Update: work on developing ecosystem service classification(s) for ecosystem accounting

Jan-Erik Petersen, EEA, and Alessandra La Notte, EU Joint Research Centre

(with input from Charles Rhodes, ORISE fellow, Dixon Landers and Amanda Nahlik (USEPA), and Roy Haines-Young, Fabis Consulting)

Introduction:

This paper summarises the follow-up to work on ecosystem service classifications that was previewed in a paper to the 2016 London group meeting in Oslo. This work is being developed in cooperation between the European Environment Agency/Univ. of Nottingham, the EU Joint Research Centre, and the US Environmental Protection Agency, under the guidance and support of UNSD. Two components of that work are discussed below. This paper complements a parallel paper on the outcome of the revision of the CICES classification of ecosystem services (J-E Petersen, R. Harris and Roy Haines-Young).

1) Wageningen workshop on ecosystem service classification for ecosystem accounting:

This workshop was a useful step for further clarifying the requirements of ecosystem accounting on ecosystem service classifications and was held at, and with the support of, the University of Wageningen on 17-18 November 2016. It had the following objectives:

i. Elaborate and agree upon a set of principles, criteria, definitions, and characteristics for ecosystem services classification(s) to be used, among other things for the compilation of SEEA Experimental Ecosystem Accounts;

ii. Discuss the classification of ecosystem services for ecosystem accounting, (based on agreed criteria and principles) and relations with other classifications used in official statistics;

iii. Agree on the next steps and required research for developing a standardized, multi-purpose international classification (or system of explicitly connected classifications), including for the SEEA Experimental Ecosystem Accounting.

The background documents, presentations of the workshop are available under the following link: https://projects.eionet.europa.eu/ecosystem-capital-accounting/library/ecosystem-service-classification-ws-nov-2016 .

The workshop enabled a very useful exchange between experts working on ecosystem service classifications and (potential) users of such classifications at statistical offices and in research organisations. Given the complexity of the topics discussed, however, not all its objectives could be achieved. The workshop thus sets the scene for further work on comparing ecosystem service classifications, as had been foreseen.

In this brief paper we present a comparative table on key characteristics of the three ES classification systems discussed and summarise key research questions that arose from the workshop (Table 1). Further details on the ES classifications discussed, as well as diagrams that describe their underpinning conceptual models, can be found in the technical background paper for the workshop (which is currently being updated by workshop organizers as a workshop product) –

https://projects.eionet.europa.eu/ecosystem-capital-accounting/library/ecosystem-service-classification-ws-nov-2016/final-draft-technical-background-document .

Table 1: Comparative overview of current ecosystem service classification systems (rev Oct. 2017)

Characteristic	CICES	FEGS-CS	NESCS
Origin / custodian	EEA & University of Nottingham	US-EPA - ORD	US-EPA – ORD, OW, OAR
Purpose & use context	'Multi-purpose classification' of potential final ES for accounting, assessment etc.	Classification system focused on final ecosystem goods and services (FEGS) (for measuring) stocks	Classification system focused on final flows of ES by flexible "Use-User" combinations
Main conceptual model	Cascade model, SEEA EEA framework	Environment + Potential Beneficiary = FEGS	Four-Group structure of 'Environment', 'End-products', 'Direct Use/Non-Use', 'Direct user'
Structure / design	Hierarchical, developed on basis of 3 of the 4 MA ES categories; substantially revised to focus on final services	Matching hierarchies of Environments and Beneficiaries yields a matrix of feasible types of FEGS	Nested hierarchies in each Group; linking across Four-Group structure essential
Current use / users	Adopted for EU ecosystem accounting work; used by many research teams, mainly in Europe	EPA pursuing metrics and indicators for ecological measures using FEGS-CS; US NSF-funded Air Quality & ES work across many envts.	Developed for work by US-EPA, proposed / adopted by current USGS-led research initiative on natural capital accounting
Links to other classifications	Has links to work under MA & TEEB, a translation tool exists to those classifications as well as to FEGS-CS	Embedded land and beneficiary classifications	Embedded and intentionally modular land and beneficiary classifications (NAICS "plus")
Other information	CICES V5.1 Is about to be released after extensive user survey and consultations	Online user tool; FEGS-CS Revision product in 2018	'Summary' document and 'Guidelines for Use' forthcoming

Note: 'ORD' stands for Office of Research and Development, 'OW' for Office of Water, and 'OAR' for Office of Air and Radiation. 'NSF' stands for (the US's) National Science Foundation.

Further details on CICES can be found under: www.cices.eu

Information on FEGS-CS is provided under:
https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=257922

Information on NESCS is available under: https://www.epa.gov/sites/production/files/2015-12/documents/110915_nescs_final_report_-_compliant_1.pdf

The workshop participants also reviewed essential needs for classifying ES for ecosystem accounting. The following is a summary of key points arising from that discussion:

- There is need for a "standard" (i.e. a jointly agreed ES classification or a translation tool between fully functional ES classifications: a shared reference that facilitates comparison

across different research fields and application domains => easier sharing of results, building of shared knowledge

- The focus from now should be on an approach / framework for identifying final ES for ecosystem accounting purposes (SEEA EEA – match of final ES supply and demand) => practical application of ES classification together with other SEEA EEA components

➢ What are the characteristics that match these needs, are they the same for both purposes ?

These points and other reflections lead to the following suggested characteristics for a reference ES classification:

- Use the (human) purpose of ES flow as the main characteristic for identifying (and naming) ES flow classes and higher level aggregation categories (what ES flows contribute to benefits, i.e. regulating water flows, contributing to human nourishment, etc.)
- An ability to connect to other ES classifications in different application domains is desirable
- Ensure suitability for ecosystem accounting by adopting the following principles:
  - Help avoid double counting
  - Hierarchical organisation
  - Clear and concrete ES categories
  - Ability to compile a complete set of ES flows
  - Be practical and feasible

Finally, the workshop participants discussed the next steps for better understanding the respective strengths and weaknesses of existing ecosystem service classification systems. One promising route lies in a shared testing and comparison of existing ecosystem service classifications (as a case study exercise). Technical discussions so far have identified the following key components for review (more may follow):

- Ecosystem units (~ecosystem types within a spatial grid) to be covered – there will be a great mixture of those in most case studies and it is important to focus on the ones that are most common or most comparable.
- Categories of potentially final ES [Core Set] to be covered as a minimum set – for CICES this would mean to select ES classes from all three main sections (provisioning, regulation & maintenance, cultural).
- Comparing definitions or metrics that are used for describing / quantifying these ES; and identifying what their functional characteristics would be with regard to condition
- Compare approaches for identifying beneficiaries / users to support comparability of results between the three ES classifications.

This exercise needs to be embedded in the SEEA EEA structure. So one additional question for comparison could be whether one can build a full set of accounts using the different systems – and whether a structure that can build the full set of accounts required by SEEA EEA is a) partly or fully compatible with any of these three systems, and b) practical for the full range of non-ecosystem-accounting uses for ES classifications.

2) Combining different ecosystem service classifications for use in the EU KIP INCA project:

In the EU KIP INCA project, the EU Joint Research Centre (JRC) is developing detailed supply and use tables for ecosystem service accounts built on CICES as an ES classification. JRC is also testing the combination of CICES with elements of the National Ecosystem Services Classification System (NESCS, out of USEPA) to account specifically for SNA and non-SNA benefits.

A key element at the basis of this approach is the complementarity between CICES and NESCS, since the former is providing the way to frame ecosystem service flow and the latter is providing the way to allocating these flows to final beneficiaries. One crucial component in NESCS that allows appropriate allocation is the "use" category that is not developed by any other classification system in this specific field.

In the following table, a few examples are provided on how the complementarity between CICES and NESCS for accounting purposes could be established.

Table 2 – Complementarity between CICES and NESCS for selected ecosystem services (work in progress)

CICES classification	*JRC rephrasing for accounting purposes*	*NESCS*		
		Ecological Endpoints [SNA and non-SNA Benefit]	"Use"	*NESCS* "User"/Beneficiary
Arable cropping	Agro-biomass growing	***Flora ([22].2.)*** [SNA:crops]	Raw material for transformation (.1101.) Direct consumption (.1109.)	Agriculture (111) [22.]2.1101.111 Households (2) .2.1109.2
Animal husbandry	Forage biomass growing	***Flora ([2(2/4/5)].2.)*** [SNA: livestock]	Support of animal breeding ([2().2.1105.111	Agriculture (111)
Materials from plants	Tree biomass growing	***Flora (.2.)*** [SNA: timber]	Raw material for transformation (.1101.)	Agriculture (111) .2.1101.111
Pollination and seed dispersal	Wild crop pollination	***Fauna (.3.)*** [SNA: wild pollinators depending on crops]	2(2).1105. Support of plant or animal cultivation [for Agric and for HHs]	Agriculture (111) 2(2).3.1105.111 Households (2) 2(3).3.1105.2
Dilution by freshwater ecosystems	Water purification (nitrogen removal)	***Water ([1(1/2/3/6)].1.)*** ***Liquid water ([1(1/2/3/6)].12.)*** [non-SNA: cleaned water]	Support of plant and animal cultivation (.1105.) Support of human subsistence (.1106.)	Agriculture (111) .12.1105.111 Households (2) .12.1106.2
Global climate regulation	Carbon sequestration	***Combined End-Products (WW.82.)*** [non-SNA: mitigation of CC effects]	Protection of human health, life and subsistence (.1205.)	All: .WW.82.1205.1(/2/3)
Filtration by plants	Air filtration	***Air ([3].51)*** [non-SNA: clean air]	Protection of human health (.1205.)	Households (2) [3].51.1205.2
Control of erosion rate	Erosion control	***Soil ([2(1/2/3/4)].6.)*** [non-SNA]	Support of plant cultivation (.1203.)	Agriculture (111) [2W].6.1203.111

Flood protection	Flood control	***Regulation of extreme events ([2(1/2/3/4)].82.)*** [non-SNA] [SNA]	Protection of human life (.1205.) Protection of human property (.1206.)	Industry (1)[1] 2W.82.1206.1 Households (2) 2W.82.1205.2 Households (2) 2W.82.1206.2
Interactions with natural environment	Provision of outdoor recreation opportunities	***Scapes (.81.)*** [non-SNA] [SNA]	Recreation (.1207.) Tourism (.1207.)	Households (2) .81.1207.2 Accommodation and Food services (172) .81.1207.172

By inserting the 'use' and 'user' categories, it is possible to assign more clearly the benefits from ecosystem services. A desirable feature of the use table can be the inclusion of "uses" as sub-categories within the standard economic classification, in order to provide clearer and transparent paths of allocation.

JRC and ORISE are currently working together to identify and allocate all possible uses of ecological end-points/ SNA and non-SNA benefits (ref Table 2, third column) to each economic sector and households.

[1] Any activity that requires hectares of lands and building in order to work.