Overview of current status of CICES and its use in an ecosystem accounting context

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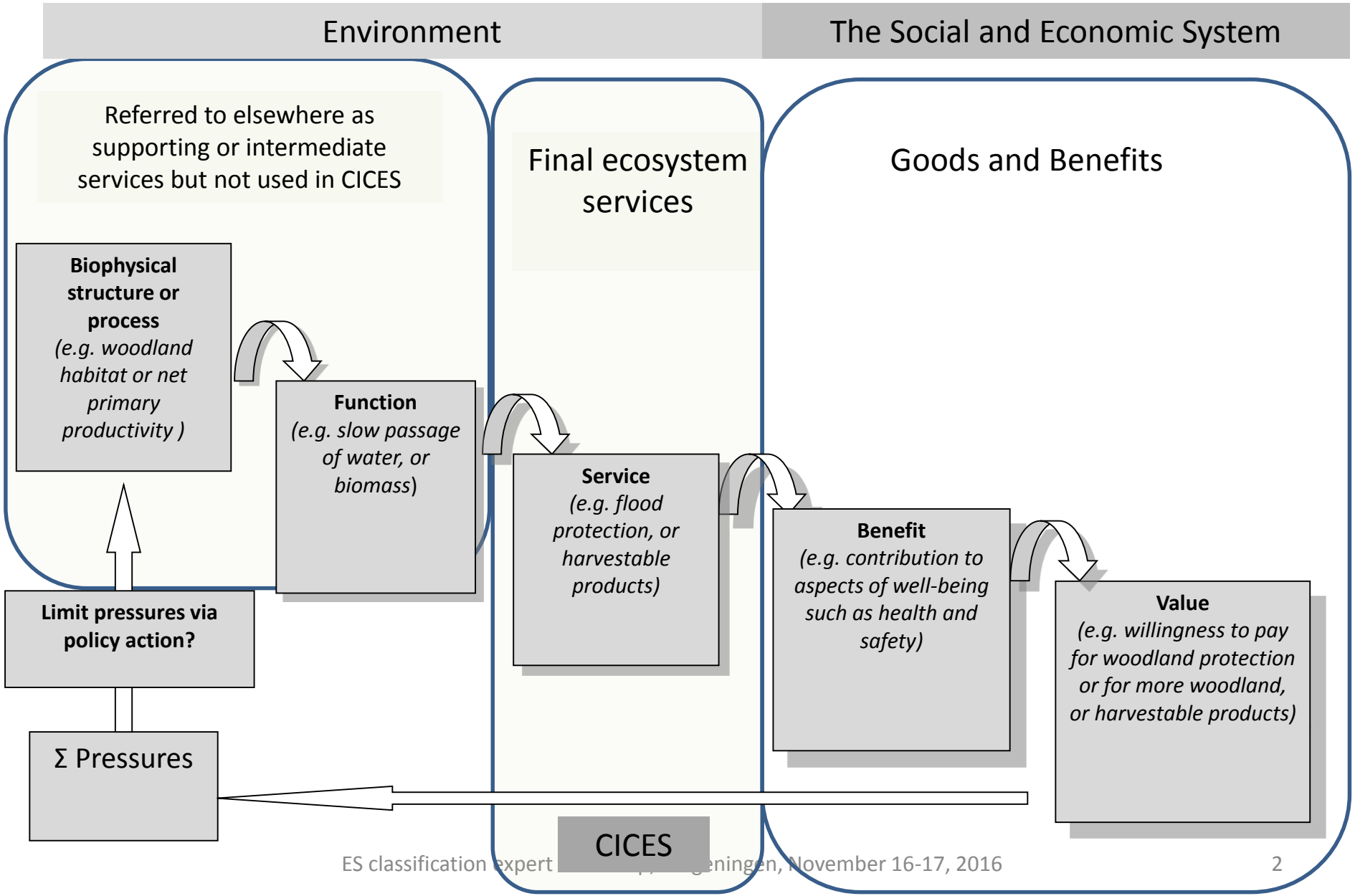
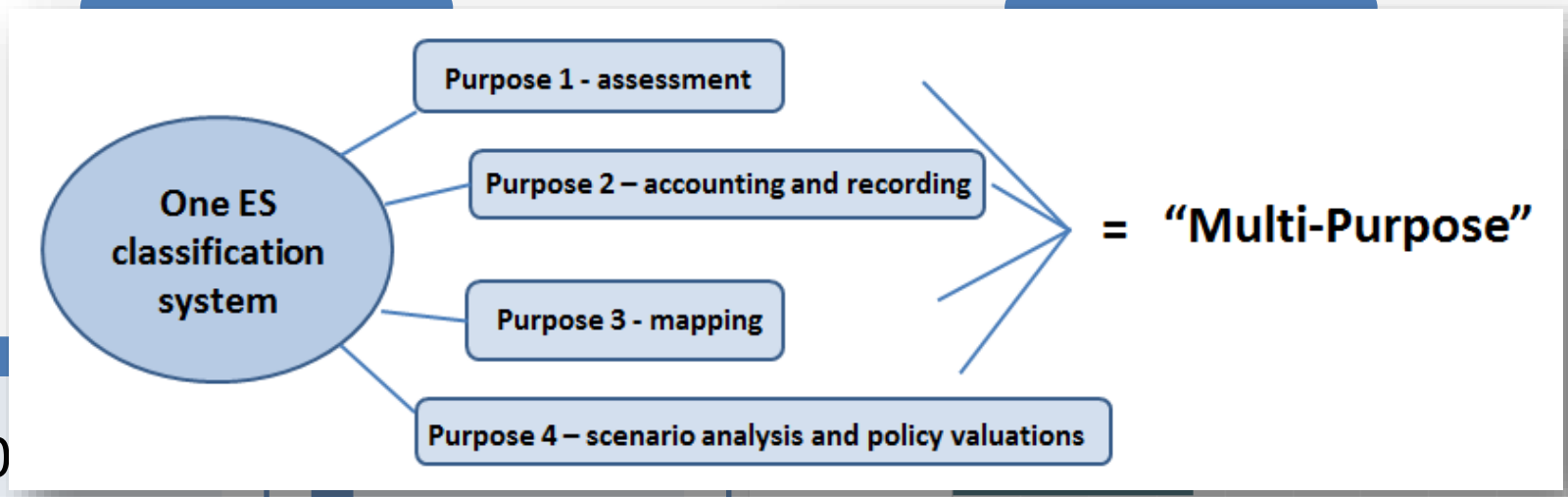
ES classification expert workshop, Wageningen, November 16-17, 2016

Conceptual Framework

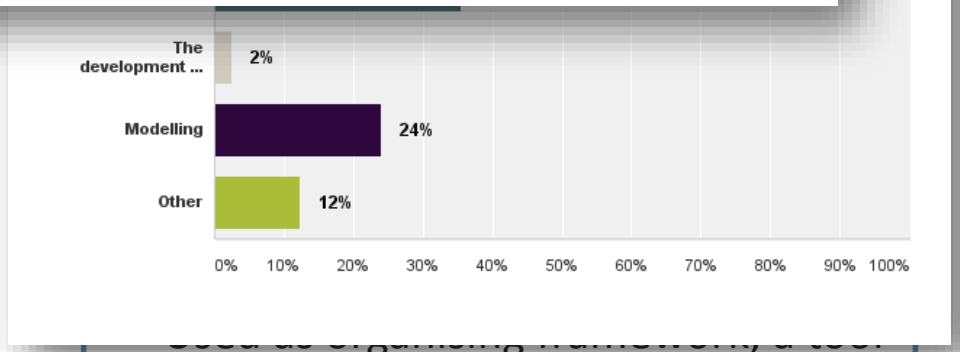


Background~ ‘Experimental evidence’



20 Survey

review



- Established user community using CICES for a range of purposes
- Suggests need for guidelines on application of CICES
- Suggests that it would be helpful to link to benefits/ beneficiaries

for re-conceptualisation, as an analytical tool and an operational framework

Developing CICES (V5.0) for accounting purposes

- Retain hierarchical structure that seeks to be comprehensive in terms of ecosystem services.
- Focus on the outputs of living systems (but do not exclude the possibility of including abiotic outputs).
- Since ecosystem services are at the interface between nature and society, definitions depend on understanding which **ecological properties and behaviours** are **useful** to people

Developing CICES (V5.0)

Section	Division	Group	Class	Simple descriptor	Ecological clause	Use clause	Example Service	Example Benefit
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*

Example definition structure proposed in V5.0

Helps bridge to FEGS/NESCS

V5.0 Changes

Section	Division	Group	Class
Provisioning	Biomass from ecosystems	Nutrition	Cultivated plants, algae, and their outputs
			Reared animals and their outputs
			plants
			W im
			Plan
			Anima
		Materials	Fibres a processi
			Fibres an
			Genetic n
			Genetic n
		Energy	Plant-bas
			Animal-ba
			Mechanic
	Water from ecosystems	Nutrition	Surface wa
			Ground water f
		Materials	Surface water for non-drinking purposes
			Ground water for non-drinking purposes
		Energy	Terrestrial water bodies
			Marine and ocastal water bodies
	Other types of provisioning service		

Terminology for Division and Group transposed to allow aggregation by use categories at Group level

Energy classes under water added

Section	Division	Group	Class
Regulation & Maintenance	Mediation of biochemical or physical impacts and nuisances	Mediation of waste, toxic substances	Bio-remediation by micro-organisms, algae, plants, and
			Filtration/sequestration/storage/accumulation by micro plants, and animals
			Dilution b
		Mediation of n	Smel
	Regulation of physical, chemical, biological conditions	Regulation of flows	
			But
			Hyd
			Flo
			Wi
		Lifecycle maintenance, habitat and gene pool protection	Pol
			Ma
		Pest and disease control	Pest
			Disease c
		Soil formation and composition	Weathering processes
			Decomposition and fixing processes
		Water conditions	Chemical condition of freshwaters
			Chemical condition of salt waters
		Atmospheric composition and conditions	Regulation of chemical composition of atmosphere
			Regulation of temperature and humidity, incl. ventilation &transpiration
	Other		

V5.0 Changes

Structure simplified at Division level:

- Separation of biota and ecosystems in V4.3has been dropped
- Flows are part of regulation of physical, chemical and biological conditions

V5.0 Changes

Section	Division	Group	Class
Cultural	Direct, in-situ and outdoor interactions that depend on presence in the environmental setting	Physical and e…tial inter…th natural e…	Characteristics of settings that provide opportunities for health, recupe… inte…
			Ch…
		Intellectual and representative interactions with natural environment	
			tra…
			Se… he…
			Se…
	Indirect, remote, often indoor interactions that do not require presence in the environmental setting	Spiritual, symbolic and other interactions with natural environment	Se… re…
			Se…
			Sett… some …
		Other	Existence
			Bequest
	Other types of cultural setting and interaction		

Structure simplified at Division level:

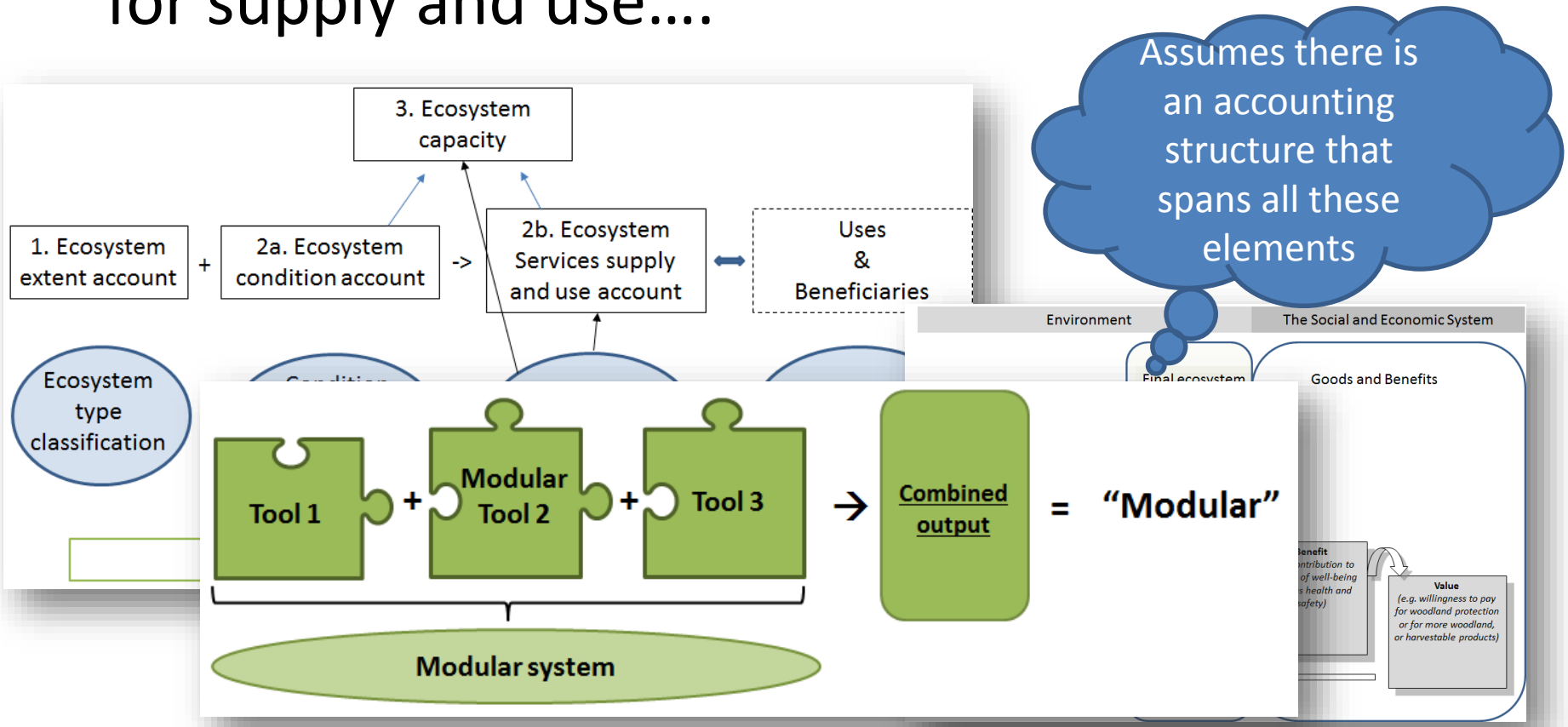
- Distinguishes direct (in-situ interactions) from remote.
- Terminology emphasises the opportunities that ecosystems offer to derive cultural goods and benefits

Hierarchical structure

- Designed to allow aggregation to:
  - Support generalisation by merging classes (e.g. single reporting category for *'Physical and experiential interactions with natural environment'*
  - Cope with partial information (e.g. where no information is available to split use of crops for food, materials or energy)
- But it is important to make the distinction between a classification (definition) and a reporting structure

The place of CICES in ecosystem accounts

- CICES intended to bridge between accounts for supply and use….



The place of CICES in ecosystem accounts

- CICES intended to bridge between accounts for supply and use….

Contents lists available at ScienceDirect

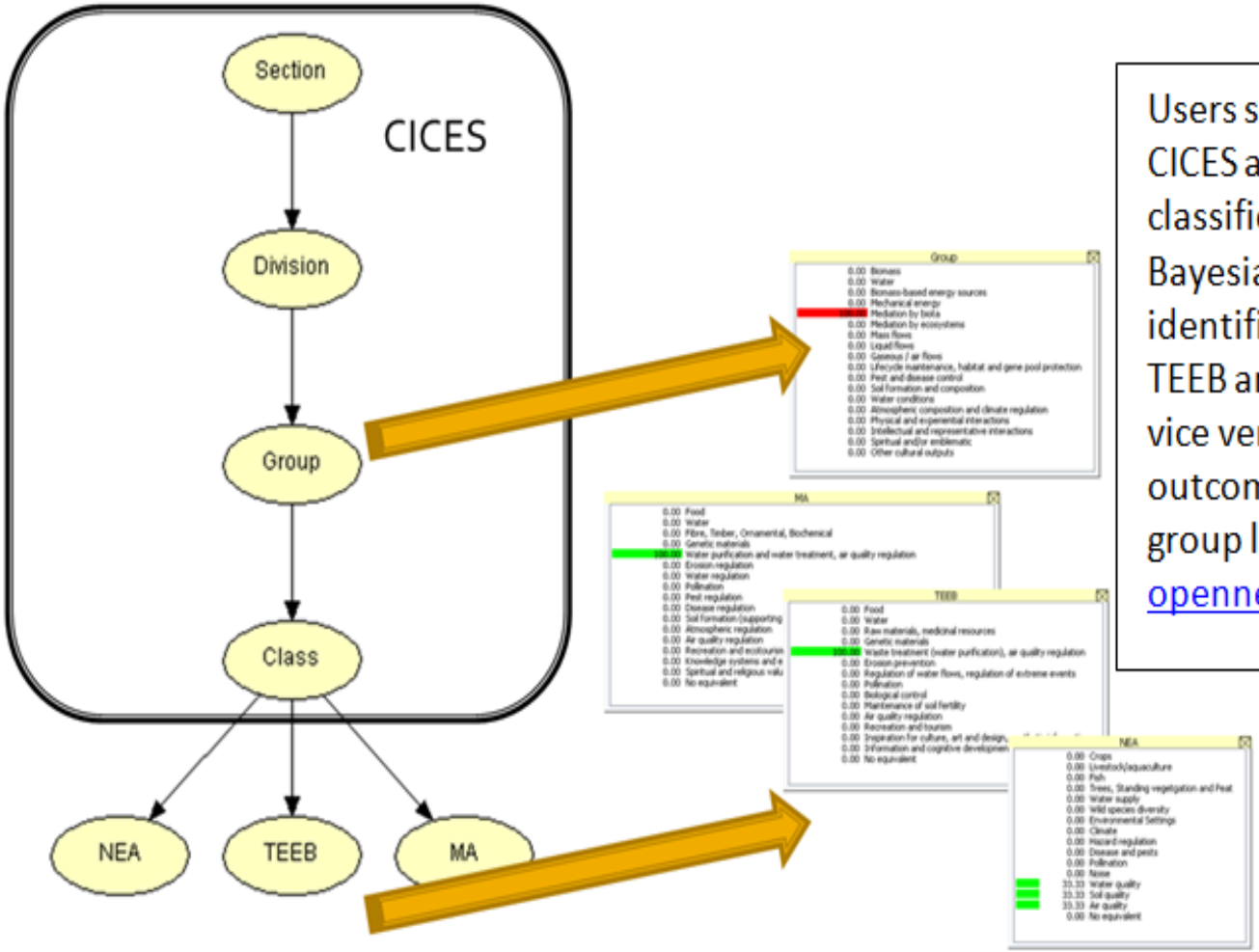
Table 1
Overview of selected ES, ES indicators and characteristics (section, division, class after CICES 4.3). For indicator choice see Section 2.5.

Section	Division	Class	ES specification	Capacity indicator	Flow indicator

Table 2
Absolute capacity–flow-balance per vegetation type for four selected ES.

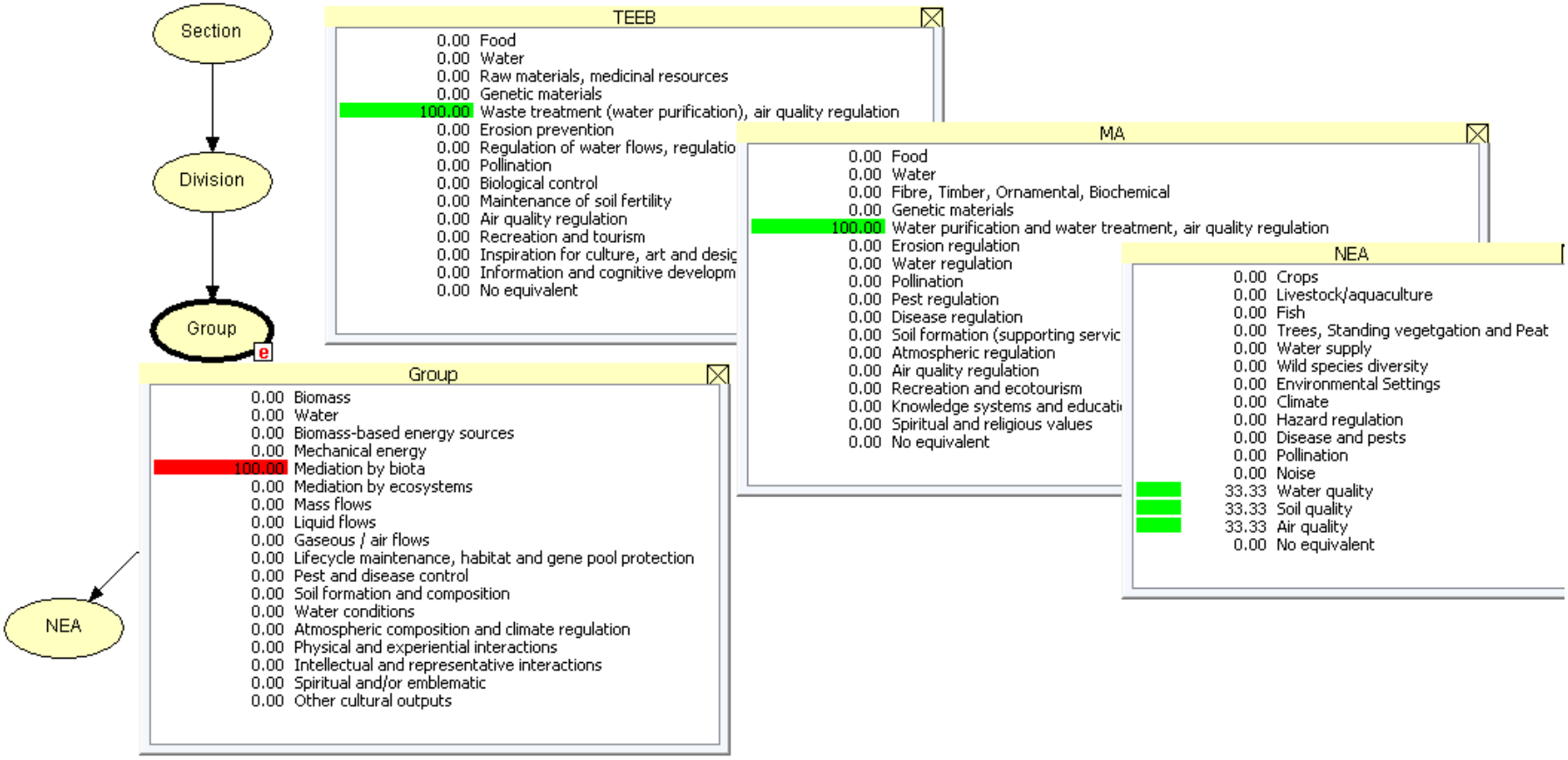
Vegetation type (ecosystem functional unit)	Timber harvest		Moose hunting		Sheep grazing		Snow slide prevention
	Area (ha)	SUM ($m^3\ yr^{-1}$)	Area (ha)	SUM (# animals yr^{-1})	Area (ha)	SUM (# animals yr^{-1})	Area (ha)
Coniferous forest (dense)	55,698	541,671	0	−70	0	22,373	3101
Coniferous and mixed forest (open)	40,427	277,715	0	−41	0	13,961	1403
Lichen rich pine forest	16,732	59,428	0	−11	0	1893	590
Low herb broadleaved forest	17,399	121,435	0	−17	0	10,116	491
Tall-fern and tall-herb broadleaved forest	6287	74,220	0	−9	0	3784	255
Bilberry birch forest	55,483	281,674	0	−42	0	23,211	1261
Cowberry birch forest	10,808	34,537	0	−6	0	3094	308

Using CICES to make the links



Users select a service category in CICES at any of the levels in the classification and the web-based Bayesian Belief Network tool identifies the equivalents in the MA, TEEB and the UK NEA systems, and vice versa. The example illustrates the outcome for one service type at the group level in CICES. See: openness.hugin.com/example/cices

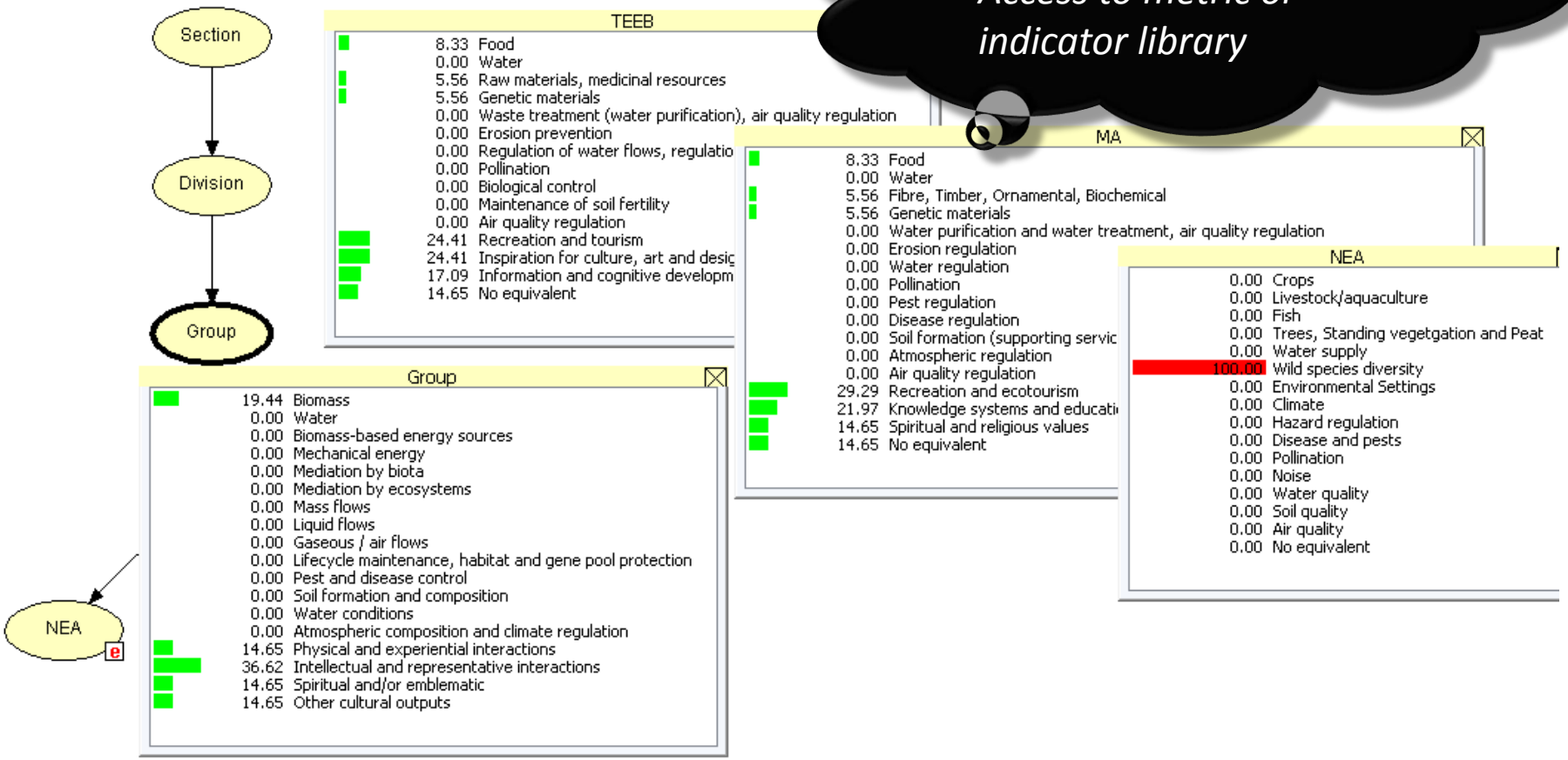
Using CICES to making the links…



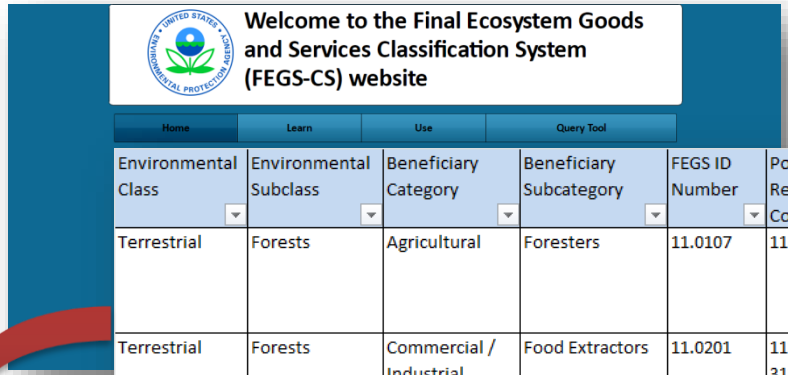
Using CICES to making the links…

Why bother?

- *Reference or standard*
- *Access to metric or indicator library*



Using CICES alongside other systems



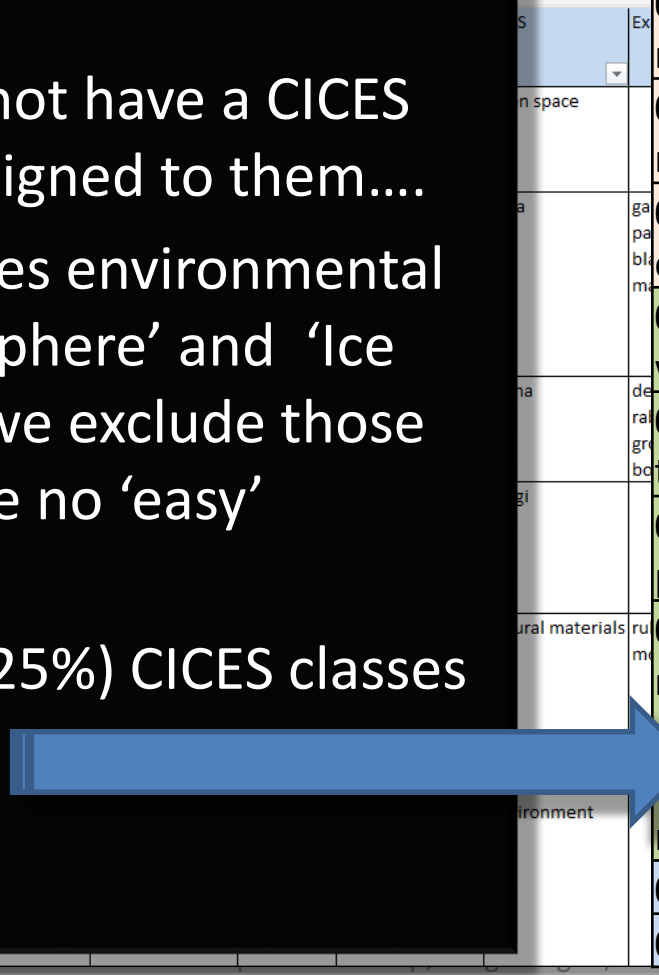
Environmental Class	Environmental Subclass	Beneficiary Category	Beneficiary Subcategory	FEGS ID Number	Potentially Relevant NAICS Code	FEGS	Example	Importance	CICES Class
Terrestrial	Forests	Agricultural	Foresters	11.0107	113	open space		suitable conditions (i.e., land) in which trees grow and to cultivate trees	No equivalent (Land Accounts?)
Terrestrial	Forests	Commercial / Industrial	Food Extractors	11.0201	113, 114, 311, 312, 454	flora	garlic mustard, pawpaw, blackberries, maple sap	edible organisms (i.e., flowers, plants, etc.) or associated products (i.e., fruit, greens, tubers, berries, sap) for commercial use or sale	Wild plants and their outputs
Terrestrial	Forests	Commercial / Industrial	Food Extractors	21.0201	113, 114, 311, 312, 454	fauna	deer, bear, rabbit, elk, grouse, turkey, boar	edible organisms (i.e., birds, mammals, reptiles, etc.) for commercial use or sale	Wild animals and their outputs
Terrestrial	Forests	Commercial / Industrial	Food Extractors	21.0201	113, 114, 311, 312, 454	fungi		edible organisms (i.e., mushrooms, shelf fungus, puffballs, etc.) for commercial use or sale	Wild plants and their outputs
					3, 339, 424, 3, 454	natural materials	rubber, lichens, mosses	non-cultivated ornamental products or by-products (from cultivation) used ornamentally for commercial use or sale	Wild plants and their outputs
					7, 712, 713, 1, 722	presence of the environment		opportunity for placement of infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property	Fire Protection Flood Protection Wind Protection Pest control Disease control

Cross tabulations are possible, recognizing that in some cases there is no direct equivalences or many to one relationships…. **Translator could be expanded**

Using CICES alongside other systems

There are 111 descriptors for 'Importance' in FEGS:

- 21 (~19%) do not have a CICES class easily assigned to them….
- But this includes environmental classes 'Atmosphere' and 'Ice and Snow'; if we exclude those 11 (~10%) have no 'easy' assignment
- There are 12 (25%) CICES classes not assigned



01.01.01.01 Cultivated crops
01.01.01.02 Reared animals and their outputs
01.03.01.01 Plant-based energy resources
01.03.01.02 Animal-based energy resources
01.03.02.01 Animal-based mechanical energy
02.02.02.01 Hydrological cycle and water flow maintenance
02.02.03.02 Ventilation and transpiration
02.03.01.02 Maintaining nursery populations and habitats
02.03.05.01 Global climate regulation by reduction of greenhouse gas concentrations
02.03.05.02 Micro and regional climate regulation
03.01.02.03 Heritage, cultural
03.01.02.04 Entertainment

Using CICES alongside other systems

There are 111 descriptors for 'Importance in FEGS':

- 21 (~19%) do not have a CICES class easily assigned to them….
- But this includes environmental classes 'Atmosphere' and 'Ice and Snow'; if we exclude those only 11(~10%) have no easy assignment
- There are 12 (25%) CICES classes not assigned

medium for and conditions that support the transportation of goods
medium for and conditions that support the transportation of people
opportunity for placement of infrastructure
opportunity for placement of infrastructure and reduced/increased risk of subsidence and sinkholes on the property
opportunity for the transportation of goods
opportunity for the transportation of people
opportunity to install power generation structures
opportunity to install power generation structures, such as dams and water turbines
suitable conditions (i.e., land) in which to grow annual or perennial crops (NOT crops themselves)
suitable conditions (i.e., land) in which trees grow and to cultivate trees
suitable conditions (i.e., land) to graze livestock
suitable conditions (i.e., land) to hold livestock and site the CAFO operation

Using CICES alongside other systems

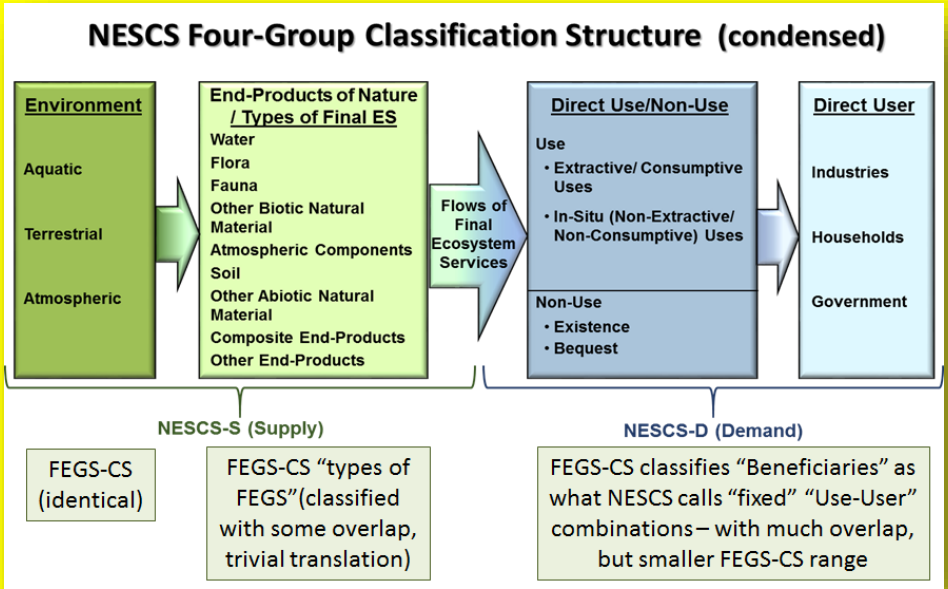
Welcome to the Final Ecosystem Goods and Services Classification System (FEGS-CS) website

Home | Learn | Use | Query Tool

Environmental Class	Environmental Subclass	Beneficiary Category	Beneficiary Subcategory	FEGS ID Number	Potentially	FEGS	Example	Importance	CICES Class
Terrestrial	Forests	Agricultural	Foresters	11.0107	1				
Terrestrial	Forests	Commercial / Industrial	Food Extractors	11.0201	1 3				
Terrestrial	Forests	Commercial / Industrial	Food Extractors	21.0201	1 3				
Terrestrial	Forests	Commercial / Industrial	Food Extractors	21.0201	1 3				
								infrastructure and reduced/increased risk of erosion, fire, and pest infestation on the property	Wind Protection Pest control Disease control

NESCS??

NESCS Four-Group Classification Structure (condensed)



Cross tabulations are possible, recognizing that in some cases there is no direct equivalences ,or many to one or partial relationships….
Translator could be expanded

Conclusions: CICES Performance…

Enable focus on final ecosystem services but include potentially final ES	☺
Devise structure and guidance to users in a way to avoid double counting, i.e. categories should be mutually exclusive	☺!
Provide clear and precise definitions of categories and individual ES ***(Access to library of metric/indicators used to characterise ES)***	☺?
Ensure that the classification covers all possible units of the items classified	☺?
Facilitate aggregation to higher-level categories in the set-up of the classification ***(But distinguish reporting and classification functions)***	☺
Ensure full compatibility with, and links to, related statistical classifications (e.g. ISIC) ***(Translator tools can be built using CICES to link to other systems)***	☺?
Ensure time-series comparability between different versions over time ***(There is backward compatibility from V5.0 to V4.3)***	☺
Consider ease of use and ease of maintenance in the design of the classification ***(CICES updated on the basis of extensive user experience…)***	☺?

Conclusions: CICES Performance…

Enable focus on final ecosystem services but include potentially final ES	☺
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Provi ***library***	
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Proposal

An aspect of the 'comparative work' that might arise from this workshop should be on the analysis of equivalences, and the testing of translator (cross-reference) tools based on CICES V5.0…