Note on CICES

Prepared by UNSD for the 18th Meeting of London Group on Environmental Accounting
28 September, 2012

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). The paper is intended to be used for discussion in the meeting of 18th London Group on Environmental Accounting.

Listed below are 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. Descriptions of ecosystem services and corresponding benefits have been added to the classification table.

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. Conceptual questions on classification rules for discussion

There is a perception that CICES is a product classification but not functional classification[1]. The implication is that ecosystem services should be classified according to their essential characteristics but not to their functions (e.g. classify the essential characteristics of natural plants rather than their use). However, there are certain cases where ecosystem services are classified according to purpose/function but not to their essential characteristics in CICES. For example, at the group level of CICES V4, the water under provisioning services is divided according to function/purpose (such as water for human consumption and agriculture use) but not by the essential characteristics or the source.

This leads us into a question of what is the underlying rule to structure CICES. Should it be structured by essential characteristics, by origin or by function /use? Should CICES be structured from a supply-side or demand-side perspective?

A related question is whether CICES is a classification of ecosystem services or benefits. In the most recent round of consultation, EEA has proposed CICES to be a classification of *final* ecosystem services[2].

Therefore, we are proposing the following question for discussion.

Discussion questions

- To discuss whether ecosystem services should be classified based on their essential characteristics, functions, origin or other rules.
- To discuss whether CICES is a classification of ecosystem services, benefits, or *final* ecosystem services

4. 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 natural 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

[1] An example of product classification is the Central Product Classification (CPC). An example of functional classification is the Classification of the Functions of Government (COFOG)

[2] Haines-Yong, R. and Potschin, M. (2012) *"CICES Version 4: Response to Consultation"*. Centre for Environmental Management, University of Nottingham

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 natural crop to be harvested (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

- Natural plants to be harvested (e.g. natural berries, natural fungi, etc.)
- Natural timber to be harvested
- Natural animal/fish to be caught for food [e.g. salmon, trout, game (wild meats served at the table)]
- Natural animal/fish to be caught 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.)

5. Classification of the ecosystem services associated with 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 resources available for the uptake of crops, fodder for livestock and feed for aquaculture products.

6. 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 allow evaluation of 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)

7. 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.

8. Water

The question of whether CICES is a functional or product classification will have an implication to the structure under water division. Since CICES is being seen as a product classification but not a functional classification, we are proposing to use a use water source (supply side perspective) rather than the water use (demand side perspective) as criteria to separate class under water division.

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).
- Propose to classify water based on water sources (i.e. abstracted surface water, abstracted groundwater, abstracted soil water and abstracted water from other source).

9. Nutrition

Proposed changes

- Group the category "Nutrients" under the division "Materials", since the essential characteristic of nutrients and food are biotic materials and they are measured at the same scale with other biotic material. For example, natural algae to be harvested for food are essential of the same characteristic of that to be harvested for fertilizer. Hence, it is consistent to classify them under the same division.
- Remove the corresponding "crops" since crops are cultivated product. Add a class "Nutrients for cultivated resources" to account for the nutrient resources available for the uptake by crop, feed for livestock and aquaculture product.
- 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 "marine" for fish in the title of the appropriate class.
- Separate Natural plants and animals into 2 distinct classes – "Natural plants" and "Natural animals"

10. Materials

The group "Biotic 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, industrial and household use (e.g. genetic resources are not for the manufacture of goods, ornamental resources can use directly in a household without processing).

Proposed changes

- Broaden the scope of the group "biotic material" to include materials from ecosystem for agriculture and household 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.
- 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.

11. 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.

12. Cultural, Recreational and Scientific

The proposed "cultural services" is a well-being measure since this is a measure of individual non-observable preference. The question is whether such well-being measure should be included in CICES, since the other ecosystem services in CICES - "Provisioning services" and Regulation and Maintenance services" - are physical measures.

Proposed changes

- Rename the section from "Cultural" to "Cultural, Recreational 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, recreational 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, recreational 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

13. 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.

14. 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.[3]
- 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)

15. Flow regulation

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.

16. 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

[3]In 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

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 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"

17. Other environmental services

The section "Other environmental services" will include the following division.

- Space
- Abiotic 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					**Note: this section is not complete and for illustrative purposes only. Key components could change by region or ecosystem.**	**Note: this section is not complete and for illustrative purposes only. Key components could change by region or ecosystem.**
CICES for ecosystem accounting						
Section (1-digit)	*Division (2-digit)*	*Group (3-digit)*	*Class (4-digit)*	*Class types (5-digit) /examples*	Description of ecosystem services	Corresponding benefits
	Water ~~supply~~	***Abstracted water***	*Abstracted surface water*		***Abstracted water for growing of crops and animals, agricultural, mining, manufacturing and household use, etc***	***Drinking water, water for crop production, livestock feed, thermoelectric power production, etc.***
			Abstracted groud water			
			Abstracted soil water			
			Abstracted water from other sources	*e.g. Collection from precipitation, abstraction from the sea*		
	Materials	***Natural terrestrial***	*~~Crops~~ Natural animals for*	*~~e.g. by type of crop (cereals etc.)~~ e.g. by*	Natural animal **to be caught** for	Game animal (e.g. wild pig, wild duck, rabbit)

		plants and animals for food	*food*	*animal type*	food (e.g. wild pig, wild duck, rabbit)	
			~~*Livestock and dairy products*~~	~~*e.g. by animal type*~~	~~Sheep, cattle for meat and dairy products~~	-
			~~*Wild*~~ *Natural plants for food* ~~*and animals and their products*~~	*e.g. by type*	Natural food, such as berries, fungi, honey, game, uncultivated crops etc. **to be harvested**	Natural berries, fungi, honey, game, uncultivated crops etc.
		Natural freshwater plants and animals for food	*Freshwater fish for food* ~~*(wild populations)*~~	*e.g. by fishery*	Plaice, sea bass, Salmon, trout etc. **to be harvested**	Plaice, sea bass, Salmon, trout etc.
			~~*Aquaculture products*~~	*e.g. by type*		
			Freshwater plants for food	*e.g. by type or source (river, lake etc.)*	Watercress **to be harvested**	Natural watercress,etc.
		Natural marine algae and animals for food	*Marine fish and crustacean products* ~~*(wild populations including shellfish)*~~ *for food* ~~*aquaculture*~~	*e.g. by fishery*	Crustaceans (such as crabs, lobsters, crayfish) etc. **to be harvested**	Crustaceans (such as crabs, lobsters, crayfish) etc.

			~~products~~			
			Algae for food	*e.g. by resource*	~~Macro and microalgae~~ Natural edible seaweed **to be harvested**	Natural edible seaweed
Provisioning		***Nutrients for cultivated biological resources***	*Nutrient resources in cultivated system*	*e.g. by resource*	Nutrient resources available for the uptake by crops in the crop field	Crops, cereals, vegetables, vines, cultivated timber, cultivated cotton, etc.
			Fodder for livestock	*e.g. by resource*	Food and other natural inputs for livestock	Sheep, cattel for meat and dariy products
			Feed for aquaculture product	*e.g. by resource*	Food and other natural inputs for agricultural product	Fish, shrimps, cultivated watercress, cultivated algae
		Biotic materials	*Non-food vegetal fibres*	*e.g. by type, excluding ornamental, genetic, medicinal and cosmetic resources*	Natural timber, natural straw, natural flax **to be harvested;** Natural algae **to be harvested** for fertiliser, packaging and chemicals;	logged timber, straw, flax for further processing; harvested algae for fertiliser, packaging and chemicals.
			Non-food animal fibres	*e.g. by type, excluding ornamental, genetic, medicinal*	Skin, bone from natural animal etc.; natural guano, corals,	Skin, bone from natural animal for further processing (etc.; natural guano, corals, shells, etc.)

				and cosmetic resources	shells, to be harvested	
			Ornamental resources	*e.g. by type*	Natural bulbs, cut flowers, shells, bones, pearls and feathers etc. to be harvested for ornamental use	Natural bulbs, cut flowers, shells, bones, pearls and feathers etc. used as ornaments
			Genetic resources	*e.g. by type, noting that genetic resources for scientific purpose are classified under "Cultural, Educational and Scientfic"*	~~Species~~ Genetic resources to be extracted for breeding programmes (e.g. for crop plants, farm animals, fisheries and aquaculture)	Genetic resources used for breeding programmes (e.g. for crop plants, farm animals, fisheries and aquaculture)
			Medicinal and cosmetic resources	*e.g. by type*	~~Bio-prospecting activities~~ Medicinal-type and cosmetic-type biochemicals in natural biological resources (e.g. enzymes, gums, oils, waxes),	Medicinal-type and cosmetic-type biochemicals in natural biological resources (e.g. enzymes, gums, oils, waxes), herbs for further processing

					herbs to be harvested	
	Energy	***Biomass based energy***	*Vegetal based resources*	*e.g. by type*	Wood to be logged for fuel, uncultivated energy plants, algae to be harvested for biofuel etc.	Heating, light, fuel,etc.
			Animal based resources	*e.g. by type*	Dung, fat, oils from natural animal to be extracted for energy	Heating, light, fuel, etc.
	Other provisioning services	***Natural animals for other provisioning services***	*Natural animals for other provisioning services*	*e.g. by type*	Natural animal **to be caught** for agriculture, transportation, industrial use, human services, draft services, zoo, pet (e.g. exotic animals and pets, wild animals tamed and trained to harness, etc.)	Natural animal for agriculture, transportation, industrial use, human services, draft services, zoo, pet (e.g. exotic animals and pets, wild animals tamed and trained to harness, etc.)

		Other provisioning services, n.e.c.		*Residual category*		
Cultural,Recreational and Scientific	***~~Symbolic~~***	***Aesthetic, Heritage and Spiritual***	*Landscape character for aesthetic*	*e.g. by resource, such as areas of* outstanding natural beauty	Provision of landscape character and biodiversity for aesthetic values and inspiration	Enjoyment of natural beauty; Increase level of creativity for art, folklore, architecture; increase economic value of a "beautiful" land; etc.
	Cultural		*Cultural landscapes*	e.g. by resource	~~Sense of place~~ Provision of landscape and biodivesity character for cultural heritage values and a sense of personal and group identity (sense of place)	Increase sense of personal and group identity, creation of national symbol, etc.
		~~Spiritual~~	*Wilderness, naturalness*	*e.g. by resource*	Provision of landscape character for tranquillity and isolation value	Enjoyment of tanquillity and isolation in the wilderness
			Sacred places or species	*e.g. by resource*	Provision of landscape character or biodiversity for spiritual and religioos	Performance of spiritual and religious functions, such as woodland cemeteries, sky burials,

					functions	
	~~***Intellectual and Experiential***~~	***Recreation and community activities***	*Charismatic or iconic wildlife or habitats*	*e.g. by resource*	Provision of wildlife, habitants and landscape character for bird or whale watching, conservation activities, volunteering, etc.	Enjoyment for bird or whale watching, conservation activities, volunteering etc.
	Recreational		*Landscape and wildlife ~~Prey~~ for hunting, fishing or collecting*	*e.g. by resource*	Provision of landscape character and wildlife for hunting, fishing or collecting	Enjoyment of hunting, fishing or collecting (e.g. Angling, shooting, membership of environmental groups and organisations); increase health level; increased number of visitors in the tourism industry, etc.
			Landscape characterfor recreational opportunities	*e.g. by resource ,*	Povision of landscape character for recreational opportunities	Enjoyment of recreational opportunity (such as bathing, scuba-diving, recreational leisure boating, surfing, abseiling, hiking, mountaineering etc.); increase health level;

						increased number of visitors in the tourism industry; etc.
	Scientific	***Information & knowledge***	*Scientific*	*e.g. by resource*	Provision of landscape character and biodiversity for scientific research	Scientific progress (e.g. such as pollen record, tree ring record, genetic patterns)
			Educational	*e.g. by resource*	Provision of landscape character and biodiversity for education	Increase knowledge (e.g. subject matter for wildlife programmes and books) etc.
Regulation and Maintenance	***Remediation regulation of biophysical environment***	***Bioremediation***	*Remediation by plants or algae*	*e.g. by method, such as phytoaccumulation, phytodegradation, phytostabilisation, rhizodegradation, rhizofiltration, vegetation cap*	Removal of pollutants by plants or algae	Reduce level of pollutant/contaminants in soil and groundwater.
			Remediation by micro-organisms	*e.g. by method, such as in situ (Bioremediation), ex situ (composting),*	Removal of pollutants by micro-organisms	Reduce level of pollutant/contaminants in soil and groundwater.

				bioreactors		
			Remediation by animals	*e.g. by method, e.g. Bioremediation e.g. filtration of particles using molluscs*	Removal of pollutants by animals	Reduce level of pollutant/contaminants in soil and groundwater.
		Dilution, filtration and sequestration of pollutants	*Dilution, decomposition, remineralisation and recycling*	*e.g. by method/process*	Dilution of municipal wastewater in rivers etc., removal of organic material and nutrients from waste water by biogeochemical processes e.g. marine denitrification	Wastewater treatment - reduction of pollutant in wasterwater
			Filtration	*e.g. by method/process*	Filtration of particulates and aerosols	Cleaner air and water
			Sequestration and absorption of pollutants	*e.g. by method/process, noting that carbon sequestration is classified under another class*	Sequestration of nutrients and pollutants in organic sediments, removal of	Cleaner air, water and soil

				"global climate regulation)	odours	
	Flow regulation	***Air flow regulation***	*Rural ~~microclimatic~~ regulation*	*e.g. by process*	Provision of natural or planted vegetation that serves as shelter belts	Increase level of dust storm prevention, level of shelter from the wind
			Urban ~~microclimatic~~ regulation	*e.g. by process*	Provision of ventilation services	Increase level of ventilation and heat migation in the urban area
		Water flow regulation	*Attenuation of runoff and discharge rates*	*e.g. by process, such as woodlands, wetlands and their impact on discharge rates*	Reduction of surface water runoff and discharge rates	Prevention of flood damage
			Water storage for flow regulation	*e.g. by process, such as flood plains and wetlands for water storage*	Total water stored/absorbed for the release into surface water and groundwater	Water released into surface water and groundwater
			Coastal protection	*e.g. by process, such as mangroves, sea grasses, macroalgae, dune systems and coastal wetlands for costal*	Dissipation of wave energy	Reduced damage from high water

				protection		
		Mass flow regulation	*Erosion protection*	*e.g. by process, such as wetlands, mangroves, sea grasses, macroalgae, dune systems for erosion protection*	Dissipation of energy causing erosion	Protection from soil erosion
			Avalanche and gravity flow protection	*e.g. by process*	Stabilisation of mudflows, erosion protection [reduction]	Protection from avalanche and mudflows
	Regulation of physico-chemical environment	***Atmospheric cycle regulation***	*Global climate regulation (incl. C-sequestration)*	*e.g. by process, Atmospheric composition, hydrological cycle?, marine cycle*	Capture of greenhouse gas	Reduce amount of greenhouse gas in the atmosphere
			Local & Regional climate regulation	*e.g. by process*	Modifying temperature, humidity etc.; maintenance of urban climate ~~and air quality~~ and regional precipitation patterns	Improvement of the climate condition governed by temperature, humdiity and regional precipitation.

		Water ~~quality~~ cycle regulation	*Water ~~purification and~~ ciculation and oxygenation*	*e.g. by process,* Natural or planted vegetation that serves nutrient retention for water, translocation of nutrients for water, marine vertical circulation, hydrological cycle?	Provision of oxygen and nutrient resources in water	Increase nutrient content in water
		Pedogenesis and soil ~~quality~~ cycle regulation	*Maintenance of soil fertility*	*e.g. by process, e.g. Green mulches; N-fixing plants,nutrient cycle for soil*	Provision of nutrient resources in the soil of a cultivated system	Improvement of soil fertility
			Maintenance of soil structure	*e.g. by process, e.g.* Soil organism activity	Provision of soil physical properties that improve soil productivity of a cultivated system	Improvement of soil productivity
	Regulation of biotic environment	***Lifecycle maintenance, habitat and gene pool protection***	*Pollination*	*e.g. by process*	~~by biota~~ Provision of pollen, distributed by natural pollinators	Pollen receipt in the cultivated system (pollen receipt in uncultivated plants is a supporting services and therefore not be included)

					species-(e.g. bees, flies, birds, etc.), in a cultivated system	
			Seed dispersal	*e.g. by process*	~~by biota~~ Provision of seed, dispersed by parent plants, in a cultivated system	Seeds receipt in cultivated system (seed receipt in uncultivated plants is a supporting services and therefore not be included)
			Maintaining nursery populations	*e.g. by process*	Provision of area for habitat refuges (e.g. wetland, riparian buffer, etc.)	Level of the maintenance of nursery population
		Pest and disease control (incl. invasive alien species)	*Biological control mechanisms*	*e.g. by process, by plants and animals for pest and disease control,*	Control of pathogens	Reduce harzard level to crops, human health and the environment
	Abiotic materials	*Non-metallic mineral resources*		*e.g. by resources, such as chemicals (subsoil), salt, sand, sedimentary rocks*	Non-metallic mineral resources (e.g. salt, sand, sedimentary rocks) to be extracted	Non-metaliic mineral resources for further processing

Other Environmental Services		*Metallic mineral resources*		*e.g. by resources, such as ores*	Metallic mineral resources (e.g. iron ores) to be extracted	Metaliic mineral resources for further processing
	Abiotic Energy	***Abiotic non-renewable energy***	*Oil resources*	*e.g by resources*	Oil resources to be extracted	Oil resources for further processing/generation of electricity and energy
			Natural gas resources	*e.g. by resources*	Natural gas resources to be extracted	Natural gas resources for for further processing/generation of electricity and energy
			Coal and peat resources	*e.g. by resources*	Coal and peat resources to be extracted	Coal and peat resources for further processing/generation of electricity and energy
			Other abiotic non-renewable resources, n.e.c.	*Residual category*		
		Abiotic renewable energy	*Solar*	*e.g. by resources*	Sunlight and heat	Heating, light, solar energy for the generation of electricity
			Wind	*e.g. by resources*	Wind energy	Wind energy for the generation of electricity/farming/sailing
			Hydro	*e.g. by resources*	Hydropower	Hydropower for the generation of electricity
			Wave and tidal	*e.g. by resources*	Wave and tidal energy	Wave and tidal energy for the generation of electricity

			Geothermal	*e.g. by resources*	Geothermal energy	Geothermal energy for the generation of electricity
	Space	***Space***	*Space for human habitat and infrastructure*	*e.g. by resources, such as space for human settlements, roads, railways*	Provision of space for human habitant and infrastructure	Space for human habitant and infrastructure
	Other environmental flow, n.e.c.	***Other environmental flows, n.e.c.***		*Residual category*		