

Note on CICES

Prepared by UNSD in consultation with the Editor and Editorial Board of the SEEA
Experimental Ecosystem Accounts
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The aim of this note is to review the proposal for a Common International Classification of Ecosystem Services V4 published in the consultation briefing note (July 2012) by the European Environmental Agency (EEA).

Listed below are UNSD comments on the discussion questions listed in the consultation note, and the proposed modification on CICES V4.

The table that follows on page 9 is a draft proposal for a modified version of CICES. The proposal was discussed with the Editor and the Editorial Board of the SEEA Experimental Ecosystem Accounts. It is acknowledged that more time is needed for further consultation within the statistical community and with ecosystem experts.

A. General Issues

1. Timing

More time is needed to reach an agreement on certain technical issue in CICES in the context of the SEEA Experimental Ecosystem Accounts. In particular, the following issues are still being discussed:

- Scope of CICES and possibly the renaming of the classification to reflect the broader scope of the classification
- Boundary of the cultivated/uncultivated biological resources – should we follow the SNA production boundary and consider the ecosystem services only those services before crops are generated (e.g. soil water and nutrient uptake, pollination, etc.) or deviate from the SNA production boundary and include the crops.
- Inclusion/exclusion of abiotic renewable and non-renewable resources as other environmental services
- Inclusion of space as other environmental services.

2. Objective of CICES

The objective of CICES – which was also agreed by other members of the CICES subgroup – is that CICES is being developed for the purpose of the SEEA Experimental Ecosystem Accounts, which is a multi-purpose statistical system to be used by various communities for ecosystem accounting, mapping, assessments and valuation. As such, we seek agreement from the policy, scientific, ecological economic and official statistical communities.

3. Ecosystem services for biological resources

There is a strong support from the statistical community to use the chained approach as being the conceptual treatment of cultivated biological resources.

Starting from this consideration, it follows that in the case of cultivated biological resources the benefits are the crops (e.g. the wheat, corn or rice produced by agricultural activity) and the ecosystem services are the nature inputs that made it possible for the wheat, corn or rice to grow (e.g. soil nutrients, water uptake, pollination etc.). Cultivated biological resources come about as a result of an economic production process that relies on natural processes. In the SEEA Central Framework, it is assumed that the economic production process is dominant with respect to the natural process. We would suggest keeping the same boundary for the cultivated biological resources, by which the final ecosystem services in relation to cultivated biological resources reflect the contribution of the ecosystem earlier in the chain. This approach is called “chained” approach in chapter 3 of the SEEA Experimental Ecosystem Accounts. It should also be noted that growing of cultivated biological resources require a combination of provisioning and regulatory services. .

For uncultivated/natural biological resources, the ecosystem service would be measured as the harvested product (e.g. berries, mushrooms in the forest).

The statistical community has a strong desire to meet the policy requirements for consistent and coherent data across the international statistical standards and recommended frameworks. Therefore, harmonization is a central element in its considerations. This harmonization principle implies the following:

- Since CICES is being developed/refined for the purpose of the SEEA Experimental Ecosystem Accounts, the boundary of what constitute production and what does not is dictated by the System of National Accounts (SNA).
- Making the distinction between cultivated and non-cultivated biological resources using the SNA production boundary will be fully consistent with the SEEA Central Framework. A similar decision – to stick with the SNA production boundary – was also taken in the context of the Material Flow Accounting (MFA) in which we agreed to disagree with the practice of Economy-wide Material Flow Accounts (EWMFA) which considers also cultivated crops as flows from the environment.
- The application of the SNA production boundary is a pragmatic solution with a strong conceptual base from the field of official statistics and the system of national accounts.

Drawing the boundary of CICES using the chained approach and the SNA production boundary, the following products are considered as output of economic production activities but not as ecosystem services. They are classified in the Central Product Classification (CPC). Hence they will not be included in CICES.

- Cultivated crops
- Livestock and dairy product
- Aquaculture products
- Plantation timber that requires continuous human management

- Grazed animal for farming, industrial use, transportation, human services, draft services, zoo, pet, scientific and recreational purpose (e.g. sheep raised for wool, donkey raised for transportation, oxen raised for farming, horse raised for horse-riding and draft services, etc.)

The following are considered as ecosystem services

- Harvested natural plants (e.g. natural berries, natural fungi, etc.)
- Harvested natural timber
- Caught natural animal/fish for food [e.g. salmon, trout, game (wild meats served at the table)]
- Caught natural animal/fish for agriculture, transportation, industrial use, human services, draft services, zoo, pet, scientific and recreational purpose (e.g. fur from wild beaver and fox, wild life research, wild animal safari, exotic animals and pets, wild animals tamed and trained to harness, etc.)

4. Classification of the growing of cultivated biological resources

Drawing the boundary of CICES using the chained approach and the SNA production boundary implies that cultivated biological resources are considered as output of economic production activities but not as ecosystem services. The ecosystem services for the growing of cultivated biological resources will be nutrients uptake for the growing of crops, fodder for livestock and feed for aquaculture products.

We are unsure where the ecosystem services for the growing of cultivated biological resources (e.g. nutrients uptake for the growing of crops) should be classified, given that the growing of cultivated biological resources requires a combination of provisioning and regulatory services. Nutrients uptake itself is a process and is a “benefit” concept. Grouping them under the same division with harvested natural product raises consistency issues.

More time is needed to reach an agreement on this technical issue

5. Should abiotic energy and material be excluded from the classification or included

We agree that abiotic energy and materials do not come about as a result of the interaction between living and non-living organism in a human life span. However, we believe that it is important to include abiotic energy and material in CICES for several reasons

- CICES should be a comprehensive classification of services provided by the ecosystems (including space, as proposed in the current draft of Chapter 3) and as such it should be able to support integrated land management decisions. It is important to have common classifications of flows that allows to evaluate trade offs – should the government extract coal or, instead, plant trees on a piece of land where there are coal deposits?

- CICES will be aligned and incorporate the list of natural inputs in the SEEA Central Framework and the list of ecosystem services.
- Previous consultations on CICES have shown that a significantly majority of respondents indicated their preference in including abiotic energy and materials in CICES to have a comprehensive classification for evaluation of trade-offs.

There is support from statistical community for recognizing these abiotic flows, not calling them as ecosystem services but as other environmental services. In this way, the logic of the classification would not be disrupted, the first part cover exclusively biotic flows and the second part –“Other environmental services” would have the purpose of completing the picture thus providing a comprehensive classification.

The section “Other environmental services” will include the following division.

- Space
- Abiotic nutrients and materials
- Abiotic renewable energy resources (e.g. wind, solar energy, geothermic energy)
- Abiotic non-renewable energy resources (e.g. oil, gas, coal, fossil water, ores, chemicals, salt, sand/rocks, etc)

6. Naming of the classification.

To balance the need to maintain a tight definition of ecosystem service and the need of the inclusion of abiotic flows for comprehensive managerial and policy-making purpose, there is a proposal from the statistical community to change the title of the classification to reflect the overarching structure while maintaining a tight definition of ecosystem services. The idea of renaming the classification is also suggested by some comments from the EEA consultation website.

Proposed changes

- To change the name of the classification to the following
 - i. Common International Classification of *Environmental* Services (CICES).

B. Detailed proposal for each division.

7. Water has given his own division. ...Do you support this revision or have any suggestion for further improvement

UNSD supports giving water its own division in CICES. Please see the following for the propose modifications.

Proposed changes

- Rename the division from “Water supply” to “Water”, such that it is consistent with other division names (i.e. nutrition, not nutrition supply).
- Combine the class “Drinking water” with “Domestic water use” since it is difficult to separate the two.

- Creation of three new classes (based on the list of water use from SEEA-Water)
 - i. “Water for fish farming”
 - ii. “Hydroelectric power generation”
 - iii. “Water for navigation”
- Create new group “Water for other uses” as a residual category to capture water for other use that is not elsewhere classified.
- Remove the term ‘consumptive’ and “non-consumptive” in the class title, noting that these terms are not clear because in many publications consumptive use refers to actual water consumption but not to the use of water that generates water consumption¹.

8. Nutrition

Proposed changes

- Remove “crops”, “livestock and dairy products” and “aquaculture products” (e.g. cereals, vines) since they are cultivated resources.
- Remove the term “wild” or “wild population” from the class title under this division, since biological resources included already refer to uncultivated resources only. In the detailed annotated descriptions of the categories, the wording of wild may be introduced as a short hand of uncultivated/natural, which is a more appropriate term in the national account context.
- Add the description “freshwater” and “saltwater” for fish in the title of the appropriate class.
- Separate Natural plants and animals into 2 distinct classes – “Natural plants” and “Natural animals”

9. Materials

The division “Material” is restricted to the manufacture of goods (Box 1 in the CICES V4 Consultation Briefing Note by EEA). The scope need to broaden to include biotic materials for agricultural and industrial use (e.g. genetic resources are not for the manufacture of goods).

Proposed changes

- Broaden the scope of the division “Material” to include materials from ecosystem for agriculture and industrial use. Now it is restricted to the manufacture of goods (Box 1 in the CICES V4 Consultation Briefing Note by EEA). However, “Genetic resources” (e.g. for crop improving, breeding programs) are for agricultural use.

¹ In line with the glossary of environmental statistics (UN F67, 1997), we think the term ‘instream use’ and ‘offstream uses’ are clear. Instream use refer to use of water taking place within a stream channel, for example, in hydroelectric power generation, navigation, fish farming, operation of locks and recreation. Offstream use of water is water abstracted or diverted from a groundwater of surface – water source for the public water supply, industry, irrigation, livestock, thermoelectric power generation or other uses.

- Add a note under the “Genetic resources” to point out that genetic resources for scientific purpose are classified under “Cultural, Education and Scientific” section
- Create of new class “Other biotic materials for agriculture and industrial use as a residual category to capture biotic materials that do not fit into other categories.

10. Creation of the division “Other provisioning services”

The provisioning services under CICES V4 have not been developed to be exhaustive and the listing of classes is not complete. For example, it is unable to fit certain ecosystem service, such as natural animals used for draft services, etc, under “Nutrition”, “Water”, “Materials” or “energy”. They are non-material services but they are not “cultural”. The creation of the division “Other provisioning services” as a residual category can solve the issue by capturing such ecosystem services that do not fit into other category.

Proposed changes

- Create new division “Other provisioning services” to capture the provisioning service that cannot classify under “Nutrition”, “Water”, “Materials” and “Energy”.
- Three groups are created under “Other provisioning services”
 - i. Terrestrial plants and animals for other provisioning-based services
 - ii. Other provisioning services, n.e.c.

11. Cultural, Educational and Scientific

Proposed changes

- Rename the section from “Cultural” to “Cultural, Educational and Scientific”, since educational and scientific services are not considered as cultural. We are also open to other suggestion of name that can fully encompass all non-material ecosystem outputs that have symbolic, cultural or intellectual significance.
- Rearrange the order such that this section follows the section “Provisioning”, since it is logical for this section to follow the “provisioning” for the following reasons
 - i. “Cultural, educational and scientific’ can be seen as a kind of non-material provisioning services that have symbolic, cultural or intellectual significance.
 - ii. In contrast with the regulation and maintenance services, the provisioning and cultural, education and scientific services is directly consumed by human.
 - iii. Hence we think it is clear if we group the “provisioning” and “cultural” together and reorder the section as follows:
 1. Provisioning - Material ecosystem services directly consumed by human

2. Cultural, educational and scientific - Non-material ecosystem services directly consumed by human
 3. Regulating – Ecosystem services that impact human in an indirect way and that define the human environment
- Remove certain example/indicative benefits such as bathing, recreational leisure boating, surfing, abseiling since they are abiotic flows.

12. Regulation and Maintenance

Regulation and maintenance service is an area which needs a more detailed elaboration. We found that the definitions of “bio-physical environment”, “physico-chemical environment” and “biotic environment” under this section are not clear and hence it is difficult to draw a clear dividing line among the 3 terms. For example, water oxygenation requires the interaction of living organism. However, it is classified under physico-chemical but not the biophysical environment. We hope the scientist community can provide a more clear definition in order to define the scope of each division under this section.

13. Remediation regulation of biophysical environment

From our understanding, the focus of this division is to cover the remediation of waste. Hence, the de-pollution (air, water, solid waste) process will be separated from physical cycles to avoid double counting.

Proposed changes

- This Division should be clearly distinguished by biogeochemical processes for remediation purpose, which has been introduced in the description of the Division “Remediation regulation for the bio-physical environment”
- Rename the group “Dilution and sequestration” to “Dilution, filtration and sequestration of pollutants” such that the title include all processes included in the group. Instead of the pollutants the words “residual” can be introduced following the SEEA Central Framework.²
- Rename the class “Sequestration and absorption” to “Sequestration and absorption of pollutants” to give a more specific scope.(i.e such that carbon and nutrient sequestration will not be included here but under atmospheric, water and soil cycle regulation)

14. Flow regulation

²In the SEEA central framework

- Natural resource residuals are natural resource inputs that do not subsequently incorporate into production processes and instead immediately return to the environment.
- Residual is a concept used in SEEA central framework, which covers the flows of solid, liquid, gaseous materials and energy discarded, arising naturally or as a result of human action, to the environment. Residuals are defined as the flows of solid, liquid and gaseous materials, and energy that are discarded, discharged or emitted by establishments through process of production, consumption and accumulation

Proposed changes

- Delete the term “microclimate” from the title of classes under “Air flow regulation”, because people will confuse “microclimate” with “climate” where the latter is classified elsewhere.

15. Regulation of physico-chemical environment

The definition of “quality” is unclear. It can refer to the de-pollution process but it can also refer the nutrient transformation process or organism activity that increases the level of oxygen in water or soil fertility. In environmental statistics quality is linked to environmental health.

We therefore propose a clearer separation of de-pollution and physical cycles under regulation services. The scope of this section will be limited to climate regulation and physical cycles. De-pollution process will be included under another division of “Remediation regulation of biophysical chemical”.

We suggest refraining from using word “quality” in this division, since regulatory services in other division (such as the waste assimilation process in the remediation regulation of biophysical environment) also contribute to the increase of “quality” of ecosystem flow.

Proposed changes

- Delete the term “quality” from the title of group under this division, because the definition of quality is unclear.
- Introduce the word “cycle” into the descriptions of atmosphere, water and soil to make them distinct from remediation and flow regulation, such that the class in this division can specific refer to the physical cycle process.
- Rename the class “Water purification and oxygenation” to “Water circulation oxygenation”. Water purification process is a de-pollution process and there should be classified in another class “Dilution, decomposition, remineralisation and recycling”
- Delete “air quality” from the example under the group “Atmospheric regulation”. The process of regulating “air quality” is classified under remediation (i.e. Filtration)
- We are unsure whether “hydrological cycle” is an example of “Atmospheric cycle regulation” or “Water cycle regulation”.
- In the example column, add “nutrient cycle for soil” for the class “Maintenance of soil fertility”

16. Other environmental services

The section “Other environmental services” will include the following division.

- Space
- Abiotic nutrients and materials
- Abiotic renewable energy resources (e.g. wind, solar energy, geothermic energy)

- Abiotic non-renewable energy resources (e.g. oil, gas, coal, fossil water, ores, chemicals, salt, sand/rocks, etc)
- Other environmental flows as a residual category

CICES for ecosystem service mapping and assessment

CICES for ecosystem accounting

Section	Division	Group	Class	Class types
Provisioning	Nutrition	Natural plants and animals for food	<i>Crops- Natural animals</i>	<i>e.g. by type of crop (cereals etc.) e.g. by animal type</i>
			<i>Livestock and dairy products</i>	<i>e.g. by animal type</i>
			<i>Wild Natural plants and animals and their products</i>	<i>e.g. by type</i>
		Freshwater plants and animals for food	<i>Freshwater fish (wild populations)</i>	<i>e.g. by fishery</i>
			<i>Aquaculture products</i>	<i>e.g. by type</i>
			<i>Freshwater plants</i>	<i>e.g. by type or source (river, lake etc.)</i>
		Marine algae and animals for food	<i>Saltwater fish (wild populations including shellfish)</i>	<i>e.g. by fishery</i>
			<i>aquaculture products</i>	
	Water supply	Water for human consumption	<i>Drinking water; Domestic water use</i>	<i>e.g. abstracted surface water, abstracted ground water, collection of precipitation, abstraction from the sea</i>
			<i>Domestic water use</i>	<i>e.g. abstracted surface water, abstracted ground water</i>

	Water for agricultural use	Irrigation water <i>(consumptive)</i>	e.g. abstracted surface water, abstracted ground water, soil water, collection of precipitation
		Water for livestock <i>(consumptive)</i>	e.g. surface water, abstracted ground water, collection of precipitation, abstraction from the sea
		Water for fish farming	e.g. Water in a stream channel
	Water for industrial and energy uses	Industrial water <i>(consumptive)</i>	e.g. abstracted surface water, abstracted ground water, collection of precipitation, abstraction from the sea
		Hydroelectric power generation	e.g. Abstracted water in a stream channel
		Cooling water (non <i>consumptive)</i>	e.g. abstracted surface water, abstracted ground water, collection of precipitation, abstraction from the sea
	Water for other uses	Water for navigation and <i>operation of locks</i>	e.g. Abstracted water in a stream channel
		Other water-based provisioning services, n.e.c.	

	Materials	Biotic materials	<i>Non-food vegetal fibres</i>	<i>e.g. by type</i>
			<i>Non-food animal fibres</i>	<i>e.g. by type</i>
			<i>Ornamental resources</i>	<i>e.g. by type</i>
			<i>Genetic resources</i>	<i>e.g. by type</i>
			<i>Medicinal and cosmetic resources</i>	<i>e.g. by type</i>
	Energy	Biomass based energy	<i>Vegetal based resources</i>	<i>e.g. by type</i>
			<i>Animal based resources</i>	<i>e.g. by type</i>
	Other provisioning services	Natural animals for other provisioning services	<i>Natural animals for other provisioning services</i>	<i>e.g. by type</i>
			Other provisioning services, n.e.c.	
	Cultural, Educational and Scientific	Symbolic	Aesthetic, Heritage	<i>Landscape character</i>
<i>Cultural landscapes</i>				<i>e.g. by resource</i>
Spiritual			<i>Wilderness, naturalness</i>	<i>e.g. by resource</i>
			<i>Sacred places or species</i>	<i>e.g. by resource</i>
Intellectual and Experiential		Recreation and community activities	<i>Charismatic or iconic wildlife or habitats</i>	<i>e.g. by resource</i>

			<i>Prey for hunting, fishing or collecting</i>	<i>e.g. by resource</i>
			<i>Landscape character for recreational opportunities</i>	<i>e.g. by resource</i>
		Information & knowledge	<i>Scientific</i>	<i>e.g. by resource</i>
			<i>Educational</i>	<i>e.g. by resource</i>
Regulation and Maintenance	Remediation regulation of biophysical environment	Bioremediation	<i>Remediation by plants or algae</i>	<i>e.g. by method</i>
			<i>Remediation by micro-organisms</i>	<i>e.g. by method</i>
			<i>Remediation by animals</i>	<i>e.g. by method</i>
		Dilution, <i>filtration</i> and sequestration of pollutants	<i>Dilution, decomposition, remineralisation and recycling</i>	<i>e.g. by method</i>
			<i>Filtration</i>	<i>e.g. by method</i>
			<i>Sequestration and absorption of pollutants</i>	<i>e.g. by method</i>
	Flow regulation	Air flow regulation	<i>Rural microclimatic regulation</i>	<i>e.g. by process</i>
			<i>Urban microclimatic regulation</i>	<i>e.g. by process</i>

		Water flow regulation	Attenuation of runoff and discharge rates	e.g. by process
			Water storage for flow regulation	e.g. by process
			Coastal protection	e.g. by process
		Mass flow regulation	Erosion protection	e.g. by process
			Avalanche and gravity flow protection	e.g. by process
	Regulation of physico-chemical environment	Atmospheric cycle regulation	Global climate regulation (incl. C-sequestration)	e.g. by process
			Local & Regional climate regulation	e.g. by process
Water quality-cycle regulation		Water purification and ciculation and oxygenation	e.g. by process	

		Pedogenesis and soil quality cycle regulation	Maintenance of soil fertility	e.g. by process
			Maintenance of soil structure	e.g. by process
	Regulation of biotic environment	Lifecycle maintenance, habitat and gene pool protection	Pollination	e.g. by process
			Seed dispersal	e.g. by process
			Maintaining nursery populations	e.g. by process
		Pest and disease control (incl. invasive alien species)	Biological control mechanisms	e.g. by process
	Other Environmental Services	Abiotic nutrients and materials	Non-metallic mineral resources	e.g. Chemicals (subsoil), salt, sand, sedimentary rocks
Metallic mineral resources			e.g. ores	
Abiotic Energy		Abiotic non-renewable energy	Oil resources	
			Natural gas resources	
			Coal and peat resources	

			<i>Other abiotic non-renewable resources, n.e.c.</i>	
		Abiotic renewable energy	<i>Solar</i>	
			<i>Wind</i>	
			<i>Wave and tidal</i>	
			<i>Geothermal</i>	
	Space	Space	<i>Space for human habitat and infrastructure</i>	
	Other environmental flow, n.e.c.	Other environmental flows, n.e.c.		