

Mapping and assessing ecosystems and their services –

MAES FOR FINLAND

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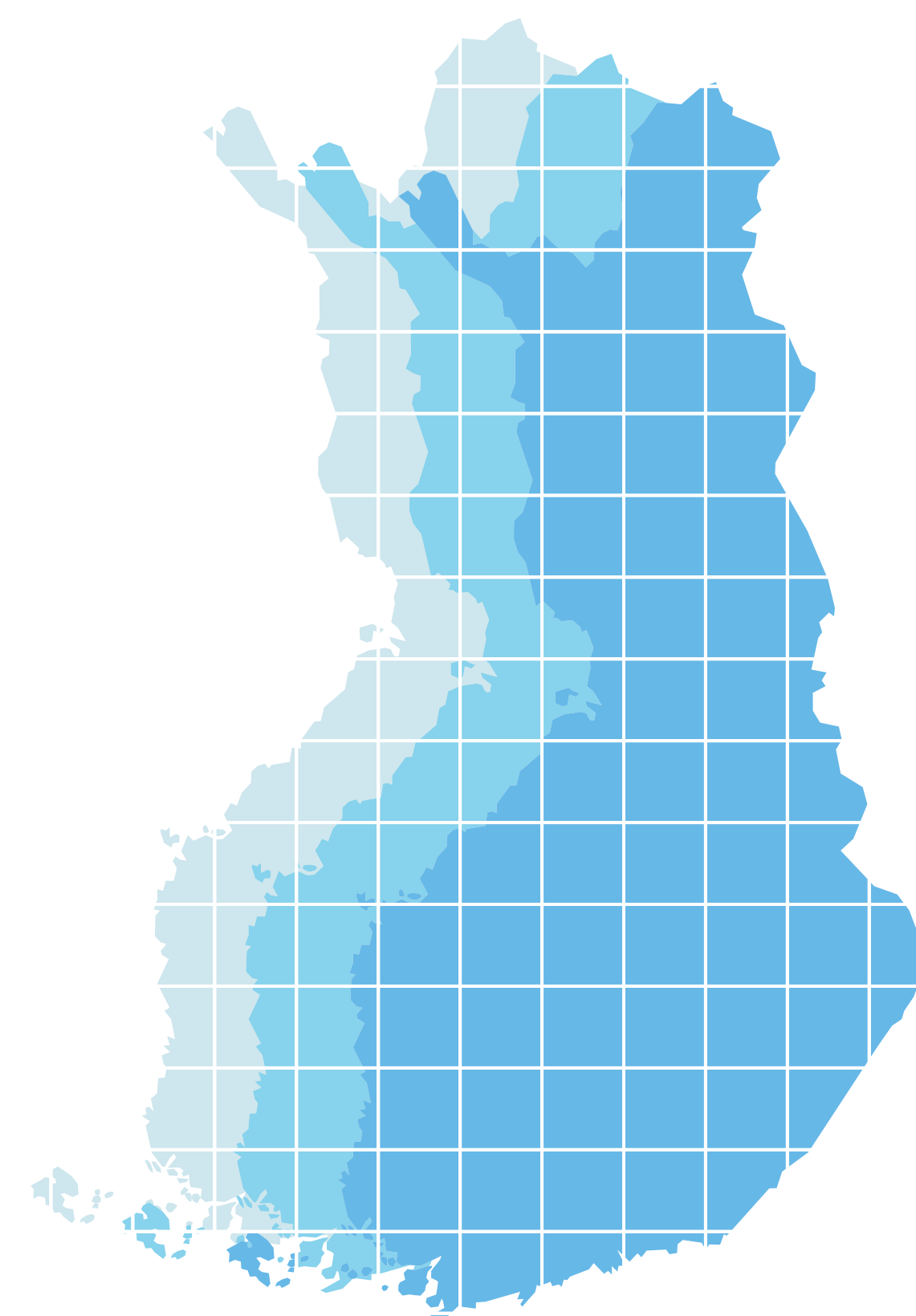


Table 1. The most important ecosystem services in Finland and their indicators based on CICES and Cascade.

Mapping and assessment of ecosystems and their services (MAES) is a key initiative of Action 5 of the EU Biodiversity Strategy 2020. Finland has contributed to EU-wide cooperation to design a harmonized and flexible methodology for the quantification, mapping and modeling of ecosystem extent and condition, as well as of ecosystem services (Vihervaara et al 2018). The mapping and assessment covers biophysical, socio-cultural and economic aspects of ecosystem services.

- 1) Finland has developed a comprehensive indicator scheme based on the CICES classification (www.cices.eu) supported by the European Environment Agency, and the cascade model that is commonly used in evaluating ecosystem services (Mononen et al. 2016). All results are published online at www.biodiversity.fi/ecosystems-services
- 2) The Finnish MAES network coordinated by SYKE has arranged national meetings of experts and stakeholders working with mapping and assessment of ecosystems and their services.
- 3) Finland has contributed actively to the testing of integrated natural capital accounting (Lai et al. 2018).

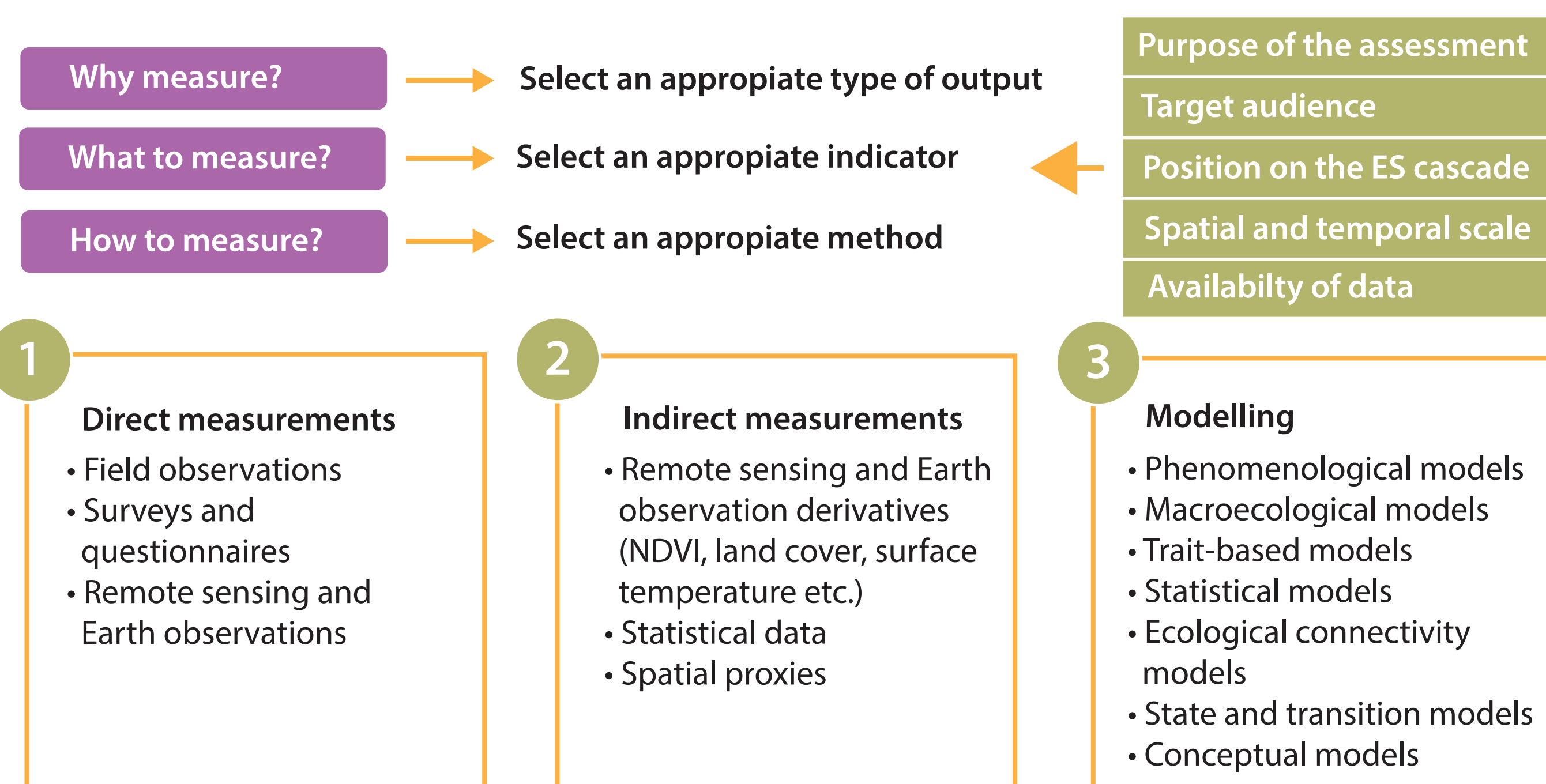
MAES for Finland covers the biomes of boreal forests and arctic tundra and aims to bridge the importance of biodiversity and ecosystem functioning with human well-being.

Climate change is expected to influence the provision of ecosystem services. To monitor these changes we need better spatial information of the current status of ecosystems that provide them. SYKE is currently working to establish a national Ecosystem Observatory to answer these data needs.

Applicability of MAES for Finland:

- framing and clarifying the big picture of ecosystem services nationally
- monitoring the state and trends of ecosystem services
- evaluating policies affecting ecosystems and their services
- environmental impact assessment and land use planning

BIOPHYSICAL QUANTIFICATION OF ECOSYSTEM SERVICES



Further reading:

Mononen, L., Ahokumpu, A.-L., Auvinen, A.-P., Rönkä, M., Tolvanen, H., Aarras, N., Kamppinen, M., Viirret, E., Kumpulainen, T. & Vihervaara, P. 2016: National ecosystem service indicators: measures of social-ecological sustainability. Ecological Indicators 61: 27-37.

Lai, T.-Y., Salminen, J., Jäppinen, J.-P., Koljonen, S., Mononen, L., Nieminen, E., Vihervaara, P. & Oinonen S. 2018: Bridging the gap between ecosystem service indicators and ecosystem accounting in Finland. Ecological Modelling 377: 51-65

Vihervaara P., Mononen L., Nedkov S., Viinikka, A. (Eds.) 2018: Biophysical mapping and assessment methods for ecosystem services. Deliverable D3.3. EU Horizon 2020 ESERALDA Project, Grant agreement No. 642007. 71 pp.

Jäppinen, J.-P. & Heliölä, J. (Eds.) 2015: Towards A Sustainable and Genuinely Green Economy. The value and social significance of ecosystem services in Finland (TEEB for Finland). Synthesis and roadmap. The Finnish Environment in 2015. Ministry of the Environment. 144 pp. Helsinki.

Important links:

www.biodiversity.fi/ecosystems-services
 https://biodiversity.europa.eu/maes
 http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/index_en.htm
 http://www.esmeralda-project.eu/
 http://ec.europa.eu/environment/nature/capital_accounting/index_en.htm
 www.MAES-Explorer.eu

CICES				CASCADE			
Sec.	Div.	Group	Class	1. Structure	2. Function	4. Benefit	5. Value
PROVISIONING SERVICES	Nutrition	Biomass	Berries and mushrooms	Berry and mushroom habitats (ha)	Average annual production (kg/A or kg/ha/A)	Harvest (kg)	Sales, picking income (€) berry and mushroom pickers (n, %), health and intrinsic values
			Game	Game habitats (ha)	Game population (n), wildlife richness	Game bag (kg)	Game bag (€), social, health and intrinsic values
			Reindeer	Reindeer pastures (ha)	Reindeer population (n), birth rate (%)	Culled reindeer (kg)	Sales of reindeer meat (€) employment (n), intrinsic and health values
			Fish and crayfish	State of surface waters (qualitative scale), stream fragmentation	Population dynamics of fish and crayfish	Total catch (kg)	Total catch (€), employment (n), health and intrinsic values
			Crops	Area under crop cultivation (ha)	Nutrient dynamics (kg/ha), fertilizer and pesticide use (kg/ha)	Harvest (kg)	Agricultural income (€), employment (n), health and intrinsic values
	Water	Biomass	Reared animals	Number of animals (n), area of pastures (ha)	Nutrient and energy uptake (organic vs. conventional)	Animal products (kg, l)	Agricultural income (€) employment (n), health and intrinsic values
			Clean water*	Undisturbed habitats and aquifers (ha)	State of surface water and groundwater (EU classification)	Use of raw water (m ³)	Value of domestic, irrigation and process water use (€), health, social and intrinsic values
	Materials	Biomass	Wood	Managed forests (ha)	Growing stock increment, impact of management (m ³ /ha)	Roundwood removals (m ³)	Roundwood trade (€) employment (n), health and intrinsic values
			Genetic material	Number of varieties (n), area of gene reserve habitats (ha)	Breeding, genetic variance, evolution	Breeding and discovery potential/benefit	Genetic variance and evolution, economic value of modified organisms (€), intrinsic, social and health values
	Energy	Biomass	Bioenergy	Area under bioenergy crops (ha)	Annual growth of biomass (tons/ha/year)	Harvest (m ³) energy content (PJ)	Produced energy (€) employment (n), health and intrinsic values
Sec.	Div.	Group	Class	1. Structure	2. Function	4. Benefit	5. Value
REGULATING AND MAINTENANCE SERVICES	Mediation of waste, toxins and other nuisances	Mediation by biota	Mediation of waste and toxins	Suitable ecosystems (ha), soil organisms	Decomposition, mediation or storage of waste by biological processes	Improvement of water and soil quality	Health value, avoided costs of waste management (€), social and intrinsic values
			Air quality	Urban green infrastructure (ha)	Retention of small particles	Improved air quality	Health values of clean air, avoided medical costs (€), social and intrinsic values
		Mediation by ecosystem	Water filtration	Undisturbed habitats and aquifers (ha)	Groundwater production (recharge rate, mm/ha/year)	Groundwater and surface water quality	Value of groundwater and surface water (€), health, social and intrinsic values
			Nutrient retention	Undisturbed habitats (ha)	Nutrient retention rate	Improved water and soil quality (qualitative scale)	Avoided costs of fertilizer use and water protection measures (€) social, health and intrinsic v.
	Mass flows	Erosion control	Noise reduction	Vegetation in urban areas (ha)	Acoustic absorption	Reduced noise level	Health values of reduced-noise environment, avoided medical costs (€), social and intrinsic v.
			Erosion control	Undisturbed soils (ha)	Particle retention rate	Avoided erosion, improved water quality	Avoided costs of fertilizer use (€) high quality surface water (€), intrinsic and health values
	Liquid flows	Water retention	Pollination	Pollinator nesting and foraging habitats (ha)	Pollination	Increase in yield (kg/ha)	Improved production (€), health, intrinsic and social values
			Nursery habitats	Area and state of nursery habitats (n, ha)	Shelter and nutrition (measured as reproduction success)	Viable populations	Avoided costs of stock replenishment and other management measures (€), intrinsic, social and health values
	Maintenance of physical, chemical and biological conditions	Soil formation & compos.	Soil quality	Functional diversity of soil organisms	Cycling of substances	Soil quality	Avoided costs of soil improvement (€), increased harvest (€), health, intrinsic and social value
			Nitrogen uptake	Nitrogen-fixing vegetation (ha)	Nitrogen fixation rate	Improvement of nutrient balance and soil quality	Avoided costs of fertilizer use (€) health, intrinsic and social values
Atmospheric composition		Climate regulation	Carbon-storing habitats (ha)	Carbon balance, sequestration rate	Climate regulation, stable climate	Avoided costs of negative climate impacts (€), intrinsic, health and social values of stable climate	
		Recreation	Preferred natural areas (ha), accessibility	Natural events, phenology	Experience; participation in recreational activities (n, %)	Avoided medical costs (€), health value, participation in outdoor activities (n), intrinsic value	
CULTURAL SERVICES	Physical and intellectual interactions with biota, ecosystems and land/seascapes**	Physical and experiential interactions	Nature tourism	Preferred natural areas (ha), accessibility	Natural events, phenology	Employment (n), recreation, experience	Tourism revenue (€), health value, employment (n), intrinsic value
			Science and education	Areas of particular interest (ha)	Natural events, phenology	Source of knowledge	Social, economic, intrinsic and health value of knowledge and innovations
	Intellectual and representative interactions	Nature-related heritage	Cultural heritage in natural landscapes (n)	Natural events, phenology	Cultural continuity	Social, intrinsic, economic and health values of nature-related cultural heritage.	
		Landscape	Valuable/preferred landscapes (n, ha)	Natural events, phenology	Aesthetic experience	Identity and aesthetics, marketing value of landscape (€), intrinsic and health values	
		Arts and popular culture	Emblematic species and landscapes (n)	Natural events, phenology	Aesthetic experience, recreation	Market value (€), identity and aesthetics, intrinsic and health values of cultural representations	

* Clean water combines the CICES classes "Surface water for drinking", "Ground water for drinking", "Surface water for non-drinking purposes" and "Ground water for non-drinking purposes".

** The CICES division "Spiritual, symbolic and other interactions with biota, ecosystems, and land-/seascapes (environmental settings)" was not included since we considered that they could mostly be considered, as intrinsic values of the other cultural services.