable biofuels | Plant based resources | eg. by resource |
| | Animal based resources | | | eg. by resource | Dung, fat, oils |
| | Renewable abiotic energy | | Wind | eg. by resource | |
| | | | Hydro | eg. by resource | |
| | | | Solar | eg. by resource | |
| | | | Tidal | eg. by resource | |
| Thermal | | | eg. by resource | | |

Table 2: The CICES Classification (V3), cont.

| Theme | Service Class | Service Group | Service Type | Sub-types | Examples and indicative benefits |
|----------------------------|------------------------------------|--|---|---|---|
| Regulation and Maintenance | Regulation of wastes | Bioremediation | Remediation using plants | eg. by method | Phytoaccumulation, phytodegradation, phytostabilisation, rhizodegradation, |
| | | | Remediation using micro-organisms | eg. by method | in situ (Bioremediation), ex situ (composting), bioreactors |
| | | Dilution and sequestration | Dilution | eg. by method | Wastewater treatment |
| | | | Filtration | eg. by method | Filtration of particulates and aerosols |
| | | | Sequestration and absorption | eg. by method | Sequestration of nutrients in organic sediments, removal of odours |
| | | Flow regulation | Air flow regulation | Windbreaks, shelter belts | eg. by process |
| | Ventilation | | | eg. by process | |
| | Water flow regulation | | Attenuation of runoff and discharge rates | eg. by process | Woodlands, wetlands and their impact on discharge rates |
| | | | Water storage | eg. by process | Irrigation water |
| | | | Sedimentation | eg. by process | Navigation |
| | | | Attenuation of wave energy | eg. by process | Mangroves |
| | Mass flow regulation | | Erosion protection | eg. by process | Wetlands reducing discharge peak |
| | | | Avalanche protection | eg. by process | Stabilisation of mudflows, erosion protection [reduction] |
| | Regulation of physical environment | Atmospheric regulation | Global climate regulation (Incl. C-sequestration) | eg. by process | Atmospheric composition, hydrological cycle |
| | | | Local & Regional climate regulation | eg. by process | Modifying temperature, humidity etc.; maintenance of regional precipitation |
| | | Water quality regulation | Water purification and oxygenation | eg. by process | Nutrient retention in buffer strips etc. and translocation of nutrients |
| | | | Cooling water | eg. by process | For power production |
| | | Pedogenesis and soil quality regulation | Maintenance of soil fertility | eg. by process | Green mulches; n-fixing plants |
| | | | Maintenance of soil structure | eg. by process | Soil organism activity |
| | Regulation of biotic environment | Lifecycle maintenance & habitat protection | Pollination | eg. by process | By plants and animals |
| Seed dispersal | | | eg. by process | By plants and animals | |
| Pest and disease control | | Biological control mechanisms | eg. by process | By plants and animals, control of pathogens | |
| Gene pool protection | | Maintaining nursery populations | eg. by process | Habitat refuges | |
| Cultural | Symbolic | Aesthetic, Heritage | Landscape character | eg. by resource | Areas of outstanding natural beauty |
| | | | Cultural landscapes | eg. by resource | Sense of place |
| | | Spiritual | Wilderness, naturalness | eg. by resource | Tranquillity, isolation |
| | | | Sacred places or species | eg. by resource | Woodland cemeteries, sky burials |
| | Intellectual and Experiential | Recreation and community activities | Charismatic or iconic wildlife or habitats | eg. by resource | Bird or whale watching, conservation activities, volunteering |
| | | | Prey for hunting or collecting | eg. by resource | Angling, shooting, membership of environmental groups and organisations |
| | | Information & knowledge | Scientific | eg. by resource | Pollen record, tree ring record, genetic patterns |
| | | | Educational | eg. by resource | Subject matter for wildlife programmes and books etc. |

Different studies reviewed by Australian Paper

- this issues paper reviews the Australian studies and examines how well they fit into the CICES classification and identifies the deviations if any
- Bennett- Uses a service-based approach to examine links between soil management, soil health, and public benefits in Australian agricultural landscapes.
- Goulburn Broken – Aims to provide an insight into the full range of ecosystem services currently provided in a catchment (highly dominated by agricultural land use), and provide the basis for a more detailed assessment of what might happen to those services under a set of scenarios for the future.

Typology of values in Australia

- Gwydir - Aimed to gauge the most important ecosystem services to the Gwydir community (in terms of their input to cotton growing);
- to assess the vulnerability and ease of management of the various ecosystem services;
- to develop analytical approaches and tools to assess ecosystem services; and
- to assess the ecological, economic and social impact of changes in delivery of priority ecosystem services.

Review of Australian studies

- South East Queensland (SEQ) - Stakeholders across a region collaborated to develop an 'agreed' ecosystem services framework to incorporate into policy planning.
- Wallace1 - Wallace proposed an alternative classification. Wallace's main concern was that previous classifications did not express ecosystem services in terms of the contribution they made to human wellbeing – thus his approach was a variation on approaches that link processes with services and services with benefits.

On board with CICES

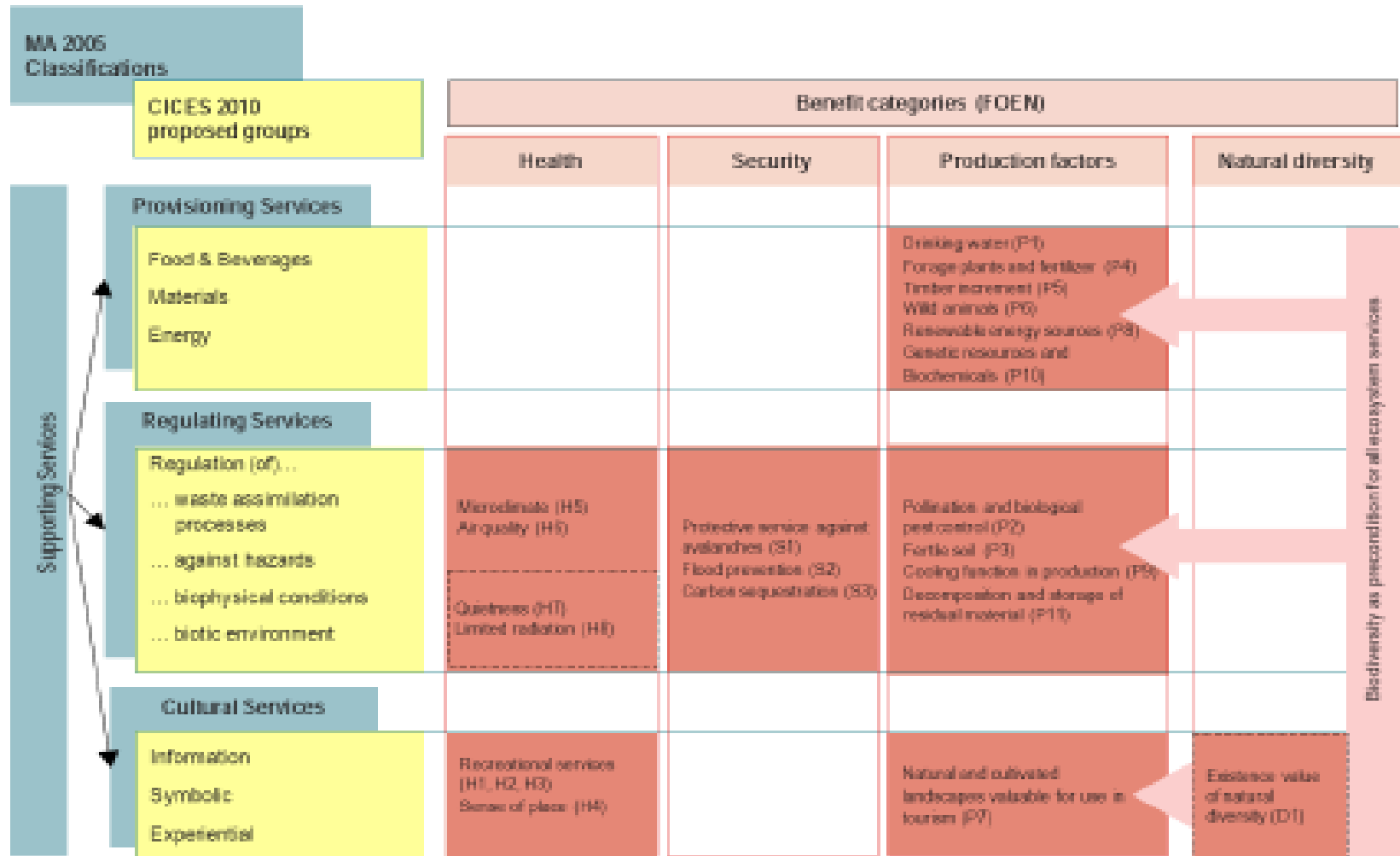
- It is important to distinguish between ecosystem structure, process, and function;
- It is important to distinguish between ecosystem functions and services; and
- It is useful to distinguish between services and benefits.
- Some way of coding ecosystem services based on their scale could facilitate alignment of ecosystem services classifications with classifications of markets (which often are based on scale from local to global)
- The time scales that ecosystem services are generated over are important
- Agree with CICES that categories should be as generic as possible and linked in a nested hierarchy to accommodate different scales of concern or thematic content’.
- Australian experience of developing ecosystem service classifications fits broadly within the CICES.

Linking the ecosystem accounts with country specific indicators Hauser et al

- Weber (2011) developed the accounts based on a comprehensive framework taking into account the depreciation and other aspects relevant for national accounting. They developed the concept of accessibility for three components
 - a. Carbon/Biomass
 - b. Fresh Water
 - c. Green Infrastructure Neighbourhood Ecosystem Services (GINES)
- Switzerland, Austria, Germany used pragmatic indicators for those ecosystem services that have been considered as being relevant for these countries.
- For Switzerland, these indicator set has been published Staub et al. (2011).
- The Austrian indicator set concentrates on ecosystem services relevant for agriculture.
- Based on the work of the Swiss , the Environment Agency Austria has established an inventory of final ecosystem goods and services for direct use by humans in the Austrian agricultural sector

Figure 1: Relationship between CICES classification and the services and benefits recognised in the Swiss Federal Office for the Environment (FOEN) (after, Staub et al. 2011)

Interpretation assistance: for example, the FECS "Natural supply of ground and service water usable as drinking and process water" (P1), which is assigned in the FOEN Inventory (red) to the "Factors of production", is coded in the MA class (blue) "Provisioning services". This class is also found in the CICES (yellow), although in a slightly altered form, with the subgroups food and drinking water, materials and energy. The FECS P1 can also be assigned to this CICES class.



Issues posed for discussion (CICES)

- To what extent is the hierarchial structure of CICES suitable for meeting the requirements for analysis at different spatial and thematic scales of resolution?
- Does this hierarchial structure support the analysis and reporting of changes in the value of different kinds of good generated by ecosystem services?
- Does the criterion of renewability remain an appropriate boundary condition for defining the scope of CICES?
- Is the present structure of CICES necessary and/or sufficient to support the implementation and testing of the experimental ecosystem capital accounting framework?

Some unresolved issues for discussion (Maynard and Cork)

- What is the appropriate terminology to be applied that will resonate with a wide range of stakeholders and/ disciplines ?
- How to account for ecosystem services, the benefits of which are evident at multiple scales?
- How to account for ecosystem services and benefits that are not yet recognised?
- How to account for ecosystem services, the benefits of which are in the future?

Key questions raised? (Austria, Swiss, Germany)

- *How can existing sets of indicators for ecosystem goods and services be integrated into or related to the framework proposed by Weber (2011)*
- *How to deal with:*
- *differences in scope (limited range of ecosystem services vs. broader scope of differentiation of CICES and of indicator sets by national agencies) and*
- *differences in the geographical scale*

Road Map for Ecosystem Accounting

- Key Objective of ecosystem accounting
- The classification of services depend on the purpose
- Ecosystems are not homogeneous
- Complexity of ecosystems
- Need for verifiable evidence base/measurable indicators (FOEN)
- Terminology needs to be simplified and represent realities in data generation
- Understanding of trade-offs
- Issue of scale is very much relevant
- Where , what, How much of ecosystem service?
- Abiotic resources should be included under ecosystem service
- Resilience – Mature ecosystems
- How do we deal with multiplicity of values and interactions?
- Systemic approach required

Operationalizing the ecosystem accounting

- Classification consistent with Central Framework
- 1) Physical supply and use table
- 2) Asset accounts in physical and monetary terms (transactions between economy and environment)
- 3) Sequence of economic accounts (payment for environmental taxes, subsidies, grants, rent)
- 4) Functional accounts for environmental transactions (investments in technology, environmental protection expenditure accounts etc)
- 5) Table containing demographic and employment
- Bipphysical indicators need to be monetised using market based approaches to be consistent with SEEA

Figure 2: Indicative relationship between CICES classification and types of value associated with ecosystem services

| Services | | | Goods | | | | |
|----------------------------|------------------------------------|--|------------|--------------|--------------|---------------|-----------------|
| Theme | Class | Group | Direct use | Indirect use | Option value | Bequest value | Existence Value |
| Provisioning | Nutrition | Terrestrial plant and animal foodstuffs | Light | | Light | | |
| | | Freshwater plant and animal foodstuffs | Light | | Light | | |
| | | Marine plant and animal foodstuffs | Light | | Light | | |
| | | Potable water | Light | | Light | | |
| | Materials | Biotic materials | Light | | Light | | |
| | | Abiotic materials | Light | | Light | | |
| | Energy | Renewable biofuels | Light | | Light | | |
| | | Renewable abiotic energy sources | Light | | Light | | |
| Regulation and Maintenance | Regulation of wastes | Bioremediation | Dark | Dark | Light | | |
| | | Dilution and sequestration | Dark | Dark | Light | | |
| | Flow regulation | Air flow regulation | Dark | Dark | Light | | |
| | | Water flow regulation | Dark | Dark | Light | | |
| | | Mass flow regulation | Dark | Dark | Light | | |
| | Regulation of physical environment | Atmospheric regulation | Dark | Dark | Light | | |
| | | Water quality regulation | Dark | Dark | Light | | |
| | | Pedogenesis and soil quality regulation | Dark | Dark | Light | | |
| | Regulation of biotic environment | Lifecycle maintenance & habitat protection | Dark | Dark | Light | | |
| | | Pest and disease control | Dark | Dark | Light | | |
| | | Gene pool protection | Dark | Dark | Light | | Light |
| Cultural | Symbolic | Aesthetic, Heritage | Dark | Dark | Light | | Light |
| | | Religious and spiritual | Dark | Dark | Light | | Light |
| | Intellectual and Experiential | Recreation and community activities | Dark | Dark | Light | | Light |
| | | Information & knowledge | Dark | Dark | Light | | Light |

Notes: Intensity of colour suggests what types of value might be associated with different types of good; although the 'total economic value' framework is used importance's can be assessed using biophysical parameters as well as monetized values.