Ecosystem Service	**Biotic filtration, sequestration and storage of waste**
CICES class name	Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals
CICES Section	Regulation & Maintenance (Biotic)
CICES Class code	2.1.1.2

Brief Description:

- Filtering organic or inorganic substances from water or air, including filtering fertilizers and pesticides from water through the soil matrix
- The fixing storage of an organic or inorganic substance by plants, animals, bacteria, fungi or algae that mitigates its harmful effects and reduces the costs of disposal by other means

Sample Indicators

Indicator values from			
Experiment or direct measurement		Survey	
Expert assessment		Statistical- or census data	
Model or GIS		Literature values	
Stakeholder participation		Not provided	

Table 1: Field Scale

Indicator	**Unit**	**Indicator values from**
[1] Filtering and buffering: -Soil organic carbon [%] -Acetate esterase enzyme activity [not provided] -Bulk density [g * cm^{-3}] -Basal soil respiration [mg CO_2 * g^{-1}]	Not provided	
[3] Soil carbon (0-100cm)	kg C * m^{-2}	
[2] Natural attenuation/ clean groundwater: Indicator value calculated as: $I = \frac{\sum \left| \log\left(\frac{i}{i_{max}}\right)\right|}{n}$	-	,

With: I – Indicator value, i – variable i measured, i_{max} – maximum ecologic potential of variable i in benchmark reference, n – number of variables Where performance is considered better than in the benchmark and deviation, therefore, has a positive effect, $\lvert log\,(\frac{i}{i_{max}})\rvert$ subtracted from the sum instead of added. For this ES, variables were: -Soil organic matter [% dw] -Bacterial biomass [mg C *g dw^{-1}] -pH in KCl -Physiological diversity bacteria [bBiolog. CLPP: Hill's slope] -Water suluble P (Pw) [mg * l^{-1}] and extractable P (PAL) [mg * kg^{-1}]		

Table 2: Farm Scale

Indicator	Unit	Indicator values from
[4] Share of nitrogen retained during water passage between agricultural sub-catchment and sea. Values were scaled [0-1]	%	
[4] Share of farmers that express clearly a value and care for the health of the land. Values were scaled to [0-1]	%	

Table 3: Regional Scale

Indicator	Unit	Indicator values from
[10] Nitrate leaching	kg * ha^{-1} * yr^{-1}	
[5] Nitrogen loss	kt N	
[8] Risk of nitrate leaching: exchange frequency of the soil water in the root layer. Infiltration rate divided by field capacity	%	
[4] Share of nitrogen retained during water passage between agricultural sub-catchment and sea. Values were scaled [0-1]	%	
[6] Mechanical filtration capacity: infiltration capacity, calculated as: $$C = soil_{perm} * (1 - s)$$ With: C – mechanical filtration capacity, $soil_{perm}$ – soil permeability [cm * d^{-1}], s – share of anthropogenic surface sealing	cm * d^{-1}	,

[6] Physicochemical filtration capacity, calculated as: $$C = CEC * (1 - s)$$ With: C – physicochemical filtration capacity, CEC – effective cation exchange capacity [cmol(+) * kg dm^{-1}], s – share of anthropogenic surface sealing)	cmol(+) * kg dm^{-1}	
[9] Share of natural forest cover in municipality's surface. Values were normalized [0-1] using benchmark values where available and observed values otherwise.	%	
[4] Share of farmers that express clearly a value and care for the health of the land. Values were scaled to [0-1]	%	
[7] Nutrient regulation: Assigned values depend on the land cover class. The matrix defined by Burkhard et al., 2012 (DOI:10.1016/j.ecolind.2011.06.019) was adapted and used in this study.	Index 0 - 5	
[11] Water purification and provision, calculated as: $$W = NPP * (1 - VCNPP) * IC_s * S_{cf}$$ With: W – water purification and provision, NPP – Net Primary Production calculated from NDVI-values and expressed on a relative scale set to [0 – 1000], VCNPP – coefficient of variation of NPP [0 – 1], IC_s – soil infiltration capacity [0 – 1], S_{cf} – slope average correction factor of the study area [0 – 1]	-	
[11] Waste purification, calculated as: $$W = NPP * (1 - VCNPP) * I_w * O_w * 1.75$$ With: NPP – Net Primary Production [0-1000], VCNPP – coefficient of variation of NPP [0–1], I_w – water input to the system [0–1], O_w – water bodies occupancy percentage and flat floodplain area [0–1]	-	
[13] Volume of purified water	m^3 / (km^2 * year)	
[13] Mass of a specific nutrient retained	ton/ (km^2 * year)	
[14] Area of undisturbed creek banks that serve as buffers to pesticide and fertilizer runoff	n/a	

Table 4: Multinational Scale

Indicator	**Unit**	**Indicator values from**
[12] Nutrient regulation: Values were assigend for Corine land cover classes, based on values published by Burkhard et al. (2009; DOI: 10.3097/LO.200915) and modified for the context of riparian zones.	Index 0 - 5	

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[7*] The impact area discussed on this factsheet is not a focus of the cited paper

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