CLASSIFYING ECOSYSTEM SERVICES FOR ECOSYSTEM ACCOUNTING AND RESEARCH PURPOSES – STATE OF THE ART AND KEY CHALLENGES

ACES 2016 Session 6: Measuring, Modeling and Mapping Ecosystem Services Jacksonville, FL December 6, 2016

Charles R Rhodes¹, Dixon Landers², Roy Haines-Young³, Jan-Erik Petersen⁴, Amanda M. Nahlik², Alessandra La Notte⁵

¹ ORISE post-doctoral fellow, U.S. EPA Offices of Water (and of Research and Development), Washington, D.C. ² U.S. EPA Office of Research and Development, Western Ecology Division, Corvallis, OR ³ University of Nettingham (Emeritus), Nettingham, England

³ University of Nottingham (Emeritus), Nottingham, England

⁴ European Environment Agency, Copenhagen, Denmark

⁵ European Commission, Joint Research Centre



Issues for System of Environmental Economic Accounting (**SEEA**) Experimental Ecosystem Accounting (**EEA**):

definition of the "production boundary," or what "final services" are may differ with the analytical approach chosen; common classification Approaches to definition and identification of ES (outside of accounting needs) seem to split between:

Those seeking formalization and standardization of ES definitions and identification

- bound to formal analysis
 - marginal/scenario/cost-benefit
- seek long-term tool development
 - "full-spectrum" identification
 - precise, reproducible, and specific *metrics*
 - precise final ES users/beneficiaries \rightarrow value
 - common tracking of relevant ES metrics; goal of "allowable" benefits transfer

Ad-hoc pragmatists

- frustrated with slowness of adoption of ES perspective
- focused on limitations of full-scale ES assessment for very few ES
 - 1 to 6 "ecosystem services"
- question the efficacy of formalizing classification

Core Features for a Desirable Final Ecosystem Services Classification System

1. Exhaustive and Mutually Exclusive

uniquely identifies all structures, processes, functions, and products of natural systems that humans use

2. Non-Duplicative

focuses attention and measurement on final vs intermediate ecosystem services, to avoid double-counting

3. Practical for Users

easy-to-grasp groupings elements, with clear definitions and rules, that appeal across disciplines and users

4. Helpful for Selecting Appropriate Metrics uniquely identifies precise flows of ecosystem services to help determine what to measure

5. Modular

for practical use, system interfaces with other standard classifications or ecosystem accounting tools

6. Appropriate to be a Standard

for practical use, system is *stable*, rules are *well-explained*, can *serve for many types* of applications



- Quantification and Measures
 - Valuation and Monetization



Common International Classification of Ecosystem Services (CICES): Consultation on Version 4,

 The Common International Classification of Ecosystem Services

 CICES http://cices.eu









Contrast Total Contrast Projector 2015 Contrast Contrast and Development 2015 (Projector 2015) Contrast Contras

National Ecosystem Services Classification System (NESCS): Framework Design and Policy Application

Final Report



The Final Ecosystem Goods and Services Classification SystemFEGS-CSPublished EPA Report: EPA/600/R-13/ORD-004914Interactive FEGS-CS website at http://gispub4.epa.gov/FEGS



The National Ecosystem Services Classification SystemNESCSPublished EPA Report: EPA-800-R-15-002

http://www.epa.gov/eco-research/ecosystems-services







"Multi-purpose" and "modular"



Modular system:





OR

How to meet SEEA EEA ES classification needs?



MA 2005 \rightarrow CICES

Conceptual Framework



Developing CICES (V5.0) – example definition structure

Section	Division	Group	Class	Simple descriptor	Ecological clause	Use clause	Example Service	Example Benefit	CICE
Provision- ing	Biomass from ecosystems	Nutrition	Wild plants, algae and their outputs	Food from wild plants	Parts of the standing crop of a non- cultivated plant species	that can be harvested and used as raw material for the production of food	Standing crop of wild berries	Jam	os bridge to GS/NESCS

US EPA breaks from MA-CICES Track Regulatory Policy Needs

- Benefit-Cost Analyses (BCA)
- Adding more ES *cannot* bring poorly identified metrics or double counting into BCA or policy analyses

EPA's ORD, OW, OAR: within constraints of MA's four groups, can researchers derive a set of clear, unique, unduplicated ecological and economic *measures for ES that matter to people and policy*?

Boyd and Banzhaf (2007) indicate a potential way forward: **count only those ES that directly enter the human economy, at the point they do**

Final Ecosystem Services

At the point they enter human systems "ecological endpoints" have no price – no human pays nature for birdsong, seashells, or soil productivity

Ecosystem Services Perspective and Economics

Final ES are *defined* as not having prices:

- A key information signal between providers (supply) and consumers (demand) in markets is *missing*
- The ES perspective *may*, and Environmental Economic Accounts *do* attempt to model/*mimic*/ approximate a Price-Quantity relationship (equilibrium) for ES

Knowing this:

- 1) careful identification of supply-and the elements IND becomes critical to "modeling success"
- 2) data may be judged relevant as it informs identified supply- and demand-*like* elements

"Supply" from a specific environment

"Demand" *from* humans and society

EG:

SEEA

EE,

Final Ecosystem Goods and Services Classification System (FEGS-CS)

"components of nature, directly enjoyed, consumed, or used to yield human well-being" (Boyd & Banzhaf 2007)

Environment + Beneficiary -> FEGS

FEGS-CS identifies FEGS using a six-digit classification number





FEGS

€EPA

The NESCS Conceptual Framework – The "Blue-Green Diagram"



NESCS Four-Group Classification Structure (condensed)

NESCS







Status and Next Steps in "3-Systems" work with UNSD

- Series of UNSD invited Meetings, continuing through Wageningen Experts Workshop (WEW) Nov 16-18th 2016, and to Spring of 2017...
- 2) Wageningen Experts Workshop discussions & conclusions to be documented via technical outcome document(s) for partners, and for SEEA EEA and future expert discussions at UNSD level
- 3) Technical background document, presentations & other material available on: <u>http://projects.eionet.europa.eu/ecosystem-capital-accounting/library/ecosystem-service-classification-ws-nov-2016</u>
- 4) Further testing of the 3 Systems in practice still necessary; need better guidance on how to use the 3 Systems and how to compare them equitably
- 5) Case Studies comparing the 3 Systems, summer 2017 (*next slide, detail*)

Status and Next Steps in "3-Systems" work with UNSD

Case Studies comparing the 3 Systems, summer 2017:

- how to frame case studies so that outcomes match Supply-Use Table needs of SEEA EEA?
- 1 European, 1 US, and 1 other geographic space for case studies?
- common beneficiary space *and* beneficiary set for analysis?
- attempt to suggest metrics by System definitions?
- units, ecosystem types, categories, "common" definitions?
- additional case study areas or partners welcome

Soft End – ACES 2016 (Reserve slides for Q&A follow)



From ecosystem function to economic value – a first attempt to illustrate the fit of different conceptual systems



Figure 6: Comparing SEEA-EEA 'work flow' with underpinning tools and classifications



Non-Use

(incl. ISIC)

Products (Classes & Sub-Classes reflect extent, condition, capacity)

Comparing FEGS-CS and NESCS

BOTH

- represent careful and continuing collaboration between natural and social scientists, enhancing usefulness to both sides
- begin in environment and end with "beneficiary" = use-user combinations
- Built to identify final ecosystem (goods and) services
- Built to be Exhaustive and Mutually Exclusive, Non-Duplicative (minimizing double-counting), Practical for Users, Helpful for Selecting Appropriate Metrics
- May offer sufficient functionality to communities, other federal agencies, private-sector users, and international agencies

FEGS-CS	NESCS		
GOAL: defines FEGS and facilitates identification of environmental metrics for ES that can be consistently used for quantifying environmental benefits to people	GOAL: facilitate economic analyses – scenario (marginal) analysis that can support economic valuation efforts (economic metrics) – for policy use, and perhaps for national accounting		
FOCUS: stocks of "FEGS"	FOCUS: <i>flows</i> of final ES		
use-user combinations are fixed	multiple uses for same user or vice versa		



Pathway Linking Policy Changes to Human Well-Being







NESCS-S

NESCS-D

