Deliverable 3.2: Definition of cross-domain EVs for services and modelling

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Approach

As already described in "Deliverable 2.2 - Unified list of EVs that reflects the cross-disciplinarity of the EV concept", enriching the EV lists with additional information is a promising way to find cross-domain variables and regroup the unified list.

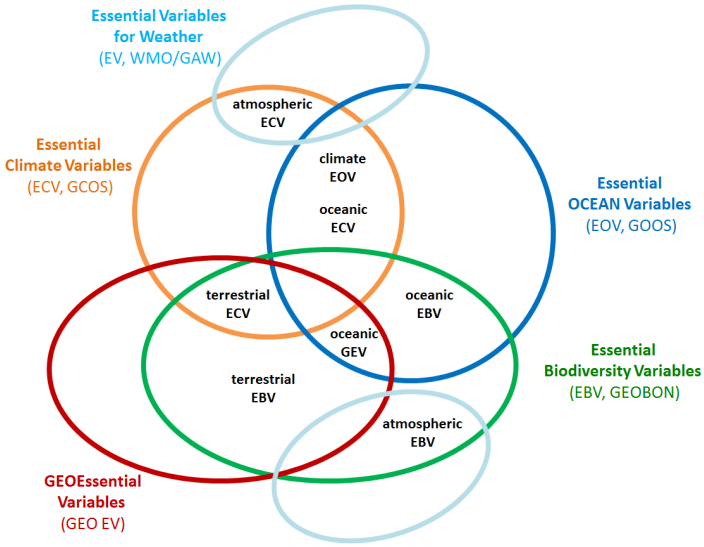

Figure 1: Conceptual overlap of all projects for defining Essential Variables; Essential Variables for Weather - EV, Essential Ocean Variables – EOV, Essential Climate Variables, Essential Biodiversity Variables – EBV and the GeoEssential Variables- GEO EV (Figure from Lausch et al. 2018, modified after Lindstrom et al. 2012).

In order to illustrate the approach, the graph of Lauschet al. 2018 is quoted again in Figure 1. Here the assumption can be made that the essential variable lists of different domains overlap. These can be directly duplications of variables. The fact that these occur only very

limited is shown in the following examples. However, the fact that there must be a semantic overlap is a well-founded assumption in the context of environmental research. But how can we find these overlaps?

In this Task3.2 we will try to identify these overlaps with the help of further metadata. In the following, the lists of Essential Biodiversity Variables (EBV), Essential Climate Variables (ECV) and Essential Ocean Variables (EOV) will be enriched with a mapping to the components of the Ecosystem Integrity Concepts, Units and Dimensions, Measurement Method and links to the Sustainable Development Goals (SDG). The procedure is shown schematically in Figure 2.

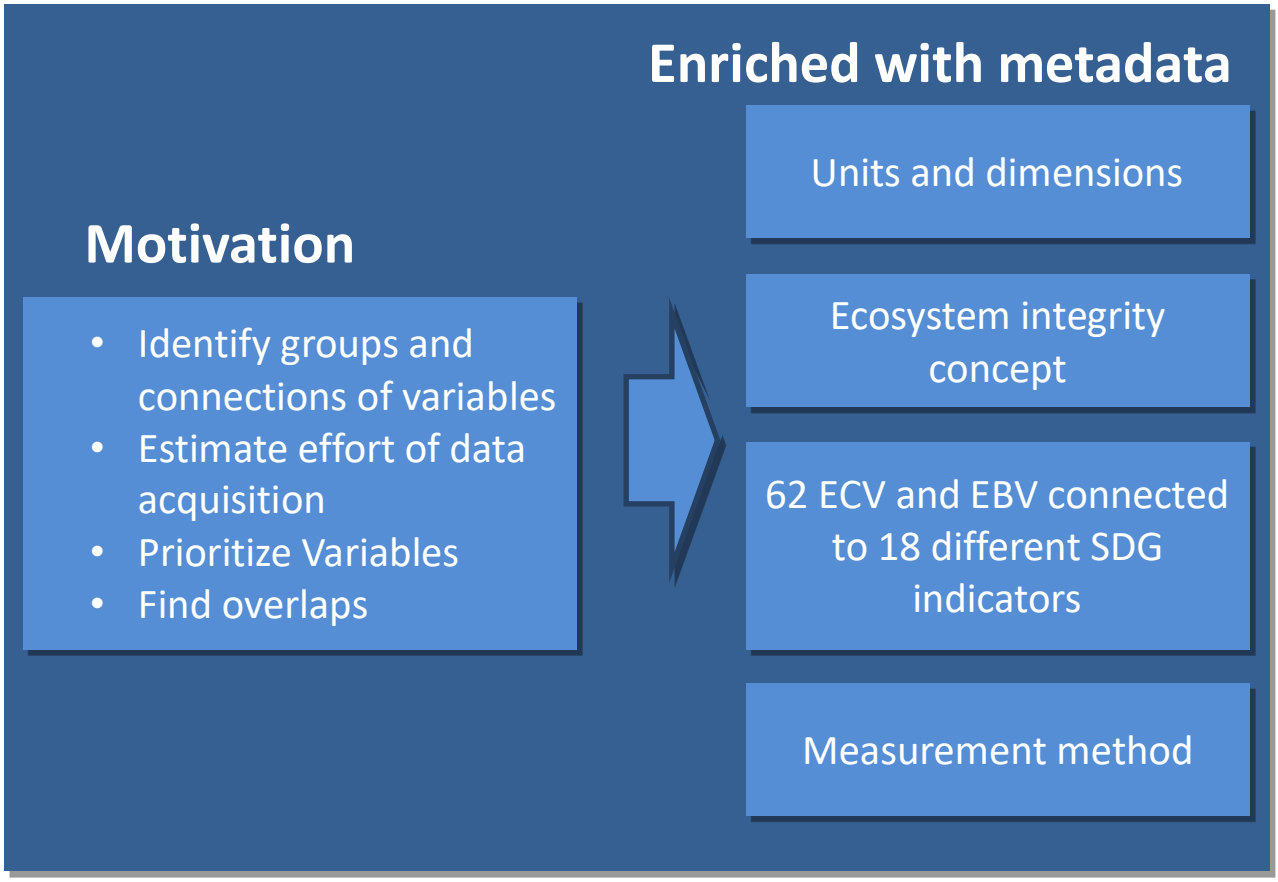

Figure 2: List of metadata added to the ECV and EBV lists.

In the first part of this deliverable, the additional data with which the unified list was provided is described and illustrated using examples. Thereby results and problem are described in details. In the second part, overlaps and groupings are analyzed. Whereby here a prioritization of the variables is suggested on the basis of the SDG assignments. At the end,

suggestions for standardization are made and an outlook on further lists is given. The complete lists and diagrams for the examples in the sections can be found in the appendix.

Meta Data Enrichment

The EV lists EOV, ECV and EBV were enhanced with additional metadata. Information on units and dimensions as well as assignments to components of the Ecosytem Integrity Concept were added or completed. The resulting open questions are described in the respective chapters.

While the variables were being grouped according to the new metadata, adding further information appeared to be useful and necessary. Below, we specifiy the method used to measure the variable and attempted to assign the EVs to one or more of the Sustainable Development Goals.

Units and dimensions

The enrichment of the variables with their physical units and dimensions was aimed to group them in: intensity, quantity and parametric variables. In addition, this approach makes it easier to identify and analyze energy or material fluxes between the domains or state variables of the domains.

One of the challenges here was the inconsistency of the symbols and and units in the lists. The use of a standard for the lists closer to SI (International System of Units) would be convenient.

An example of problems with the linkebility of dimensions is the different representation of concentrations. There are essentially 2 groups:

- **Group A: Unique and comparable units suitable for quatinization**, for example:
  - weight/weight (kg * kg^{-1}) and
  - Molecule per Molecule in substance mixture (mol * mol^{-1})
- **Group B: Units that require additional information and are suitable for qualitative considerations**:

- Molecules per weight (mol * kg^{-1}). Weight generally depends on density, which in turn depends on temperature. But mol does not.
- Molecules per volume (mol * $liter^{-1}$, mol * m^{-3}). The volume also generally depends on the density, which in turn depends on the temperature.
- Percentage in volume, total molecules or weight (%): Like the previous two, these also depend on the temperature.

The variables given in Group A units are in themselves unique and should preferably be used. The other units should be convertible with metadata, such as temperature. If this data is attached as metadata to the measurement, this can easily be implemented. However, this would have to be included as a requirement in the list of variables.

Ecosystem integrity concept

A further enrichment of the variables was done by liking them with the ecosystem integrity concept (EIC) components. The ECI was chosen because it is currently discussed and implemented in integrated environmental long-term observatories (Mirtl et al. 2018, Mollenhauer et al. 2018). The information is assigned here to a process or structure level (component 1). In a further hierarchy level (component 2), it can then be mapped to budget or biotic and abiotic diversity characteristics.

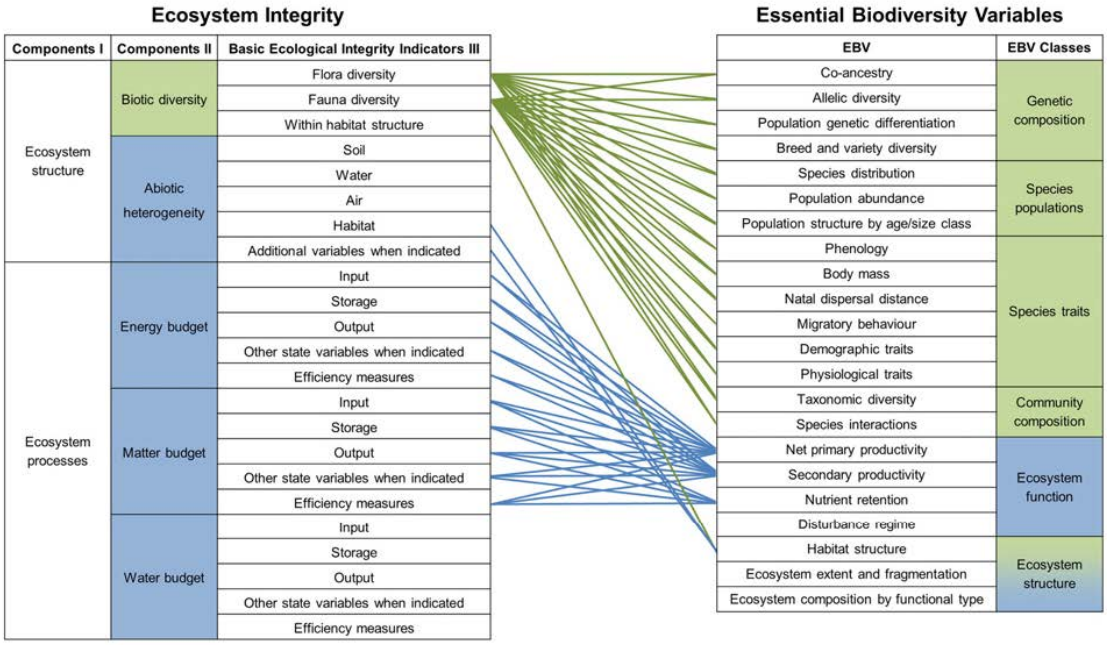

Figure 3 : Ecosystem integrity (EI) concept connected with essential biodiversity variables (EBV). (Figure from Haase et al. 2018)

This was done for the EBV, ECV and EOV list. During the assignment some difficulties occur:

1. The lists are not structured in the same way. While the ECV_athmosphere and ECV_Ocean lists are structured in 4 hierarchy levels, the EBV, ECV_land and EOV lists are structured in only 3. This leads to problems with the merging of the lists.

2. The concept works only limitedly because it is partly not clear what is evaluated as input /output or state variable (Haase et al. 2018). Here water quality variables appear in abiotic heterogeneity (state) and water budget (process). Furthermore, it is unclear whether a process variable is an input or an output. For example, in the

case of heat flow at the ocean/atmosphere interface, the sign decides if it is an input or an output of the ocean. This results in multiple assignments that distort the occurrence of the EI indicators.

In general, the classifications can be seen in Figure 4. Some EI indicators are linked to many variables, such as water storage or matter storage. Others are not represented by any variables, such as water efficiency measurement. The numbers in the indicator boxes show the number of links and thus how strongly they are represented by the variable list. There is a certain imbalance. Here, in relation to the EI concept, the essential variables could be reduced or extended.

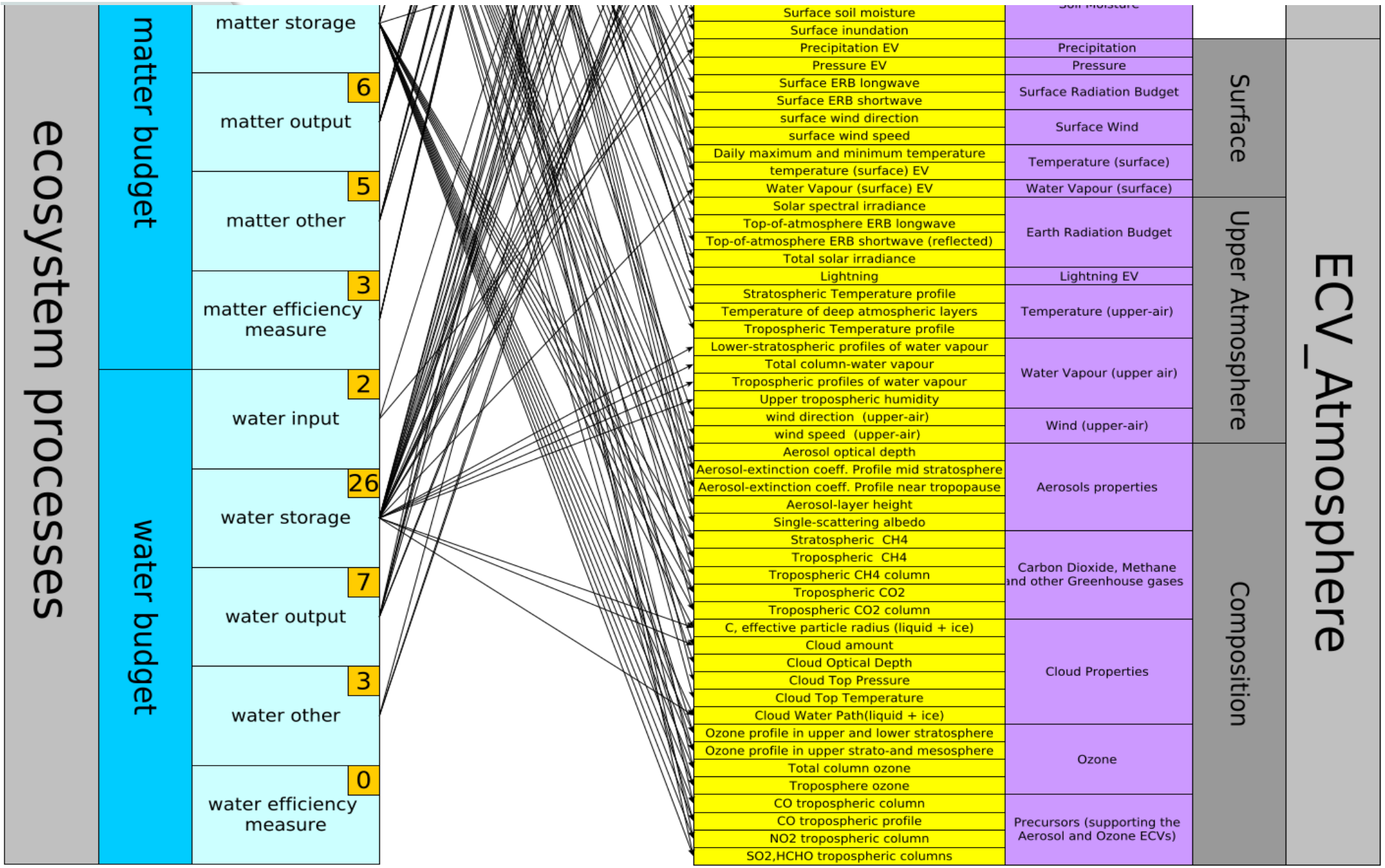

Figure 4: Detail of the EBVs and ECVs connected to the Ecosystem Integrity concept components. The numbers in the indicator box refers to the number of the connections. (Full graph in Figure 8)

Measurement method

The lists of EVs provide detailed information on the measurement methods and sources of the individual variables. This information can be used to further group the variables and find possible overlaps. The measurement method also gives an indication of the effort required to determine this variable. This information is important when choosing which variable could play a greater role in a group.

Table 1: Explanation of the categories for measurement methods as they are used in the meta-data enrichment for the ECVs and EBVs

Category (method)	**Effort, technical implementation, etc.**	**Area**	**Time period**
Remote sensing	Satellite, airborne,	global	regular
Station	Monitoring Station	Point	continues
Observation	Someone goes there and observes	Point	point
Sampling	Someone goes and takes a sample	Point	point
Statistics	Government institutions	Country	continues

Sustainable development goals

Policies such as the Sustainable development goals (SDG) and their Indicators are important landmarks for decision-makers and stakeholders. Earth observing sciences try to provide verifiable data to these indicators. To what extent the selection of EVs fulfils this task is a significant research question. Some of the variables have already been linked to the SDG using models. In this task the attempt was to regroup the variables with the help of the assignment to the SDGs and then possibly to find overlaps and redundancies.

The information on the EVs' links to the SDGs is taken from the Connection GEO project website of the Centre for Research on Ecology and Forestry Applications (CREAF) "eneon.org" and from the GEO (Group on Earth Observations) brochure: "Observations in Service of the 2030 Agenda for Sustainable Development". 62 variables from the list of EBVs and ECVs could be linked to 18 different SDGs. The remaining 62 variables of the 124

elements list could not be assigned. In Figure 8 the elaborated connections for all variables are displayed. Some EVs have many links to the indicators. This applies for example for the variables connected to water in Figure 5. From this one could either conclude that they have more importance or that they are already well understood and provided with powerful models. But this has to be investigated for the variables individually.

In general, it is assumed here that connections are only established if the entire workflow with data collection, quality control, modelling and calculation of the indicator can be demonstrated. This requires a considerable effort for many variables to indicator combinations and is under development in many areas (see also GEOEssential Deliverable 7.1).

During the investigation of the connection graphs of the eneon project, one notices that some EVs depend on other EVs, but are not assigned to an indicator or SDG. These variables are often strongly networked in the graph and could therefore serve as a central element in a grouping process. How strongly a variable is networked could be a further indicator for the relevance of the variable. This means that variables with little or no networking have a high singular information content. Whereby strongly networked variables could possibly be reduced.

In summary, it should be noted that in the following selection processes for essential variable lists, the link to potential indicators should be considered. It should be noted here that this list outlasts the lifecycle of the policies and serves to describe the ecosystem as completely as possible.

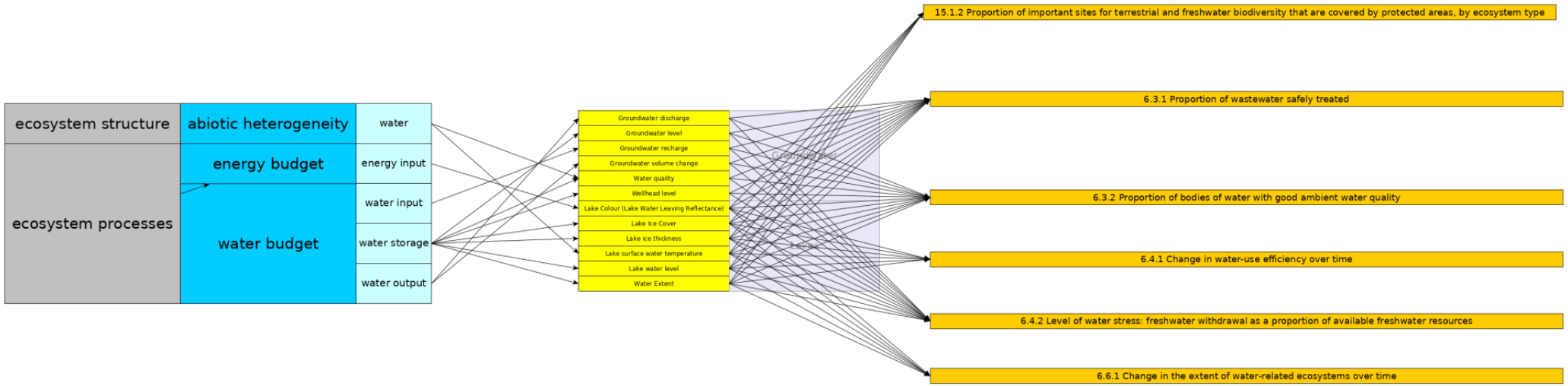

Figure 5: Example EBVs and ECVs connected to the Ecosystem Integrity Concept and the Sustainable Development Goals. (Full graph in Figure 8)

Cross Domain EVs

The cross-domain analysis of data and the identification of new processes as well as the extraction of information will be an important topic in the future. A prerequisite for this is to find out where research domains such as climate research, biodiversity research or ocean research overlap. In order to address this question, an approach based on the overlapping of the lists of the essential variables ECV, EBV and EOV was developed and enriched with further metadata. Variables that play an essential role in several domains and characterize the overlap of the domains can therefore be called cross domain EVs.

Unfortunately, the analysis of the lists did not identify any strong reduction possibilities for cross domain EVs. Only in a few cases a simple overlap of the domains by doubling of variable could be found. Therefore, the lists had to be provided with further information in the form of metadata. The results are presented below.

Discovered Overlaps

Merging the ECVs, EOVs and EBVs results in a list of 293 variables. Direct overlaps are obviously only found in the ocean-related variables. Here, the 35 ECV_ocean variables could be assigned to 102 of the EOVs. These relationships are shown in the Table 2 as examples. The total connections can be found in the Table 5 in the appendix. For example, the ECV “subsurface currents” matches with the OCV “Ocean currents”, which furthermore consists of 6 subvariables. For most of the ECV_ocean there is more than one counterpart in the OCV, that describes the variable in more detail.

Table 2: Examples for the overlaps of the ECV_ocean and the EOVs.(Full list in the appendix)

EV Domain	EV group (normative)	EV	EV Subvariables	EV Domain	EV	EV Subvariables
ECV_Ocean	Physics	Sea Level	Regional Sea Level	EOV	Sea Surface Height (SSH)	sea level extremes
				EOV	Sea Surface Height (SSH)	sea surface height gradients
				EOV	Sea Surface Height (SSH)	tidal range
ECV_Ocean	Physics	Sea State	Wave Height	EOV	Sea State	Significant wave height
				EOV	Sea State	maximum wave height
ECV_Ocean	Physics	Sea Surface Salinity	Sea Surface Salinity	EOV	Sea Surface Salinity (SSS)	Bulk surface salinity
				EOV	Sea Surface Salinity (SSS)	near surface salinity at stated depth
				EOV	Sea Surface Salinity (SSS)	skin surface salinity
ECV_Ocean	Physics	Subsurface Currents	Interior Currents	EOV	Ocean Currents (Subsurface)	3-dimensional velocity components
				EOV	Ocean Currents (Subsurface)	Ekman currents
				EOV	Ocean Currents (Subsurface)	geostrophic velocities
				EOV	Ocean Currents (Subsurface)	quasi-Lagrangian drift
				EOV	Ocean Currents (Subsurface)	speed
				EOV	Ocean Currents (Subsurface)	tidal currents
ECV_Ocean	Physics	Surface Currents	Surface Geostrophic Current	EOV	Surface Currents	Lagrangian drift
				EOV	Surface Currents	Near surface velocity at stated depth
				EOV	Surface Currents	near-surface Ekman currents
				EOV	Surface Currents	Stokes velocity
				EOV	Surface Currents	surface geostrophic velocity
				EOV	Surface Currents	surface speed
				EOV	Surface Currents	tidal currents

The other variables, especially from the biodiversity domain, can only be overlapped with the variables of the other domains with additional information and assumptions. The existence of overlaps is therefore an assumption for now. But a very well-founded one. For example, there will probably be a correlation between the productivity variables of the EBVs (Net primary productivity, Nutrient retention and Secondary productivity) and climate variables of the ECVs such as "Fraction of Absorbed Photosynthetically Active Radiation (FAPAR)" and "Soil Moisture". These correlations can only be found with further metadata enrichment. Such an attempt was made here. As described above, further information such as dimensions and units, assignment to the SDGs and order concepts such as the Ecosystem Integrity Concept have been incorporated. Also by these data no direct overlaps or redundancies occur. It becomes rather obvious that variables can be grouped.

As an example, two ECV with their subvariables are selected in Table 3 and shown with their EI components and the Eneon SDG assignments. It becomes clear that the two variables can be assigned to the water group. And that the connected SDGs are mainly about drinking water quality. The Lake Colour is assigned to the energy budget, but it is also an important indicator for the quality of water in lakes. Therefore, a group drinking water

ECV	EV Subvariables	EV EI Component assingment	EV EI Indicator	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6
Groundwater	Groundwater discharge	water budget	output	6.3.1	6.3.2	6.4.2			
	Groundwater volume change	water budget	output						
	Groundwater recharge	water budget	input						
	Groundwater level	water budget	storage						
	Wellhead level	water budget	storage						
	Water quality	abiotic heterogeneity	water						
Lakes	Lake surface water temperature	abiotic heterogeneity	water				6.4.1	6.6.1	15.1.2
	Lake Ice Cover	water budget	storage						
	Lake ice thickness	water budget	storage						
	Water Extent	water budget	storage						
	Lake water level	water budget	storage						
	Lake Colour (Lake Water Leaving Reflectance)	energy budget	input						
Goal 6. Ensure availability and sustainable management of water and sanitation for all									
6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally									
6.3.1 Proportion of wastewater safely treated									
6.3.2 Proportion of bodies of water with good ambient water quality									
6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity									
6.4.1 Change in water-use efficiency over time									
6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources									
6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes									
6.6.1 Change in the extent of water-related ecosystems over time									
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss									
15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements									
15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type									

Table 3: Example for the connection of some ECVs to the SDGs (from eneon.org graph) and the Ecosystem Integrity Concept. Also, the relevant SDGs are listed here.

budget and quality could be identified here. If further EV lists with the metadata are available, further variables would probably be assigned to this group, too.

Therefore, cross domain EVs are expected to be in the form of higher-level groups rather than concrete variables. This is partly due to the differences in how the individual communities designed the lists. If there would be a standard, harmonisation and linking would certainly be easier.

Finding EVs with higher importance related to the SDGs

As already described above, when investigating the existing links of the EVs to the SDGs, individual variables were noticed. These variables are already linked to many SDG indicators and partly to other variables. These are usually semantic links such as "determined by", "derived from" or "measured by". The links of EVs to SDG indicators should generally be calculation models. They determine the indicator from a measure through one or more models.

The assumption here is that on the one hand these variables are better understood and therefore good models exist. And on the other hand, these variables are of great

importance for the SDGs and for humanity and are therefore measured and evaluated with more effort.

Table 4 shows some variables from the combined EBV and ECV lists. Only those variables are selected which are connected to at least 2 SDG indicators. According to the current status these variables can therefore be regarded as particularly relevant. The complete list with all assignments to the SDGs can be found in the appendix under Table 6. In the Table 4 it is noticeable that some variables are even linked with up to 6 indicators. Here, a particularly high relevance of the underlying ecosystem for humans can be assumed. These are in particular drinking water sources such as lakes, rivers and groundwater. But land use and biodiversity also play a major role. This is particularly visible in the spread of land degradation, for example through fire, changes in the ecosystem structure and genetic composition.

It should be emphasized again that linking EVs with SDG indicators is a process that has only just begun. If further data and connections are available in the future, the prioritization of relevance can change significantly. Thus, the list presented here is only a snapshot and is intended to illustrate the concept used here.

Table 4: EVs from ECV and EBV with at least 2 assignments to the SDGs (from eneon.org graph). With a list of the used SDGs

EV Domain	EV	EV Subvariables	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	connected with
ECV_Land	Lakes	Lake Colour (Lake Water Leaving Reflectance)	6.6.1	6.3.1	6.3.2	6.4.1	6.4.2	15.1.2	
		Lake Ice Cover							
		Lake ice thickness							
		Lake surface water							
		Lake water level							
		Water Extent							
ECV_Land	Land cover	Land cover	2.4.1	6.6.1	15.1.1	15.1.2	15.3.1		derived from habitat structure, extracted from Forest(LC)
		Land Use							
EBV	Ecosystem structure	Ecosystem extent and fragmentation	15.3.1	15.1.2	6.6.1	15.1.1			derived from habitat structure
ECV_Land	River Discharge	Cross-section	6.3.1	6.3.2	6.4.2	6.6.1			
		Flow Velocity							
		River discharge							
		Water Level							
ECV_Land	Groundwater	Groundwater discharge	6.3.1	6.3.2	6.4.2				
		Groundwater level							
		Groundwater recharge							
		Groundwater volume							
		Water quality							
		Wellhead level							
ECV_Land	Fire	Active fire maps	15.1.1	15.3.1					derived from disturbance regime
		Burnt Areas							
		Fire radiative power							
EBV	Genetic composition	Allelic diversity	15.5.1	2.5.1					
		Breed and variety	2.5.2						
ECV_Atmosphere	Precipitation		6.4.2	6.5.1					

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

2.4.1 Proportion of agricultural area under productive and sustainable agriculture

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

2.5.1 Number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities

2.5.2 Proportion of local breeds classified as being at risk, not at risk or at unknown level of risk of extinction

Goal 6. Ensure availability and sustainable management of water and sanitation for all

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.3.1 Proportion of wastewater safely treated

6.3.2 Proportion of bodies of water with good ambient water quality

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.4.1 Change in water-use efficiency over time

6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources

6.5 By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.5.1 Degree of integrated water resources management implementation (0–100)

6.6 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.6.1 Change in the extent of water-related ecosystems over time

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

15.1 By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

15.1.1 Forest area as a proportion of total land area

15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type

15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

15.3.1 Proportion of land that is degraded over total land area

15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species

15.5.1 Red List Index

Conclusion and outlook

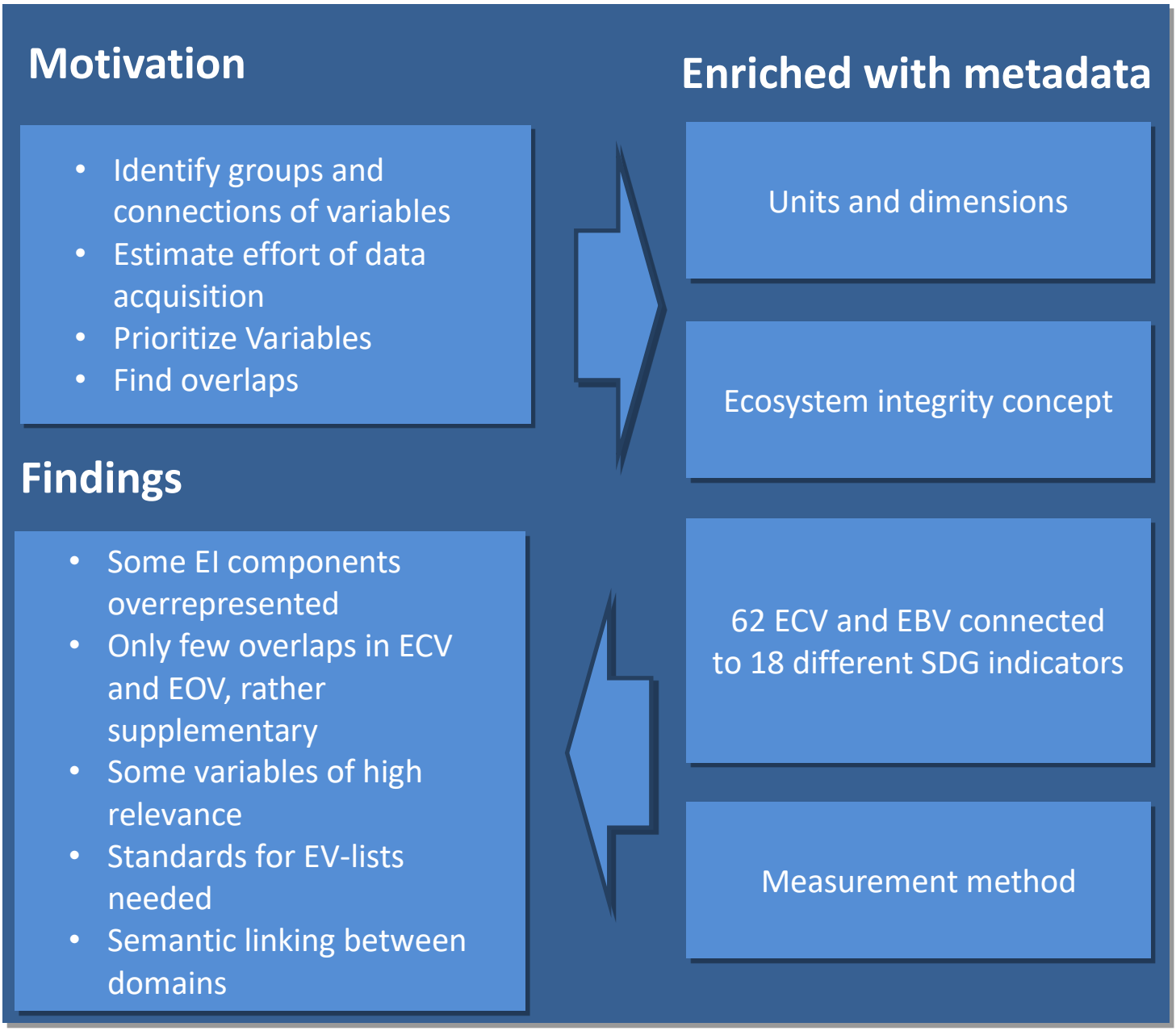

Figure 6: List of the metadata added to the ECV and EBV lists together with the motivations and findings.

The objective of Task 3.2 is to identify cross-domain EVs. As described at the beginning, the approach of combining and enriching the EV lists was chosen. This was demonstrated with the EBV, ECV and EOV lists as examples.

As shown in the Figure 6, the lists were enriched with assignments to the Ecosystem Integrity Concept, Units and Dimensions, Connections to the SDGs and measurement method. The goal here is the identification of overlaps, groups, connections and effort of data acquisition. By that cross-domain EVs should be found and possibly variables can be prioritized.

Direct overlaps could be found with restrictions only between ECV_ocean and EOV. The selection of the variables of the 3 lists is primarily a supplement to each other. However, the metadata can be used to **identify groups or variables with particularly high relevance for humans**.

When examining the individual lists, differences in the definition of the lists between the domains were noticed. Here, **standards for EV lists would be a good way to improve the linkeability of the lists and the comparability of the data**. This is especially true for variables indicating concentrations. The problems encountered here are described above. However, when standards are introduced, the consistency of the existing list must be maintained.

In some other scientific communities, further harmonisations in the form of EV lists are in process. These are for example "Essential Water Variables", "Essential Agriculture Variables", "Essential Renewable Energy Variables", "Essential Soil Variables" and "Essential Social Variables". Here, direct overlapping with other domains should be avoided in the definition. The existing lists could serve here as a quasi-standard to enable consistency and cross-linking. Otherwise these lists always remain very specific for the domains.

In the future, **a semantic linking between the lists would be possible**. Then, for example, "flora trait phenology" (EBV) could be linked to "Marine Habitat Properties" (ECV ocean) as a specialization. "Marine Habitat Properties" could then be specified in 3 variables from EOV "Mangrove", " Seagrass" and "Macroalgal". This would allow the domains to be linked to each other and the overlaps or cross-domain areas to be integrated and visible in the lists.

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Projectwebside Connecting GEO, Centre for Research on Ecology and Forestry Applications (CREAF),

Appendix:

ECV_ocean and EOV: Overlaps

Table 5: full List of the ECV_ocean overlaping with the EOVs

EV group (normative)	EV	EV Subvariables	EV Domain	EV	EV Subvariables
Biochemistry	Inorganic Carbon	Interior ocean carbon storage. At least 2 of: Dissolved Inorganic Carbon (DIC), Total Alkalinity (TA) or pH	EOV	Inorganic Carbon	pH
Biochemistry	Inorganic Carbon	pCO2 (to provide Air-sea flux of CO2)	EOV	Inorganic Carbon	Partial pressure of carbo (pCO2)
Biochemistry	Nitrous Oxide	Interior ocean N2O	EOV	Nitrous Oxide	Nitrous Oxide (N2O)
Biochemistry	Nitrous Oxide	N2O air-sea flux			
Biochemistry	Nutrients	Interior ocean Concentrations of silicate, phosphate, nitrate	EOV	Nutrients	Ammonium (NH4)
			EOV	Nutrients	Nitrate (NO3-)
			EOV	Nutrients	Nitrite (NO2-)
			EOV	Nutrients	Phosphate (PO4)
			EOV	Nutrients	Silicic acid (Si(OH)4)
Biochemistry	Ocean Colour	Chlorophyll-a Concentration	EOV	Phytoplankton biomass and diversity	Pigment concentration b spectrophotometry (chl b, HPLC pigments)
Biochemistry	Ocean Colour	Water Leaving Radiance	EOV	Ocean Colour	under development
Biochemistry	Oxygen	Interior ocean Oxygen concentration	EOV	Oxygen	Dissolved Oxygen (O2)
Biochemistry	Transient Tracers	Interior ocean 39Ar	EOV	Transient Tracers	39Ar
Biochemistry	Transient Tracers	Interior ocean 14C	EOV	Transient Tracers	14C
Biochemistry	Transient Tracers	Interior ocean 3He	EOV	Transient Tracers	3He
Biochemistry	Transient Tracers	Interior ocean CFC-11	EOV	Transient Tracers	Chlorofluorocarbons (CF 11, CFC-113, CCl4)
Biochemistry	Transient Tracers	Interior ocean CFC-12	EOV	Transient Tracers	Chlorofluorocarbons (CF 11, CFC-113, CCl4)
Biochemistry	Transient Tracers	Interior ocean SF6	EOV	Transient Tracers	Sulphur hexafluoride (SF
Biochemistry	Transient Tracers	Interior ocean tritium	EOV	Transient Tracers	tritium
Biology/Ecosystems	Marine Habitat Properties	Coral Reefs	EOV	Live coral	Live coral cover and are
Biology/Ecosystems	Marine Habitat Properties	Mangrove Forests, Seagrass Beds, Macroalgal Communities	EOV	Mangrove cover	Canopy height and trunk
			EOV	Mangrove cover	Intertidal fish and invert densities
			EOV	Mangrove cover	Mangrove fringe width a
			EOV	Mangrove cover	Mangrove tree species composition and zonatio
			EOV	Mangrove cover	Sediment and water col respiration
			EOV	Mangrove cover	Soil profile, carbon/nutr content, and C14 age
			EOV	Mangrove cover	Tree, algae, and phytopl primary production

EV group (normative)	EV	EV Subvariables	EV Domain	EV	EV Subvariables
Biology/Ecosystems	Plankton	Phytoplankton	EOV	Phytoplankton biomass and diversity	Diversity/Taxonomy
			EOV	Phytoplankton biomass and diversity	Genomic information
			EOV	Phytoplankton biomass and diversity	In vitro/In vivo pigment fluorescence
			EOV	Phytoplankton biomass and diversity	Pigment concentration spectrophotometry (chl b, HPLC pigments)
			EOV	Phytoplankton biomass and diversity	Presence/Absence/Rela Abundance
			EOV	Phytoplankton biomass and diversity	Spectral reflectance (oc color/remote sensing m
Biology/Ecosystems	Plankton	Zoo plankton	EOV	Zooplankton biomass and diversity	biomass or abundance (presence/absence) by ta
			EOV	Zooplankton biomass and diversity	functional group or size
Physics	Ocean Surface Heat Flux	Latent Heat Flux	EOV	Ocean Surface Heat Flux	Latent heat flux
Physics	Ocean Surface Heat Flux	Sensible Heat Flux	EOV	Ocean Surface Heat Flux	Sensible heat flux
			EOV	Ocean Surface Heat Flux	albedo
			EOV	Ocean Surface Heat Flux	downward longwave ra
			EOV	Ocean Surface Heat Flux	downward shortwave ra
			EOV	Ocean Surface Heat Flux	net longwave radiation
			EOV	Ocean Surface Heat Flux	net short wave radiation
			EOV	Ocean Surface Heat Flux	photosynthetically avail radiation
			EOV	Ocean Surface Heat Flux	upward longwave radiat
			EOV	Ocean Surface Heat Flux	upward shortwave radia
Physics	Sea Level	Global Mean Sea Level	EOV	Sea Surface Height (SSH)	Sea level anomaly
Physics	Sea Level	Regional Sea Level	EOV	Sea Surface Height (SSH)	sea level extremes
			EOV	Sea Surface Height (SSH)	sea surface height gradi
			EOV	Sea Surface Height (SSH)	tidal range
Physics	Sea State	Wave Height	EOV	Sea State	Significant wave height
			EOV	Sea State	maximum wave height
Physics	Sea Surface Salinity	Sea Surface Salinity	EOV	Sea Surface Salinity (SSS)	Bulk surface salinity
			EOV	Sea Surface Salinity (SSS)	near surface salinity at s depth
			EOV	Sea Surface Salinity (SSS)	skin surface salinity
Physics	Subsurface Currents	Interior Currents	EOV	Ocean Currents (Subsurface)	3-dimensional velocity d
			EOV	Ocean Currents (Subsurface)	Ekman currents
			EOV	Ocean Currents (Subsurface)	geostrophic velocities
			EOV	Ocean Currents (Subsurface)	quasi-Lagrangian drift
			EOV	Ocean Currents (Subsurface)	speed
			EOV	Ocean Currents (Subsurface)	tidal currents
Physics	Surface Currents	Surface Geostrophic Current	EOV	Surface Currents	Lagrangian drift
			EOV	Surface Currents	Near surface velocity at

EV group (normative)	EV	EV Subvariables	EV Domain	EV	EV Subvariables
Physics	Sea Ice	Sea Ice Concentration	EOV	Sea Ice	ice concentration
Physics	Sea Ice	Sea Ice Drift	EOV	Sea Ice	ice motion
Physics	Sea Ice	Sea Ice Extent/Edge	EOV	Sea Ice	Ice extent and area
Physics	Sea Ice	Sea Ice Thickness	EOV	Sea Ice	ice thickness
			EOV	Sea Ice	fast ice
			EOV	Sea Ice	ice salinity
			EOV	Sea Ice	snow cover thickness
			EOV	Sea Ice	surface freeze-up and m
			EOV	Sea Ice	ice type (first year, mult
			EOV	Sea Ice	melt pond coverage
Physics	Sea Surface Temperature	Sea Surface Temperature	EOV	Sea Surface Temperature (SST)	bulk SST
			EOV	Sea Surface Temperature (SST)	near surface temperatu depth
			EOV	Sea Surface Temperature (SST)	Skin SST
			EOV	Sea Surface Temperature (SST)	subskin SST
Physics	Subsurface Salinity	Interior Salinity	EOV	Subsurface Salinity	bulk SSS
			EOV	Subsurface Salinity	Foundation
Physics	Subsurface Temperature	Interior Temperature	EOV	Subsurface Temperature	Bulk SST
			EOV	Subsurface Temperature	Foundation SST

Table ECV, EBV and EOV: units, dimensions, measurement method, Ecosystem Integrity concept, Sustainable Development Goals Indicators, Scientific Domain

Table 6: ful list of EBV, ECV and EOV with all metadata

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EBV		Community composition	Species interactions			Biotic diversity	within habitat structure	Biology	x							Sample
EBV		Community composition	Taxonomic diversity			Biotic diversity	within habitat structure	Biology	x							Sample
EBV		Ecosystem function	Disturbance regime			abiotic heterogeneity	habitat	Biology	x						derived from Surface Speed and Direction, Wind Speed and Direction Upper, Sea Surface Temperature, Sea Surface Salinity, Lightning, Fire	
EBV		Ecosystem function	Net primary productivity	rate	kg s^-1 or mol kg^-1	Matter budget	output	Biology	15.4.2						Disturbance measured by Leaf Area Index, derived from Above Ground Biomass, FAPAR	Remote Sensing
EBV		Ecosystem function	Nutrient retention	Concentration	mol kg^-1 or mol l^-1 (kg m^-3)	Matter budget	efficiency measure	Chemistry	x						derived from soil carbon	Remote Sensing; Station
EBV		Ecosystem function	Secondary productivity	mass/time	kg s^-1	Matter budget	output	Biology	x						derived from Leaf Area Index, Above Ground Biomass, FAPAR	Sample
EBV		Ecosystem structure	Ecosystem composition by functional type			Biotic diversity	within habitat structure	Biology	x							Observation
EBV		Ecosystem structure	Ecosystem extent and fragmentation	area	m^2	Biotic diversity	within habitat structure	Biology	15.3.1	15.1.2	6.6.1	15.1.1			derived from habitat structure	Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EBV		Ecosystem structure	Habitat structure			Biotic diversity	within habitat structure	Biology	15.3.1						derived from Ecosystem extent and fragmentation, Land Cover	Remote Sensing
EBV		Genetic composition	Allelic diversity			Biotic diversity	within habitat structure	Biology	15.5.1	2.5.1						Sample
EBV		Genetic composition	Breed and variety diversity			Biotic diversity	within habitat structure	Biology	2.5.2	2.5.1						Sample
EBV		Genetic composition	Co-ancestry			Biotic diversity	within habitat structure	Biology	x							Sample
EBV		Genetic composition	Population genetic differentiation			Biotic diversity	within habitat structure	Biology	15.5.1							Sample
EBV		Species populations	Population abundance	count		Biotic diversity	within habitat structure	Biology	x							Sample
EBV		Species populations	Population structure by age/size class	count or biomass		Biotic diversity	within habitat structure	Biology	x							Observation
EBV		Species populations	Species distribution			Biotic diversity	within habitat structure	Biology	x							Observation
EBV		Species traits	Body mass			Biotic diversity	fauna diversity	Biology	15.7.1							Sample
EBV		Species traits	Demographic traits			Biotic diversity	fauna diversity	Biology	15.7.1							Sample
EBV		Species traits	Migratory behavior			Biotic diversity	fauna diversity	Biology	x							Observation
EBV		Species traits	Natal dispersion distance			Biotic diversity	fauna diversity	Biology	x							Observation
EBV		Species traits	Phenology	timing or date		Biotic diversity	fauna diversity	Biology	x							Observation
EBV		Species traits	Physiological traits			Biotic diversity	fauna diversity	Biology	x							Observation
ECV_Atmosphere	Composition	Aerosols properties	Aerosol optical depth	extinction		energy budget	other	Physics	3.9.1							Remote Sensing
ECV_Atmosphere	Composition	Aerosols properties	Aerosol-extinction coeff. Profile mid stratosphere	extinction		energy budget	other	Physics	3.9.1							Remote Sensing
ECV_Atmosphere	Composition	Aerosols properties	Aerosol-extinction coeff. Profile near tropopause	extinction		energy budget	other	Physics	3.9.1							Remote Sensing
ECV_Atmosphere	Composition	Aerosols properties	Aerosol-layer height	length	m	energy budget	other	Physics	3.9.1							Remote Sensing
ECV_Atmosphere	Composition	Aerosols properties	Single-scattering albedo	flux fraction		energy budget	other	Physics	3.9.1							Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Atmosphere	Composition	Carbon Dioxide, Methane and other Greenhouse gases	Stratospheric CH4	concentration	mol mol^⁻1	energy budget	other	Chemistry	7.1.2							Remote Sensing
ECV_Atmosphere	Composition	Carbon Dioxide, Methane and other Greenhouse gases	Tropospheric CH4	concentration	mol mol^⁻1	energy budget	other	Chemistry	7.1.2							Remote Sensing
ECV_Atmosphere	Composition	Carbon Dioxide, Methane and other Greenhouse gases	Tropospheric CH4 column	molecules/area	mol m^-2	energy budget	input	Chemistry	7.1.2							Remote Sensing
ECV_Atmosphere	Composition	Carbon Dioxide, Methane and other Greenhouse gases	Tropospheric CO2	concentration	mol mol^⁻1	energy budget	other	Chemistry	7.1.2							Remote Sensing
ECV_Atmosphere	Composition	Carbon Dioxide, Methane and other Greenhouse gases	Tropospheric CO2 column	molecules/area	mol m^-2	energy budget	input	Chemistry	7.1.2							Remote Sensing
ECV_Atmosphere	Composition	Cloud Properties	C, effective particle radius (liquid + ice)	length	m	water budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Composition	Cloud Properties	Cloud amount	scalar		water budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Composition	Cloud Properties	Cloud Optical Depth	extinction		energy budget	other	Physics	x							Remote Sensing
ECV_Atmosphere	Composition	Cloud Properties	Cloud Top Pressure	force/area	kg m^-1 s^-2	energy budget	input	Physics	x							Remote Sensing
ECV_Atmosphere	Composition	Cloud Properties	Cloud Top Temperature	temperture	K	energy budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Composition	Cloud Properties	Cloud Water Path(liquid + ice)	mass/area	kg m^-2	water budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Composition	Ozone	Ozone profile in upper and lower stratosphere	concentration	mol mol^⁻1	energy budget	other	Chemistry	x							Remote Sensing
ECV_Atmosphere	Composition	Ozone	Ozone profile in upper strato-and mesosphere	concentration	mol mol^⁻1	energy budget	other	Chemistry	x							Remote Sensing
ECV_Atmosphere	Composition	Ozone	Total column ozone	molecules/area	mol m^-2	energy budget	input	Chemistry	x							Remote Sensing
ECV_Atmosphere	Composition	Ozone	Troposphere ozone	concentration	mol mol^⁻1	energy budget	other	Chemistry	x							Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Atmosphere	Composition	Precursors (supporting the Aerosol and Ozone ECVs)	CO tropospheric column	molecules/area	mol m^-2	energy budget	input	Chemistry	x							Remote Sensing
ECV_Atmosphere	Composition	Precursors (supporting the Aerosol and Ozone ECVs)	CO tropospheric profile	concentration	mol mol^⁻1	energy budget	other	Chemistry	x							Remote Sensing
ECV_Atmosphere	Composition	Precursors (supporting the Aerosol and Ozone ECVs)	NO2 tropospheric column	molecules/area	mol m^-2	energy budget	input	Chemistry	x							Remote Sensing
ECV_Atmosphere	Composition	Precursors (supporting the Aerosol and Ozone ECVs)	SO2,HCHO tropospheric columns	molecules/area	mol m^-2	energy budget	input	Chemistry	x							Remote Sensing
ECV_Atmosphere	Surface	Precipitation		volume/area	L m^-2	water budget	input	Physics	6.4.2	6.5.1						Station
ECV_Atmosphere	Surface	Pressure		force/area	kg m^-1 s^-2	abiotic heterogeneity	air	Physics	x							Station
ECV_Atmosphere	Surface	Surface Radiation Budget	Surface ERB longwave	flux	W m^-2	energy budget	input	Physics	13.2.1							Station
ECV_Atmosphere	Surface	Surface Radiation Budget	Surface ERB shortwave	flux	W m^-2	energy budget	input	Physics	13.2.1							Station
ECV_Atmosphere	Surface	Surface Wind	surface wind direction	angle	rad	abiotic heterogeneity	air	Physics	x						derived from disturbance regime	Remote Sensing
ECV_Atmosphere	Surface	Surface Wind	surface wind speed	velocity	m s^-2	energy budget	input	Physics	x						derived from disturbance regime	Remote Sensing
ECV_Atmosphere	Surface	Temperature (surface)	Daily maximum and minimum temperature	temperature	K	energy budget	storage	Physics	x							Station
ECV_Atmosphere	Surface	Temperature (surface)	temperature (surface)	temperature	K	energy budget	storage	Physics	x							Station
ECV_Atmosphere	Surface	Water Vapour (surface)		concentration		water budget	storage	Physics	x							Station
ECV_Atmosphere	Upper Atmosphere	Earth Radiation Budget	Solar spectral irradiance	flux/wavelength	W m^−2 s	energy budget	input	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Earth Radiation Budget	Top-of-atmosphere ERB longwave	flux	W m^-2	energy budget	input	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Earth Radiation Budget	Top-of-atmosphere ERB shortwave (reflected)	flux	W m^-2	energy budget	input	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Earth Radiation Budget	Total solar irradiance	flux	W m^-2	energy budget	input	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Lightning		count		abiotic heterogeneity	air	Physics	x						derived from disturbance regime	Station

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Atmosphere	Upper Atmosphere	Temperature (upper-air)	Stratospheric Temperature profile	temperature	K	energy budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Temperature (upper-air)	Temperature of deep atmospheric layers	temperature	K	energy budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Temperature (upper-air)	Tropospheric Temperature profile	temperature	K	energy budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Water Vapour (upper air)	Lower-stratospheric profiles of water vapour	concentration	kg m^-3 or %	water budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Water Vapour (upper air)	Total column-water vapour	concentration	kg m^-2 or %	water budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Water Vapour (upper air)	Tropospheric profiles of water vapour	concentration	kg m^-3 or %	water budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Water Vapour (upper air)	Upper tropospheric humidity	concentration	%	water budget	storage	Physics	x							Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Wind (upper-air)	wind direction (upper-air)	angle	rad	energy budget	storage	Physics	x						derived from disturbance regime	Remote Sensing
ECV_Atmosphere	Upper Atmosphere	Wind (upper-air)	wind speed (upper-air)	velocity	m s^-2	energy budget	storage	Physics	x						derived from disturbance regime	Remote Sensing
ECV_Land		Above-ground biomass		mass/area	kg m^-2	energy budget	output	Biology	15.4.2						derived from Secondary productivity, Net primary productivity	Remote Sensing
ECV_Land		Albedo	bi-hemispherical reflectance	flux fraction		energy budget	input	Physics	13.2.1							Remote Sensing
ECV_Land		Albedo	directional-hemispherical reflectance	flux fraction		energy budget	input	Physics	13.2.1							Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Land		Anthropogenic Greenhouse Gas Fluxes	Emissions from fossil fuel use, industry, agriculture and waste sectors.	mass	kg	matter budget	output	Chemistry	x							Statistics
ECV_Land		Anthropogenic Greenhouse Gas Fluxes	Emissions/ removals by IPCC land categories	mass	kg	matter budget	output	Chemistry	x							Statistics
ECV_Land		Anthropogenic Greenhouse Gas Fluxes	Estimated fluxes by inversions of observed atmospheric composition - continental	flux	m^3 m^-2 s^-1	matter budget	other	Chemistry	x							Remote Sensing
ECV_Land		Anthropogenic Greenhouse Gas Fluxes	Estimated fluxes by inversions of observed atmospheric composition - national	flux	m^3 m^-2 s^-1	matter budget	other	Chemistry	x							Remote Sensing
ECV_Land		Anthropogenic Greenhouse Gas Fluxes	Hi-res CO2 column concentrations to monitor point sources	molecules/area	mol m^-2	matter budget	input	Chemistry	x							Remote Sensing
ECV_Land		Anthropogenic Water Use		volume	m^3	water budget	output	Physics	6.4.1							Statistics
ECV_Land		Fire	Active fire maps	area	m^2	abiotic heterogeneity	soil	Physics	15.1.1	15.3.1					derived from disturbance regime	Remote Sensing
ECV_Land		Fire	Burnt Areas	area	m^2	abiotic heterogeneity	soil	Physics	15.1.1	15.3.1					derived from disturbance regime	Remote Sensing
ECV_Land		Fire	Fire radiative power	flux	W m^-2	energy budget	output	Physics	15.1.1	15.3.1					derived from disturbance regime	Remote Sensing
ECV_Land		Fraction of Absorbed Photosynthetically Active Radiation (FAPAR)	maps of FAPAR for adaptation	flux fraction		energy budget	input	Physics	15.4.2						derived from Secondary productivity, Net primary productivity	Remote Sensing
ECV_Land		Fraction of Absorbed Photosynthetically Active Radiation (FAPAR)	maps of FAPAR for modelling	flux fraction		energy budget	input	Physics	15.4.2						derived from Secondary productivity, Net primary productivity	Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Land		Glaciers	Glacier area	area	m^2	water budget	storage	Physics	6.6.1							Remote Sensing
ECV_Land		Glaciers	Glacier elevation change	length	m	water budget	storage	Physics	6.6.1							Remote Sensing
ECV_Land		Glaciers	Glacier mass change	mass	kg	water budget	output	Physics	6.6.1							Remote Sensing
ECV_Land		Groundwater	Groundwater discharge	volume	m^3	water budget	output	Physics	6.3.1	6.3.2	6.4.2					Station
ECV_Land		Groundwater	Groundwater level	length	m	water budget	storage	Physics	6.3.1	6.3.2	6.4.2					Station
ECV_Land		Groundwater	Groundwater recharge	volume	m^3	water budget	input	Physics	6.3.1	6.3.2	6.4.2					Station
ECV_Land		Groundwater	Groundwater volume change	volume	m^3	water budget	output	Physics	6.3.1	6.3.2	6.4.2					Station
ECV_Land		Groundwater	Water quality	composition		abiotic heterogeneity	water	Chemistry	6.3.1	6.3.2	6.4.2					Sample
ECV_Land		Groundwater	Wellhead level	length	m	water budget	storage	Physics	6.3.1	6.3.2	6.4.2					Station
ECV_Land		Heat fluxes	Latent Heat flux	flux	W m^-2	energy budget	output	Physics	k.a.							Station
ECV_Land		Heat fluxes	Sensible Heat flux	flux	W m^-2	energy budget	output	Physics	k.a.							Station
ECV_Land		Ice Sheets and ice shelves	Grounding line location and thickness	length	m	water budget	storage	Physics	6.6.1							Remote Sensing
ECV_Land		Ice Sheets and ice shelves	Ice mass change	mass	kg	water budget	output	Physics	6.6.1							Remote Sensing
ECV_Land		Ice Sheets and ice shelves	Ice velocity	velocity	m s^-2	water budget	other	Physics	6.6.1							Remote Sensing
ECV_Land		Ice Sheets and ice shelves	Surface Elevation Change	length	m	water budget	storage	Physics	6.6.1							Remote Sensing
ECV_Land		Lakes	Lake Colour (Lake Water Leaving Reflectance)	flux fraction	(W m^-2)/(W m^-2)	energy budget	input	Physics	6.6.1	6.3.1	6.3.2	6.4.1	6.4.2	15.1.2		Remote Sensing
ECV_Land		Lakes	Lake Ice Cover	area	m^2	water budget	storage	Physics	6.6.1	6.3.1	6.3.2	6.4.1	6.4.2	15.1.2		Remote Sensing
ECV_Land		Lakes	Lake ice thickness	length	m	water budget	storage	Physics	6.6.1	6.3.1	6.3.2	6.4.1	6.4.2	15.1.2		Remote Sensing
ECV_Land		Lakes	Lake surface water temperature	temperature	K	abiotic heterogeneity	water	Physics	6.6.1	6.3.1	6.3.2	6.4.1	6.4.2	15.1.2		Remote Sensing
ECV_Land		Lakes	Lake water level	length	m	water budget	storage	Physics	6.6.1	6.3.1	6.3.2	6.4.1	6.4.2	15.1.2		Remote Sensing
ECV_Land		Lakes	Water Extent	length	m	water budget	storage	Physics	6.6.1	6.3.1	6.3.2	6.4.1	6.4.2	15.1.2		Remote Sensing
ECV_Land		Land cover	Land cover	class		abiotic heterogeneity	Habitats	Physics	2.4.1	6.6.1	15.1.1	15.1.2	15.3.1		derived from habitat structure, extracted from Forest(LC)	Remote Sensing
ECV_Land		Land cover	Land Use	class		abiotic heterogeneity	Habitats	Physics	2.4.1	6.6.1	15.1.1	15.1.2	15.3.1		derived from habitat structure, extracted from Forest(LC)	Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Land		Land Surface Temperature	Land Surface Temperature	temperature	K	energy budget	storage	Physics	x							Remote Sensing
ECV_Land		Leaf Area Index (LAI)	Leaf Area Index (LAI)	index		energy budget	input	Physics	15.4.2						derived from Secondary productivity, Net primary productivity	Remote Sensing
ECV_Land		Permafrost	Active Layer Thickness	length	m	energy budget	storage	Physics	x							Station
ECV_Land		Permafrost	Thermal State of Permafrost	temperature	K	energy budget	storage	Physics	x							Station
ECV_Land		River Discharge	Cross-section	area	m^2	water budget	storage	Physics	6.3.1	6.3.2	6.4.2	6.6.1				Observation
ECV_Land		River Discharge	Flow Velocity	velocity	m s^-1	water budget	output	Physics	6.3.1	6.3.2	6.4.2	6.6.1				Station
ECV_Land		River Discharge	River discharge	volume	m^3	water budget	output	Physics	6.3.1	6.3.2	6.4.2	6.6.1				Station
ECV_Land		River Discharge	Water Level	length	m	water budget	storage	Physics	6.3.1	6.3.2	6.4.2	6.6.1				Station
ECV_Land		Snow	Area covered by snow	area	m^2	water budget	storage	Physics	6.6.1							Remote Sensing
ECV_Land		Snow	snow depth	length	m	water budget	storage	Physics	6.6.1							Station
ECV_Land		Snow	snow water equivalent	volume	m^3	water budget	storage	Physics	6.6.1							Station
ECV_Land		Soil Carbon	%Carbon in soil	concentration		matter budget	storage	Chemistry	15.3.1						derived from nutrient retention	Sample
ECV_Land		Soil Carbon	Mineral soil bulk density to 30 cms and 1m	density	kg m^-3	abiotic heterogeneity	soils	Physics	15.3.1						derived from nutrient retention	Sample
ECV_Land		Soil Carbon	Peatlands total depth of profile, area and location			abiotic heterogeneity	soils	Physics	15.3.1						derived from nutrient retention	Remote Sensing
ECV_Land		Soil Moisture	Freeze/thaw	date		abiotic heterogeneity	soils	Physics	x							Station
ECV_Land		Soil Moisture	Root-zone soil moisture	concentration		water budget	storage	Physics	x							Sample
ECV_Land		Soil Moisture	Surface inundation	count and date		abiotic heterogeneity	soils	Physics	x							Remote Sensing
ECV_Land		Soil Moisture	Surface soil moisture	concentration		water budget	storage	Physics	x							Remote Sensing
ECV_Ocean	Biochemistry	Inorganic Carbon	Interior ocean carbon storage. At least 2 of: Dissolved Inorganic Carbon (DIC), Total Alkalinity (TA) or pH			matter budget	storage	Chemistry								Sample
ECV_Ocean	Biochemistry	Inorganic Carbon	pCO2 (to provide Air-sea flux of CO2)	pressure	N m^-2	matter budget	output	Chemistry								Sample
ECV_Ocean	Biochemistry	Nitrous Oxide	Interior ocean N2O	concentration	mol m^-3	matter budget	storage	Chemistry								Sample
ECV_Ocean	Biochemistry	Nitrous Oxide	N2O air-sea flux	flux	mol m^2 s^-1	matter budget	output	Chemistry								Sample

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Ocean	Biochemistry	Nutrients	Interior ocean Concentrations of silicate, phosphate, nitrate	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
ECV_Ocean	Biochemistry	Ocean Colour	Chlorophyll-a Concentration	concentration	kg m^-3	matter budget	output	Chemistry								Sample
ECV_Ocean	Biochemistry	Ocean Colour	Water Leaving Radiance	flux	W sr^-1 m^-2	energy budget	input	Physics								Remote Sensing
ECV_Ocean	Biochemistry	Oxygen	Interior ocean Oxygen concentration	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
ECV_Ocean	Biochemistry	Transient Tracers	Interior ocean 39Ar	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
ECV_Ocean	Biochemistry	Transient Tracers	Interior ocean 14C	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
ECV_Ocean	Biochemistry	Transient Tracers	Interior ocean 3He	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
ECV_Ocean	Biochemistry	Transient Tracers	Interior ocean CFC-11	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
ECV_Ocean	Biochemistry	Transient Tracers	Interior ocean CFC-12	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
ECV_Ocean	Biochemistry	Transient Tracers	Interior ocean SF6	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
ECV_Ocean	Biochemistry	Transient Tracers	Interior ocean tritium	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
ECV_Ocean	Biology/Ecosystems	Marine Habitat Properties	Coral Reefs	area	m^2	abiotic heterogeneity	Habitats	Biology								Remote Sensing
ECV_Ocean	Biology/Ecosystems	Marine Habitat Properties	Mangrove Forests, Seagrass Beds, Macroalgal Communities	area	m^2	abiotic heterogeneity	Habitats	Biology								Remote Sensing
ECV_Ocean	Biology/Ecosystems	Plankton	Phytoplankton			matter budget	input	Biology								Sample
ECV_Ocean	Biology/Ecosystems	Plankton	Zoo plankton			matter budget	input	Biology								Sample
ECV_Ocean	Physics	Ocean Surface Heat Flux	Latent Heat Flux	flux	W m^-2	energy budget	input	Physics								Station
ECV_Ocean	Physics	Ocean Surface Heat Flux	Sensible Heat Flux	flux	W m^-2	energy budget	input	Physics								Station
ECV_Ocean	Physics	Sea Ice	Sea Ice Concentration	concentration		water budget	storage	Physics								Remote Sensing
ECV_Ocean	Physics	Sea Ice	Sea Ice Drift	velocity	m s^-2	water budget	other	Physics								Remote Sensing
ECV_Ocean	Physics	Sea Ice	Sea Ice Extent/Edge	area	m^2	water budget	storage	Physics								Remote Sensing
ECV_Ocean	Physics	Sea Ice	Sea Ice Thickness	length	m	water budget	storage	Physics								Remote Sensing
ECV_Ocean	Physics	Sea Level	Global Mean Sea Level	length	m	water budget	output	Physics								Remote Sensing
ECV_Ocean	Physics	Sea Level	Regional Sea Level	length	m	water budget	output	Physics								Remote Sensing
ECV_Ocean	Physics	Sea State	Wave Height	length	m	energy budget	input	Physics								Station
ECV_Ocean	Physics	Sea Surface Salinity	Sea Surface Salinity	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Remote Sensing
ECV_Ocean	Physics	Sea Surface Temperature	Sea Surface Temperature	temperature	K	energy budget	storage	Physics								Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
ECV_Ocean	Physics	Subsurface Currents	Interior Currents	velocity	m s^-1	energy budget	output	Physics								Station
ECV_Ocean	Physics	Subsurface Salinity	Interior Salinity	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Sample
ECV_Ocean	Physics	Subsurface Temperature	Interior Temperature	temperature	K	energy budget	storage	Physics								Station
ECV_Ocean	Physics	Surface Currents	Surface Geostrophic Current	velocity	m s^-1	energy budget	output	Physics								Station
ECV_Ocean	Physics	Surface Stress	Surface Stress	pressure	N m^-2	energy budget	input	Physics								Station
EOV		Benthic invertebrate abundance and distribution	under development			Biotic diversity	Fauna diversity	Biology								Sample
EOV		Dissolved Organic Carbon	Dissolved Organic Carbon (DOC)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Fish abundance and distribution	Number, biomass or abundance index of fish of different taxa per unit volume or area of water in a specific region, stock or population, and measured by a standard or known protocol	mass or count	kg	Biotic diversity	Fauna diversity	Biology								Observation
EOV		Fish abundance and distribution	Numbers or biomass of fish by size/age/stage	mass or count	kg	Biotic diversity	Fauna diversity	Biology								Observation
EOV		Inorganic Carbon	Dissolved Inorganic Carbon (DIC)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Inorganic Carbon	Partial pressure of carbon dioxide (pCO2)	pressure	N m^-2	matter budget	output	Chemistry								Observation
EOV		Inorganic Carbon	pH			matter budget	other	Chemistry								Sample
EOV		Inorganic Carbon	Total Alkalinity (TA)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Live coral	Coral condition (diseases, bleaching, mortality (partial and full), predated, silted, other conditions/syndromes)			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Live coral	Coral diversity (species, genera and functional type; and alpha, beta or gamma)			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Live coral	Coral size classes (recruits/small corals, size class distribution)			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Live coral	Live coral cover and areal extent	area	m^2	Biotic diversity	Habitat structure	Biology								Observation
EOV		Live coral	Total habitable substrate (less sand/silt substrates, structural complexity)			Biotic diversity	Fauna diversity	Biology								Sample

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EOV		Macroalgal canopy cover	Areal extent	area	m^2	Biotic diversity	Habitat structure	Biology								Remote Sensing
EOV		Macroalgal canopy cover	Canopy height	length	m	Biotic diversity	Fauna diversity	Biology								Observation
EOV		Macroalgal canopy cover	Canopy species diversity			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Macroalgal canopy cover	Photosynthetic biomass	mass	kg	Matter budget	output	Biology								Sample
EOV		Macroalgal canopy cover	Photosynthetic efficiency	ratio		Energy budget	Efficiency measures	Biology								Remote Sensing
EOV		Macroalgal canopy cover	Plant condition (qualitative: signs of necrosis and potential drivers, fouling and grazing)			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Macroalgal canopy cover	Plant size classes (including recruits)			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Macroalgal canopy cover	Stem density (kelps)	count/area		Biotic diversity	Fauna diversity	Biology								Observation
EOV		Mangrove cover	Canopy height and trunk girth	length	m	Biotic diversity	Flora diversity	Biology								Observation
EOV		Mangrove cover	Intertidal fish and invertebrate densities			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Mangrove cover	Mangrove fringe width and area	area	m^2	Biotic diversity	Habitat structure	Biology								Remote Sensing
EOV		Mangrove cover	Mangrove tree species composition and zonation			Biotic diversity	Flora diversity	Biology								Observation
EOV		Mangrove cover	Sediment and water column respiration			Abiotic heterogeneity	Water	Biology								Sample
EOV		Mangrove cover	Soil profile, carbon/nutrient content, and C14 age			Abiotic heterogeneity	Soil	Biology								Sample
EOV		Mangrove cover	Tree, algae, and phytoplankton primary production	mass	kg	matter budget	output	Biology								Remote Sensing
EOV		Mangrove cover	Trunk and seedling density by species	Count / area		Biotic diversity	Flora diversity	Biology								Observation

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EOV		Marine turtle, bird and mammal abundance and distribution	Age	time	s	Biotic diversity	Fauna diversity	Biology								Observation
EOV		Marine turtle, bird and mammal abundance and distribution	Count data	count		Biotic diversity	Fauna diversity	Biology								Observation
EOV		Marine turtle, bird and mammal abundance and distribution	Repeated individual presence (tracking/resights)			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Marine turtle, bird and mammal abundance and distribution	Sex			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Marine turtle, bird and mammal abundance and distribution	Species presence/absence			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Microbe biomass and diversity	under development			Biotic diversity	Flora diversity	Biology								Sample
EOV		Nitrous Oxide	Nitrous Oxide (N2O)	concentration	mol kg^-1	matter budget	output	Chemistry								Observation
EOV		Nutrients	Ammonium (NH4)	concentration	mol kg^-1	matter budget	storage	Chemistry								Observation
EOV		Nutrients	Nitrate (NO3-)	concentration	mol kg^-1	matter budget	storage	Chemistry								Observation
EOV		Nutrients	Nitrite (NO2-)	concentration	mol kg^-1	matter budget	storage	Chemistry								Observation
EOV		Nutrients	Phosphate (PO4)	concentration	mol kg^-1	matter budget	storage	Chemistry								Observation
EOV		Nutrients	Silicic acid (Si(OH)4)	concentration	mol kg^-1	matter budget	storage	Chemistry								Observation
EOV		Ocean Colour	under development			Energy budget	output									Remote Sensing
EOV		Ocean Currents (Subsurface)	3-dimensional velocity components	velocity	m s^-1	energy budget	output	Physics								Observation
EOV		Ocean Currents (Subsurface)	Ekman currents	velocity	m s^-1	energy budget	output	Physics								Observation
EOV		Ocean Currents (Subsurface)	geostrophic velocities	velocity	m s^-1	energy budget	output	Physics								Observation
EOV		Ocean Currents (Subsurface)	quasi-Lagrangian drift	velocity	m s^-1	energy budget	output	Physics								Observation
EOV		Ocean Currents (Subsurface)	speed	velocity	m s^-1	energy budget	output	Physics								Observation
EOV		Ocean Currents (Subsurface)	tidal currents	velocity	m s^-1	energy budget	output	Physics								Observation

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EOV		Ocean Sound	particle motion (displacement, velocity, acceleration)	displacement, velocity, acceleration	m, m s^-1, m s^-2	Abiotic heterogeneity	Additional variables	Physics								Station
EOV		Ocean Sound	sound pressure	pressure	N m^-2	Abiotic heterogeneity	Additional variables	Physics								Station
EOV		Ocean Surface Heat Flux	albedo	flux fraction		energy budget	other	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	downward longwave radiation	flux	W m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	downward shortwave radiation	flux	W m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	Latent heat flux	flux	W m^-2	energy budget	output	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	net longwave radiation	flux	W m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	net short wave radiation	flux	W m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	photosynthetically available radiation	flux	W m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	Sensible heat flux	flux	W m^-2	energy budget	output	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	upward longwave radiation	flux	W m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Heat Flux	upward shortwave radiation	flux	W m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Vector Stress (OSVS)	Equivalent neutral winds	pressure	N m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Vector Stress (OSVS)	Scalar stress	pressure	N m^-2	energy budget	input	Physics								Remote Sensing
EOV		Ocean Surface Vector Stress (OSVS)	Stress equivalent neutral winds	pressure	N m^-2	energy budget	input	Physics								Remote Sensing
EOV		Oxygen	Dissolved Oxygen (O2)	concentration	mol kg^-1	matter budget	storage	Chemistry								Station

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EOV		Particulate Matter	Biogenic Silica (BSi) flux	flux	kg m^-2 s^-1	matter budget	output	Chemistry								Sample
EOV		Particulate Matter	Calcium Carbonate (CaCO3) flux	flux	kg m^-2 s^-1	matter budget	output	Chemistry								Sample
EOV		Particulate Matter	Particulate Inorganic Carbon (PIC)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Particulate Matter	Particulate Organic Carbon (POC)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Particulate Matter	Particulate Organic Matter (POM)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Particulate Matter	Particulate Organic Nitrogen (PON)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Particulate Matter	Particulate Organic Phosphorus (POP)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Particulate Matter	POC flux	flux	kg m^-2 s^-1	matter budget	output	Chemistry								Sample
EOV		Particulate Matter	Total Suspended Matter (TSM)	concentration	mol kg^-1	matter budget	storage	Chemistry								Sample
EOV		Phytoplankton biomass and diversity	Diversity/Taxonomy			Biotic diversity	Flora diversity	Biology								Sample
EOV		Phytoplankton biomass and diversity	Genomic information			Biotic diversity	Flora diversity	Biology								Sample
EOV		Phytoplankton biomass and diversity	In vitro/In vivo pigment fluorescence			Biotic diversity	Flora diversity	Biology								Sample
EOV		Phytoplankton biomass and diversity	Pigment concentration by spectrophotometry (chlorophyll a, b, HPLC pigments)			Biotic diversity	Flora diversity	Biology								Sample
EOV		Phytoplankton biomass and diversity	Presence/Absence/Relative Abundance			Biotic diversity	Flora diversity	Biology								Sample
EOV		Phytoplankton biomass and diversity	Primary productivity (different methods)	rate	kg s^-1	Matter budget	Efficiency measures	Biology								Sample
EOV		Phytoplankton biomass and diversity	Spectral reflectance (ocean color/remote sensing methods)			Biotic diversity	Flora diversity	Biology								Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EOV		Sea Ice	fast ice	area	m^2	abiotic heterogeneity	water	Physics								Remote Sensing
EOV		Sea Ice	ice concentration	concentration		water budget	storage	Physics								Remote Sensing
EOV		Sea Ice	Ice extent and area	area	m^2	water budget	storage	Physics								Remote Sensing
EOV		Sea Ice	ice motion	velocity	m s^-1	Energy budget	output	Physics								Remote Sensing
EOV		Sea Ice	ice salinity	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Remote Sensing
EOV		Sea Ice	ice thickness	length	m	water budget	storage	Physics								Remote Sensing
EOV		Sea Ice	ice type (first year, multi-year)	type		abiotic heterogeneity	water	Physics								Remote Sensing
EOV		Sea Ice	melt pond coverage	area	m^2	water budget	input	Physics								Remote Sensing
EOV		Sea Ice	snow cover thickness	length	m	water budget	input	Physics								Remote Sensing
EOV		Sea Ice	surface freeze-up and melt time	date		water budget	input	Physics								Remote Sensing
EOV		Sea State	directional spectrum			energy budget	output	Physics								Station
EOV		Sea State	maximum wave height	length	m	energy budget	output	Physics								Remote Sensing
EOV		Sea State	Significant wave height	length	m	energy budget	output	Physics								Remote Sensing
EOV		Sea State	swell			energy budget	output	Physics								Remote Sensing
EOV		Sea State	wave direction	angle	rad	abiotic heterogeneity	water	Physics								Remote Sensing
EOV		Sea State	wave period	time	s	energy budget	output	Physics								Remote Sensing
EOV		Sea State	whitecap fraction	fraction		abiotic heterogeneity	water	Physics								Station
EOV		Sea Surface Height (SSH)	Sea level anomaly	length	m	water budget	output	Physics								Remote Sensing
EOV		Sea Surface Height (SSH)	sea level extremes	length	m	water budget	output	Physics								Remote Sensing
EOV		Sea Surface Height (SSH)	sea surface height gradients	length	m	water budget	output	Physics								Remote Sensing
EOV		Sea Surface Height (SSH)	tidal range	length	m	water budget	output	Physics								Remote Sensing
EOV		Sea Surface Salinity (SSS)	Bulk surface salinity	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Remote Sensing
EOV		Sea Surface Salinity (SSS)	near surface salinity at stated depth	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Remote Sensing
EOV		Sea Surface Salinity (SSS)	skin surface salinity	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Remote Sensing
EOV		Sea Surface Temperature (SST)	bulk SST	temperature	K	energy budget	storage	Physics								Remote Sensing
EOV		Sea Surface Temperature (SST)	near surface temperature at stated depth	temperature	K	energy budget	storage	Physics								Remote Sensing
EOV		Sea Surface Temperature (SST)	Skin SST	temperature	K	energy budget	storage	Physics								Remote Sensing
EOV		Sea Surface Temperature (SST)	subskin SST	temperature	K	energy budget	storage	Physics								Remote Sensing

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EOV		Seagrass Cover	Areal extent of seagrass meadows	area	m^2	Biotic diversity	Habitat structure	Biology								Remote Sensing
EOV		Seagrass Cover	Canopy height	length	m	Biotic diversity	Flora diversity	Biology								Observation
EOV		Seagrass Cover	Photosynthetic efficiency (measured with PAM)	ratio		Energy budget	Efficiency measures	Biology								Remote Sensing
EOV		Seagrass Cover	Seagrass diversity (species)			Biotic diversity	Flora diversity	Biology								Sample
EOV		Seagrass Cover	Shoot density/cover	area	m^2	matter budget	output	Biology								Observation
EOV		Stable Carbon Isotopes	13C/12C isotope ratio of Dissolved Inorganic Carbon (DIC)	ratio		matter budget	other	Chemistry								Sample
EOV		Subsurface Salinity	bulk SSS	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Sample
EOV		Subsurface Salinity	Foundation	concentration	kg kg^-1	abiotic heterogeneity	water	Physics								Sample
EOV		Subsurface Temperature	Bulk SST	temperature	K	energy budget	storage	Physics								Station
EOV		Subsurface Temperature	Foundation SST	temperature	K	energy budget	storage	Physics								Station
EOV		Surface Currents	Lagrangian drift	velocity	m s^-1	energy budget	output	Physics								Remote Sensing
EOV		Surface Currents	Near surface velocity at stated depth	velocity	m s^-1	energy budget	output	Physics								Remote Sensing
EOV		Surface Currents	near-surface Ekman currents	velocity	m s^-1	energy budget	output	Physics								Remote Sensing
EOV		Surface Currents	Stokes velocity	velocity	m s^-1	energy budget	output	Physics								Remote Sensing
EOV		Surface Currents	surface geostrophic velocity	velocity	m s^-1	energy budget	output	Physics								Remote Sensing
EOV		Surface Currents	surface speed	velocity	m s^-1	energy budget	output	Physics								Remote Sensing
EOV		Surface Currents	tidal currents	velocity	m s^-1	energy budget	output	Physics								Remote Sensing
EOV		Transient Tracers	14C	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
EOV		Transient Tracers	39Ar	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
EOV		Transient Tracers	3He	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
EOV		Transient Tracers	Chlorofluorocarbons (CFC-12, CFC-11, CFC-113, CCl4)	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
EOV		Transient Tracers	Sulphur hexafluoride (SF6)	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample
EOV		Transient Tracers	tritium	concentration	mol l^-1	abiotic heterogeneity	water	Chemistry								Sample

EV Domain	EV group (normative)	EV	EV Subvariables	Dimension	Unit (SI)	EV EI Component assingment	EV EI Indicator	Scientific domain	eneon SDG 1	eneon SDG 2	eneon SDG 3	eneon SDG 4	eneon SDG 5	eneon SDG 6	eneon connected with	Measurement method
EOV		Zooplankton biomass and diversity	biomass or abundance (or presence/absence) by taxon			Biotic diversity	Fauna diversity	Biology								Observation
EOV		Zooplankton biomass and diversity	Biomass overall	mass	kg	Matter budget	output	Biology								Sample
EOV		Zooplankton biomass and diversity	functional group or size class			Biotic diversity	Fauna diversity	Biology								Observation

Graph EBV and ECV: Links to Ecosystem Integrity Concept

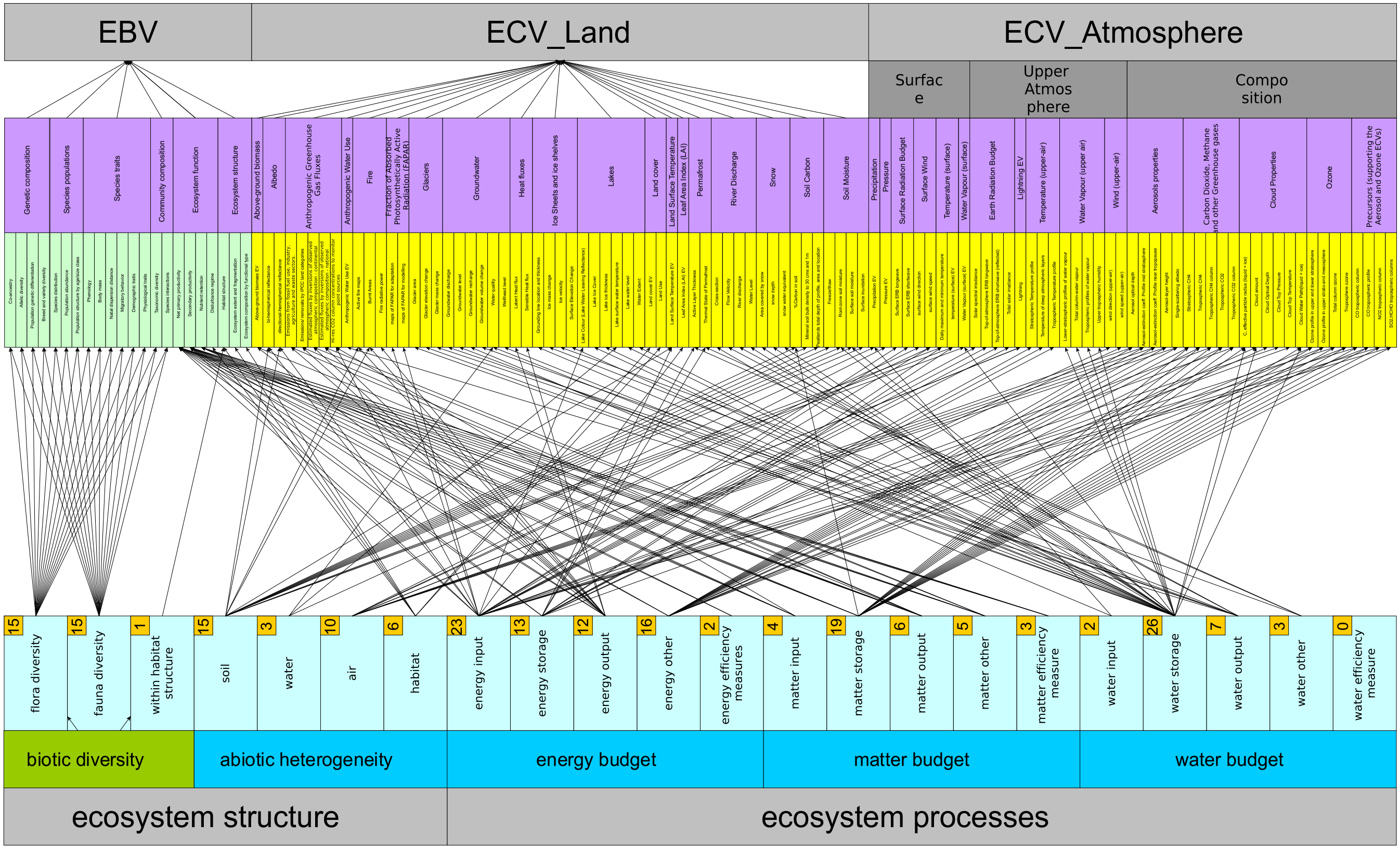

Figure 7: EBVs and ECVs connected to the Ecosystem Integrity concept components. The numbers in the indicator box refers to the number of the connections.

Graph EBV and ECV: Links to Ecosystem Integrity Concept and Sustainable Development Goals Indicators

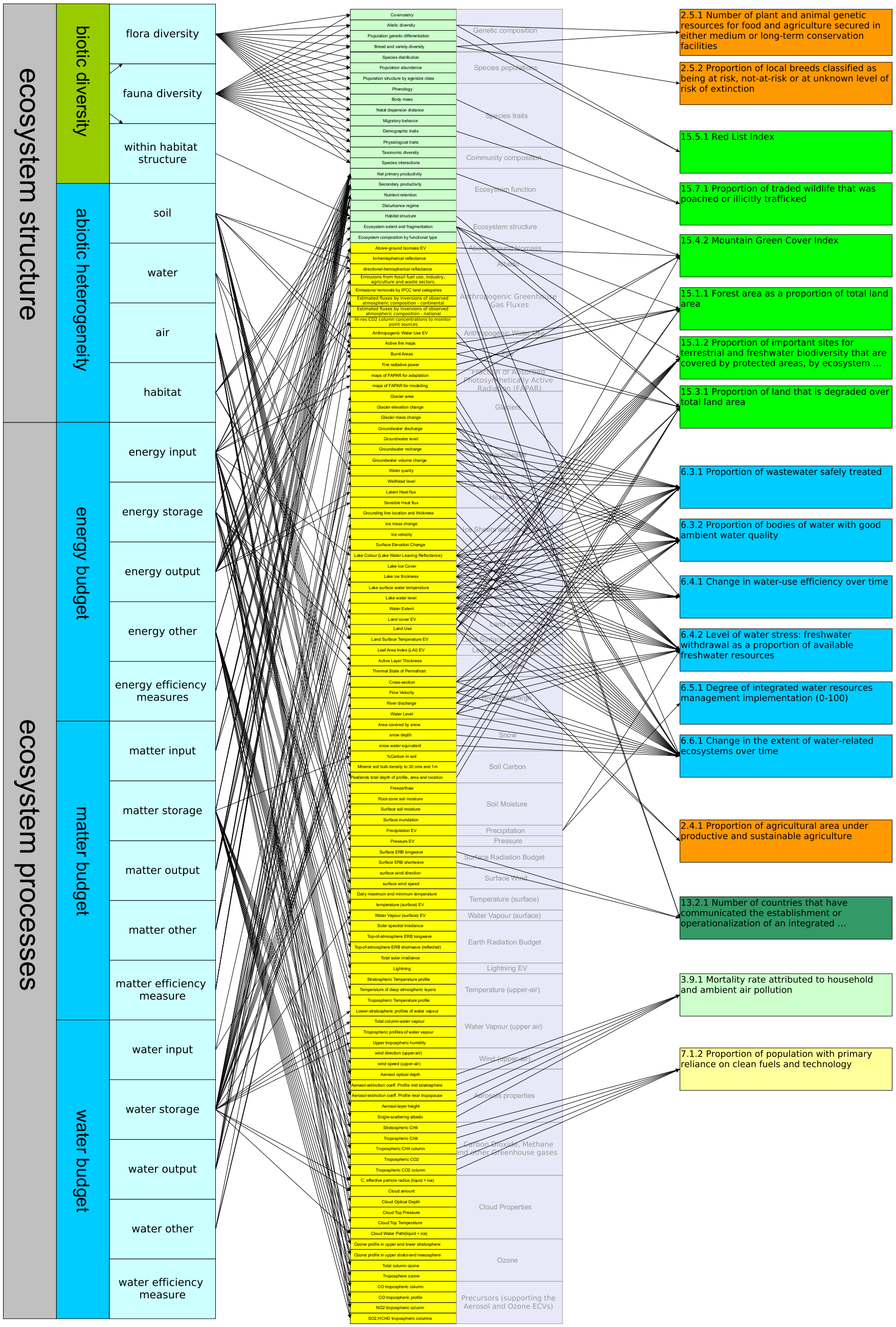

Figure 8: Links of the ECVs and the EBVs to Ecosystem Integrity Concept and the Sustainable development goals

GEOESSENTIAL
ERA-PLANET

Essential Variables workflows for resource efficiency and environmental management