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CICES for ecosystem service mapping and assessment

CICES for ecosystem accounting

Note this section is open in that many class types can potentially be recognised and

Note: this section is not complete and for illustrative purposes only. Key components could change by region or ecosystem.

Section	Division	Group	Class	Class type	Examples
This column lists the three main categories of ecosystem services	*This column divides section categories into main types of output or process.*	*The group level splits division categories by biological, physical or cultural type or process.*	*The class level provides a further sub-division of group categories into biological or material outputs and bio-physical and cultural processes that can be linked back to concrete identifiable service sources.*	*Class types break the class categories into further individual entities and suggest ways of measuring the associated ecosystem service output.*	
Provisioning	Nutrition	Biomass	Cultivated crops	*Crops by amount, type*	Cereals (e.g. wheat, rye, barely), vegetables, fruits etc.
			Reared animals and their outputs	*Animals, products by amount, type*	Meat, dairy products (milk, cheese, yoghurt), honey etc.
			Wild plants, algae and their outputs	*Plants, algae by amount, type*	Wild berries, fruits, mushrooms, water cress, salicornia (saltwort or samphire); seaweed (e.g. Palmaria palmata = dulse, dillisk) for food
			Wild animals and their outputs	*Animals by amount, type*	Game, freshwater fish (trout, eel etc.), marine fish (plaice, sea bass etc.) and shellfish (i.e. crustaceans, molluscs), as well as equinoderms or honey harvested from wild populations; Includes commercial and subsistence fishing and hunting for food
			Plants and algae from in-situ aquaculture	*Plants, algae by amount, type*	In situ seaweed farming
			Animals from in-situ aquaculture	*Animals by amount, type*	In-situ farming of freshwater (e.g. trout) and marine fish (e.g. salmon, tuna) also in floating cages; shellfish aquaculture (e.g. oysters or crustaceans) in e.g. poles
		Water	Surface water for drinking	*By amount, type*	Collected precipitation, abstracted surface water from rivers, lakes and other open water bodies for drinking
			Ground water for drinking		Freshwater abstracted from (non-fossil) groundwater layers or via ground water desalination for drinking
	Materials	Biomass	Fibres and other materials from plants, algae and animals for direct use or processing	*Material by amount, type, use, media (land, soil, freshwater, marine)*	Fibres, wood, timber, flowers, skin, bones, sponges and other products, which are not further processed; material for production e.g. industrial products such as cellulose for paper, cotton for clothes, packaging material; chemicals extracted or synthesised from algae, plants and animals such as turpentine, rubber, flax, oil, wax, resin, soap (from bones), natural remedies and medicines (e.g. chondritin from sharks), dyes and colours, ambergris (from sperm whales used in perfumes); Includes consumptive ornamental uses.
			Materials from plants, algae and animals for agricultural use		Plant, algae and animal material (e.g. grass) for fodder and fertilizer in agriculture and aquaculture;
			Genetic materials from all biota		Genetic material (DNA) from wild plants, algae and animals for biochemical industrial and pharmaceutical processes e.g. medicines, fermentation, detoxification; bio-prospecting activities e.g. wild species used in breeding programmes etc.
		Water	Surface water for non-drinking purposes	*By amount, type and use*	Collected precipitation, abstracted surface water from rivers, lakes and other open water bodies for domestic use (washing, cleaning and other non-drinking use), irrigation, livestock consumption, industrial use (consumption and cooling) etc.
			Ground water for non-drinking purposes		Freshwater abstracted from (non-fossil) groundwater layers or via ground water desalination for domestic use (washing, cleaning and other non-drinking use), irrigation, livestock consumption, industrial use (consumption and cooling) etc.
	Energy	Biomass-based energy sources	Plant-based resources	*By amount, type, source*	Wood fuel, straw, energy plants, crops and algae for burning and energy production
			Animal-based resources		Dung, fat, oils, cadavers from land, water and marine animals for burning and energy production
		Mechanical energy	Animal-based energy	*By amount, type, source*	Physical labour provided by animals (horses, elephants etc.)
Regulation & Maintenance	Mediation of waste, toxics and other nuisances	Mediation by biota	Bio-remediation by micro-organisms, algae, plants, and animals	*By amount, type, use, media (land, soil, freshwater, marine)*	Bio-chemical detoxification/decomposition/mineralisation in land/soil, freshwater and marine systems including sediments; decomposition/detoxification of waste and toxic materials e.g. waste water cleaning, degrading oil spills by marine bacteria, (phyto)degradation, (rhizo)degradation etc.

			Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals	*By amount, type, use, media (land, soil, freshwater, marine)*	Biological filtration/sequestration/storage/accumulation of pollutants in land/soil, freshwater and marine biota, adsorption and binding of heavy metals and organic compounds in biota
		Mediation by ecosystems	Filtration/sequestration/storage/accumulation by ecosystems	*By amount, type, use, media (land, soil, freshwater, marine)*	Bio-physicochemical filtration/sequestration/storage/accumulation of pollutants in land/soil, freshwater and marine ecosystems, including sediments; adsorption and binding of heavy metals and organic compounds in ecosystems (combination of biotic and abiotic factors)
			Dilution by atmosphere, freshwater and marine ecosystems		Bio-physico-chemical dilution of gases, fluids and solid waste, wastewater in atmosphere, lakes, rivers, sea and sediments
			Mediation of smell/noise/visual impacts		Visual screening of transport corridors e.g. by trees; Green infrastructure to reduce noise and smells
	Mediation of flows	Mass flows	Mass stabilisation and control of erosion rates	*By reduction in risk, area protected*	Erosion / landslide / gravity flow protection; vegetation cover protecting/stabilising terrestrial, coastal and marine ecosystems, coastal wetlands, dunes; vegetation on slopes also preventing avalanches (snow, rock), erosion protection of coasts and sediments by mangroves, sea grass, macroalgae, etc.
			Buffering and attenuation of mass flows		Transport and storage of sediment by rivers, lakes, sea
		Liquid flows	Hydrological cycle and water flow maintenance	*By depth/volumes*	Capacity of maintaining baseline flows for water supply and discharge; e.g. fostering groundwater; recharge by appropriate land coverage that captures effective rainfall; includes drought and water scarcity aspects.
			Flood protection	*By reduction in risk, area protected*	Flood protection by appropriate land coverage; coastal flood prevention by mangroves, sea grass, macroalgae, etc. (supplementary to coastal protection by wetlands, dunes)
		Gaseous / air flows	Storm protection	*By reduction in risk, area protected*	Natural or planted vegetation that serves as shelter belts
			Ventilation and transpiration	*By change in temperature/humidity*	Natural or planted vegetation that enables air ventilation
	Maintenance of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Pollination and seed dispersal	*By amount and source*	Pollination by bees and other insects; seed dispersal by insects, birds and other animals
			Maintaining nursery populations and habitats	*By amount and source*	Habitats for plant and animal nursery and reproduction e.g. seagrasses, microstructures of rivers etc.
		Pest and disease control	Pest control	*By reduction in incidence, risk, area protected*	Pest and disease control including invasive alien species
			Disease control		In cultivated and natural ecosystems and human populations
		Soil formation and composition	Weathering processes	*By amount/concentration and source*	Maintenance of bio-geochemical conditions of soils including fertility, nutrient storage, or soil structure; includes biological, chemical, physical weathering and pedogenesis
			Decomposition and fixing processes		Maintenance of bio-geochemical conditions of soils by decomposition/mineralisation of dead organic material, nitrification, denitrification etc.), N-fixing and other bio-geochemical processes;
		Water conditions	Chemical condition of freshwaters	*By amount/concentration and source*	Maintenance / buffering of chemical composition of freshwater column and sediment to ensure favourable living conditions for biota e.g. by denitrification, re-mobilisation/re-mineralisation of phosphorous, etc.
			Chemical condition of salt waters		Maintenance / buffering of chemical composition of seawater column and sediment to ensure favourable living conditions for biota e.g. by denitrification, re-mobilisation/re-mineralisation of phosphorous, etc.
		Atmospheric composition and climate regulation	Global climate regulation by reduction of greenhouse gas concentrations	*By amount, concentration or climatic parameter*	Global climate regulation by greenhouse gas/carbon sequestration by terrestrial ecosystems, water columns and sediments and their biota; transport of carbon into oceans (DOCs) etc.
			Micro and regional climate regulation		Modifying temperature, humidity, wind fields; maintenance of rural and urban climate and air quality and regional precipitation/temperature patterns
Cultural	Physical and intellectual interactions with biota, ecosystems, and land-/seascapes [environmental settings]	Physical and experiential interactions	Experiential use of plants, animals and land-/seascapes in different environmental settings	*By visits/use data, plants, animals, ecosystem type*	In-situ whale and bird watching, snorkelling, diving etc.
			Physical use of land-/seascapes in different environmental settings		Walking, hiking, climbing, boating, leisure fishing (angling) and leisure hunting
		Intellectual and representative interactions	Scientific	*By use/citation, plants, animals, ecosystem type*	Subject matter for research both on location and via other media
			Educational		Subject matter of education both on location and via other media
			Heritage, cultural		Historic records, cultural heritage e.g. preserved in water bodies and soils
			Entertainment		Ex-situ viewing/experience of natural world through different media
			Aesthetic		Sense of place, artistic representations of nature

	Spiritual, symbolic and other interactions with biota, ecosystems, and land-/seascapes [environmental settings]	Spiritual and/or emblematic	Symbolic	*By use, plants, animals, ecosystem type*	Emblematic plants and animals e.g. national symbols such as American eagle, British rose, Welsh daffodil
			Sacred and/or religious		Spiritual, ritual identity e.g. 'dream paths' of native Australians, holy places; sacred plants and animals and their parts
		Other cultural outputs	Existence	*By plants, animals, feature/ecosystem type or component*	Enjoyment provided by wild species, wilderness, ecosystems, land-/seascapes
			Bequest		Willingness to preserve plants, animals, ecoystems, land-/seascapes for the experience and use of future generations; moral/ethical perspective or belief

Accompanying classification of abiotic outputs from natural systems (Provisional)

Section	Division	Group	Examples
Abiotic Provisioning	Nutritional abiotic substances	Mineral	e.g. salt
		Non-mineral	e.g. sunlight
	Abiotic materials	Metallic	e.g. metal ores
		Non-metallic	e.g. minerals, aggregates, pigments, building materials (mud/clay)
	Energy	Renewable abiotic energy sources	e.g. wind, waves, hydropower
		Non-renewable energy sources	e.g. coal, oil, gas
Regulation & Maintenance by natural physical structures and processes	Mediation of waste, toxics and other nuisances	By natural chemical and physical processes	e.g. atmospheric dispersion and dilution; adsorption and sequestration of waters in sediments; screening by natural physical structures
	Mediation of flows by natural abiotic structures	By solid (mass), liquid and gaseous (air)flows	e.g. protection by sand and mud flats; topographic control of wind erosion
	Maintenance of physical, chemical, abiotic conditions	By natural chemical and physical processes	e.g. land and sea breezes; snow
Cultural settings dependent on abiotic structures	Physical and intellectual interactions with land-/seascapes [physical settings]	By physical and experiential interactions or intellectual and representational interactions	e.g. caves
	Spiritual, symbolic and other interactions with land-/seascapes [physical settings]	By type	e.g. sacred rocks or other physical structures or spaces

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Section	Division
Provisioning	Nutrition
	Materials
	Energy
Regulation & Maintenance	Mediation of waste, toxics and other nuisances
	Mediation of flows
	Maintenance of physical, chemical, biological conditions
Cultural	Physical and intellectual interactions with ecosystems and land-/seascapes [environmental settings]
	Spiritual, symbolic and other interactions with ecosystems and land-/seascapes [environmental settings]

Accompanying classification of abiotic outputs fror

Section	Division
Abiotic Provisioning	Nutritional abiotic substances
	Abiotic materials
	Energy
Regulation & Maintenance by natural physical structures and processes	Mediation of waste, toxics and other nuisances

	Mediation of flows by natural abiotic structures
	Maintenance of physical, chemical, abiotic conditions
Cultural settings dependent on abiotic structures	Physical and intellectual interactions with land-/seascapes [physical settings]
	Spiritual, symbolic and other interactions with land-/seascapes [physical settings]

Group
Biomass
Water
Biomass, Fibre
Water
Biomass-based energy sources Mechanical energy
Mediation by biota
Mediation by ecosystems
Mass flows
Liquid flows
Gaseous / air flows
Lifecycle maintenance, habitat and gene pool protection
Pest and disease control
Soil formation and composition
Water conditions
Atmospheric composition and climate regulation
Physical and experiential interactions
Intellectual and representational interactions
Spiritual and/or emblematic
Other cultural outputs

n natural systems (Provisional)

Group
Mineral
Non-mineral
Metallic
Non-metallic
Renewable abiotic energy sources
Non-renewable energy sources
By natural chemical and physical processes

By soild (mass), liquid and gaseous (air)flows
By natural chemical and physical processes
By physical and experiential interactions or intellectual and representational interactions
By type

Examples
e.g. salt
e.g. sunlight
e.g. metal ores
e.g. minerals, aggregates, pigments, building materials (mud/clay)
e.g. wind, waves, hydropower
e.g. coal, oil, gas
e.g. atmospheric dispersion and dilution; adsorption and sequestration of waters in sediments; screening by natural physical structures

e.g. protection by sand and mud flats; topographic control of wind erosion
e.g. land and sea breezes; snow
e.g. caves
e.g. scared rocks or other physical structures or spaces