



D6.2 Operational Database: Ecosystem AsseSsment Explorer (EASE)

31/10/24

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1 Preface

The importance of biodiversity, natural capital and healthy ecosystems and the services they supply has increasingly been acknowledged in diverse policy initiatives (e.g., EU Biodiversity Strategies 2020 and 2030, Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), Natural Capital and Ecosystem Services Accounting, Intergovernmental Panel on Climate Change (IPCC) and Convention on Biological Diversity (CBD)).

The EU Horizon Research and Innovation Action “Science for Evidence-based and sustainable decisions about NATural capital” (SELINA) aims to provide robust information and guidance that can be harnessed by different stakeholder groups to support transformative change in the EU, to halt biodiversity decline, to support ecosystem restoration and to secure the sustainable supply and use of essential Ecosystem Services (ES) in the EU by 2030.

SELINA builds upon the Mapping and Assessment of Ecosystems and their Services (MAES) initiative that has provided the conceptual, methodological, data and knowledge base for comprehensive assessments on different spatial scales, including the EU-wide assessment (Maes et al. 2020) and assessments in EU member states. Knowledge and data for different ecosystem types are increasingly available.

The overall objective of Work Package (WP) 6 “Integrated assessment” is to integrate and aggregate the outcomes of all research-oriented Work Packages along different paths. The Deliverable D6.2 “Operational Database (EASE)” presents the update of the former MAES Methods Explorer to fit the SELINA needs and content for an operational open access online database.



2 Summary

The overall objective of SELINA Work Package (WP) 6 is the appropriate integration of outcomes of the research-oriented Strand B related to better understanding ecosystem condition and its impact in ecosystem services supply. Additionally, WP6 serves as communication and knowledge transfer between the different project Strands making sure that information is further processed and integrated. Deliverable (D) 6.2 (DATA) represents the online interface of the operational database that was developed in Task 6.6. This supplementary technical report summarises the outcomes from the operational database development and is intended to emphasise the structural innovations and improvements.

Deliverable D6.2 “Operational Database (EASE)” describes the update and upgrade of the former MAES Methods Explorer (<https://database.esmeralda-project.eu/home>) to fit the SELINA needs and content for an operational open access online database. The literature database on ecosystem assessment has been substantially updated. This update has been made in coordination with the literature reviews undertaken in T3.2, T4.1, and T6.1. As of October 2024, the Ecosystem Assessment Explorer (EASE) database contains approximately 700 entries. The EASE is a “living” database and will continue to grow throughout the lifetime of the SELINA project and beyond. In particular, the results of the SELINA Demonstration Projects and test sites, as well as other scientific project outcomes, will be gradually added to the database.

The main additional features that have been included in the upgrade of the online interface are: 1. A page on ecosystem condition with information on indicator variables and access to related literature; 2. A map interface to enable the identification of relevant literature based on geographic area; 3. Additional search filters on ecosystem condition; 4. An API link to the Ecosystem Services Valuation Database (ESVD) to deliver search results from that database; 5. A section on ecosystem typologies including published crosswalks to aid with understanding the relationship and synergies between different classifications of ecosystem types; 6. A page containing a searchable list of complementary online resources to facilitate links to other relevant projects, initiatives, and data sources.



3 List of abbreviations

API	Application Programming Interface
CLMS	Copernicus Land Monitoring Service
CoG	Compendium of Guidance
EAGLE	Eionet Action Group on Land monitoring in Europe
EASE	Ecosystem AsseSsment Explorer
EC	Ecosystem Condition
ECT	Ecosystem Condition Typology
EIONET	European Environment Information and Observation Network
EO	Earth Observation
ES	Ecosystem Services
ESVD	Ecosystem Services Valuation Database
EU	European Union
LCC	Land Cover Component
MAES	Mapping and Assessment of Ecosystems and their Services
SEEA EA	System of Environmental-Economic Accounting - Ecosystem Accounting
WP	Work Package



4 Introduction

The purpose of the Operational Database (named the Ecosystem AsseSsment Explorer, acronym: EASE), developed by the SELINA project, is to provide an online platform for participants of the SELINA consortium, the wider research community, practitioners aiming at conducting an ecosystem assessment, and others to obtain relevant literature and further information on ecosystem service assessment methods, ecosystem condition indicators, and ecosystem typologies. The development of the EASE is the result of a consultation and co-creation process within the SELINA consortium. While the implementation took place in WP6, Task 6.6.

Currently (October 2024), the EASE is accessible online through the following access data:

URL: <https://selina.gc.spatial-services.com/>

Username: selina

Password: A1MZ7Fn9oOIECWq

The name for the Operational Database was selected by consortium members through a majority vote during Workshop 4 in Trondheim, Norway. Partners were asked to vote for their preferred option from a list of proposed names that had been collected over the previous months. “EASE (Ecosystem AsseSsment Explorer)” took first place and received 32% of the votes (see Fig. 1).

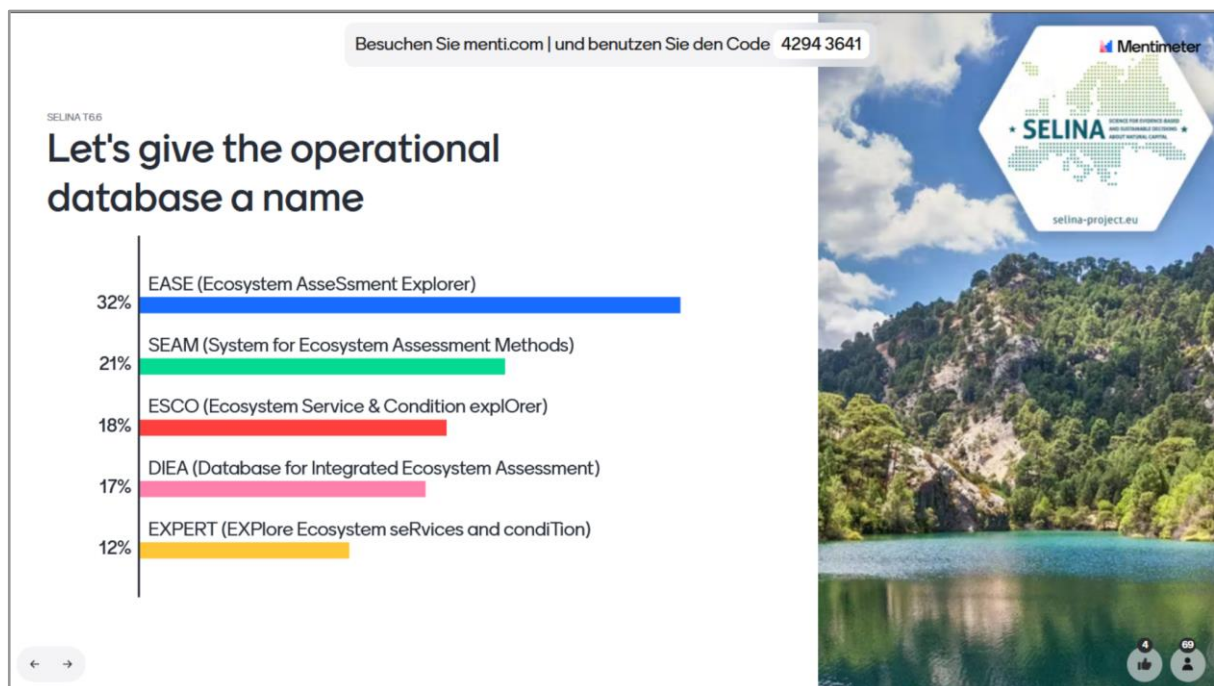


Figure 1: Results of consortium membership vote for the name of the operational database



5 Development of the operational database

5.1 Preceding projects and inputs

The EASE is an update and upgrade of the MAES Methods Explorer, which was developed in the ESMERALDA project. ESMERALDA¹ (Enhancing ecoSystem sERVICES mApping for policy and Decision mAKing, 2015-2018) delivered a flexible methodology to provide the building blocks for pan-European and regional assessments in relation to Action 5 of the EU Biodiversity Strategy 2020, supporting the needs of assessments in relation to the requirements for planning, agriculture, climate, water and nature policy. ESMERALDA built on existing ES projects and databases (i.a. MAES, OpenNESS, OPERAs, national studies), the Millennium Assessment (MA) and The Economics of Ecosystems and Biodiversity (TEEB). After completion of the project, the dataset was further extended with literature items collected in the MOVE² and MOVE-ON³ projects, which – similar to ESMERALDA – aimed to advance MAES methodology, but focused on the implementation in Europe's Outermost Regions and Overseas Countries and Territories.

5.2 MAES methods explorer

The functionality and implementation of the [MAES Methods Explorer](#) are described by Santos-Martín et al. (2018a) and Reichel & Klug (2018).

Santos-Martín et al. (2018a) describe the development of the ESMERALDA database that underlies the MAES Methods Explorer, including the consultation process, literature collection, database structure, methods identification and classification, harmonisation and validation of the data.

In Reichel & Klug (2018), the authors describe the technical implementation, how the MAES Methods Explorer helps to navigate the database, and how it complements as well as differs from other relevant tools and web resources at the time of the ESMERALDA project.

5.3 EASE structure and functionality

Following the objectives of the ESMERALDA project, the MAES Methods Explorer only focussed on methods for ecosystem service assessment. For the EASE, the data structure was extended to meet SELINA's needs and accommodate the addition of Ecosystem Condition (EC) indicators with the attributes described later in this document (see chapter 6.1).

In the MAES Methods Explorer, the high level structure was a many-to-many (M:N) relationship between a “method” and a “literature item”. For the EASE, this was extended to include a many-to-many (M:N) relationship between “ecosystem condition indicators”

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² funded through the EU under grant agreement N° 07.027735/2018/776517/SUB/ENV.D2

³ funded through the EU under grant agreement N° 07.027735/2019/808239/SUB/ENV.D2



and “literature item”. The full data model is displayed in Figure 2. The orange boxes mark the extension for the EC indicators. The blue boxes describe the methods and the purple boxes encode a literature item.

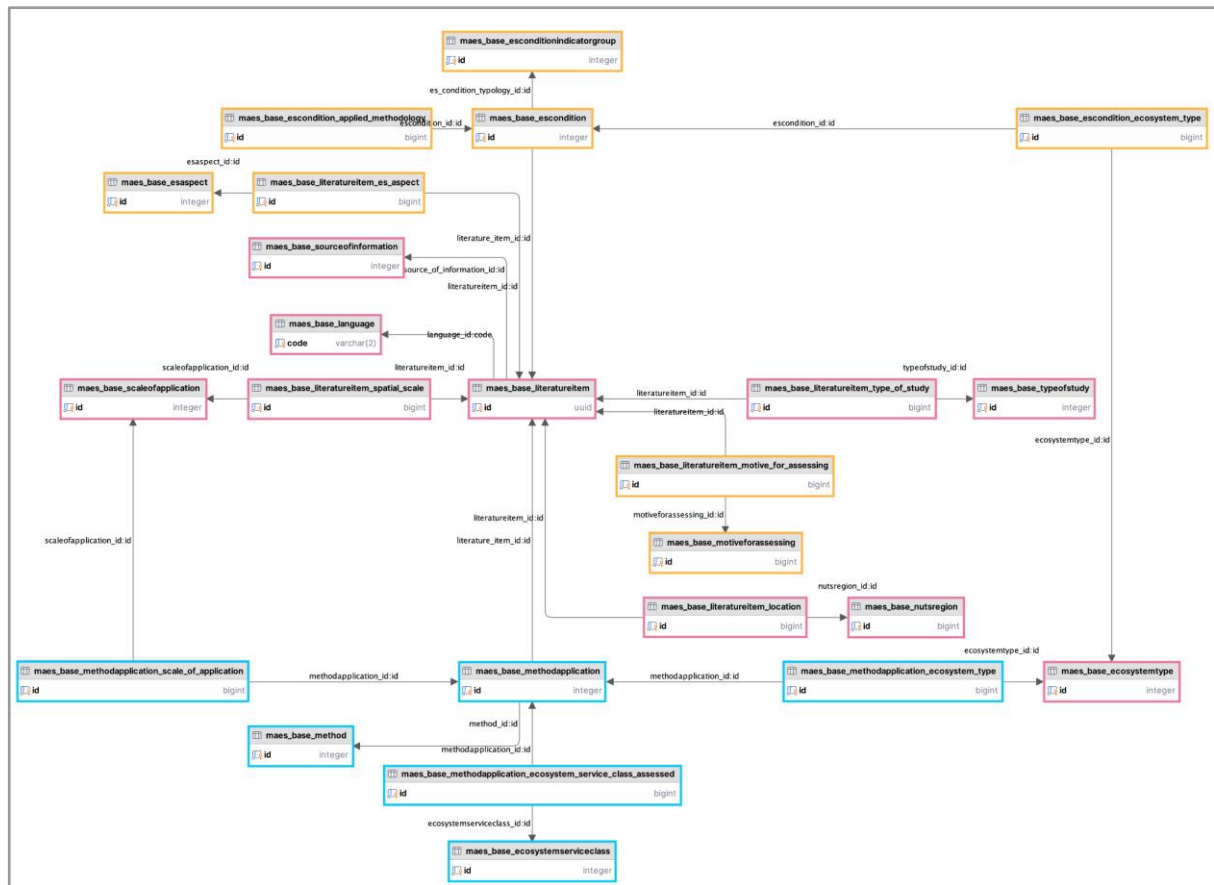


Figure 2: The EASE database model shows the relationships between methods (blue), literature (red), and ecosystem condition indicators (orange)

The backend was implemented in Python using various Open Source libraries and provides an application programming interface (API)⁴ to deliver data to the web frontend.

The EASE web frontend is structured in five parts which will be described in detail in chapter 6 and onwards:

1. Ecosystem Condition Indicators
2. Methods for Ecosystem Assessment
3. Literature Database
4. Ecosystem Typology Database
5. Additional resources and projects


⁴ An API is a software interface that functions as a connection between computers or computer programs. In this specific case the webserver provides data from the database to the website frontend in the user's browser.

5.4 User feedback and refinement

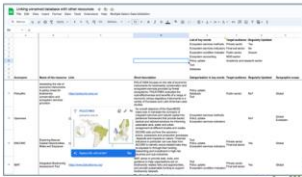


The process of developing the EASE involved consultation and feedback from users in two rounds. The first round of feedback was obtained from the SELINA Executive Board in May 2024 and, following refinement and presentation at the Trondheim workshop in June 2024, the second round of input and feedback was obtained from June 2024 onwards from consortium partners.

Consortium partners were provided with a link and login details to the web interface and were asked to 1. Access and test the operational database by visiting each page and exploring the functionality; 2. Complete an online feedback questionnaire; and 3. Add suggestions to the “Additional online resources” database (see Fig. 3). The online feedback questionnaire included 38 questions covering the functionality, clarity of information, bugs, and suggestions for improvements. The full questionnaire is provided in the Annex to this report.

Testing and feedback



- 1. Access and test the operational database:**
 - <https://selina.gc.spatial-services.com/>
 - Username: selina
 - Password: A1MZ7Fn9oOIECWq
- 2. Complete the feedback questionnaire:**
 - <https://survey.alchemer.eu/s3/90716533/EAE-development-questionnaire>
- 3. Add to the “Additional online resources”:**
 - <https://docs.google.com/spreadsheets/d/1D4DHf2kXnoDsXTWzJF3GjHR6Vs8EeNEw963V1C8HNfl/edit?gid=0#gid=0>



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Figure 3: EASE user feedback instructions

In total, 23 responses were received from users who had tested the draft EASE interface. In general, the feedback on the functionality was positive and also provided many constructive suggestions for improvement. All suggestions were collated and evaluated by members of the T6.6 team and implemented, where feasible, into the final version of the EASE. For example, some paragraphs have been rephrased to improve comprehensibility, table formatting has been improved to better fit screen sizes, and navigation has been adjusted. Throughout the lifespan of the project, it will remain possible to give feedback on the database that helps to improve the product itself and its user-friendliness (see chapter 11).

5.5 Extension of the literature database

As the EASE literature database builds upon the MAES Method Explorer (see chapter 5.2), it inherited its general structure as well as all literature items and related information that have been gathered over the course of three previous EU projects ESMERALDA, MOVE, and MOVE-ON (see chapter 5.1). From these projects, 540 items have been taken up in the EASE database. All of the items deal with the ecosystem services concept and all of the already collected information has been retained. As the research projects had slightly different foci and objectives, some of the items or pieces of information may seem less relevant for the purpose of SELINA. But as the database is generally aimed at supporting ecosystem services assessments, all information is considered as potentially beneficial for the database user.

For SELINA, it was agreed that as a start relevant literature items from the three systematic reviews conducted in Tasks T3.2, T4.1b, and T6.1 would be transferred to the EASE. For WP6 and WP4, this process has been completed and 200 additional literature items have been added to the database (see Fig. 4). For items from WP3, the process is still ongoing and will most likely be completed during the second reporting period. Additionally, other relevant literature items (papers, manuscripts, documents) that are and will be developed within SELINA or during the runtime of the project will be gradually added to the database. Until the end of the project, a living database component will be developed (see chapter 11 “roadmap”) that enables the subsequent addition of relevant literature items by end users.

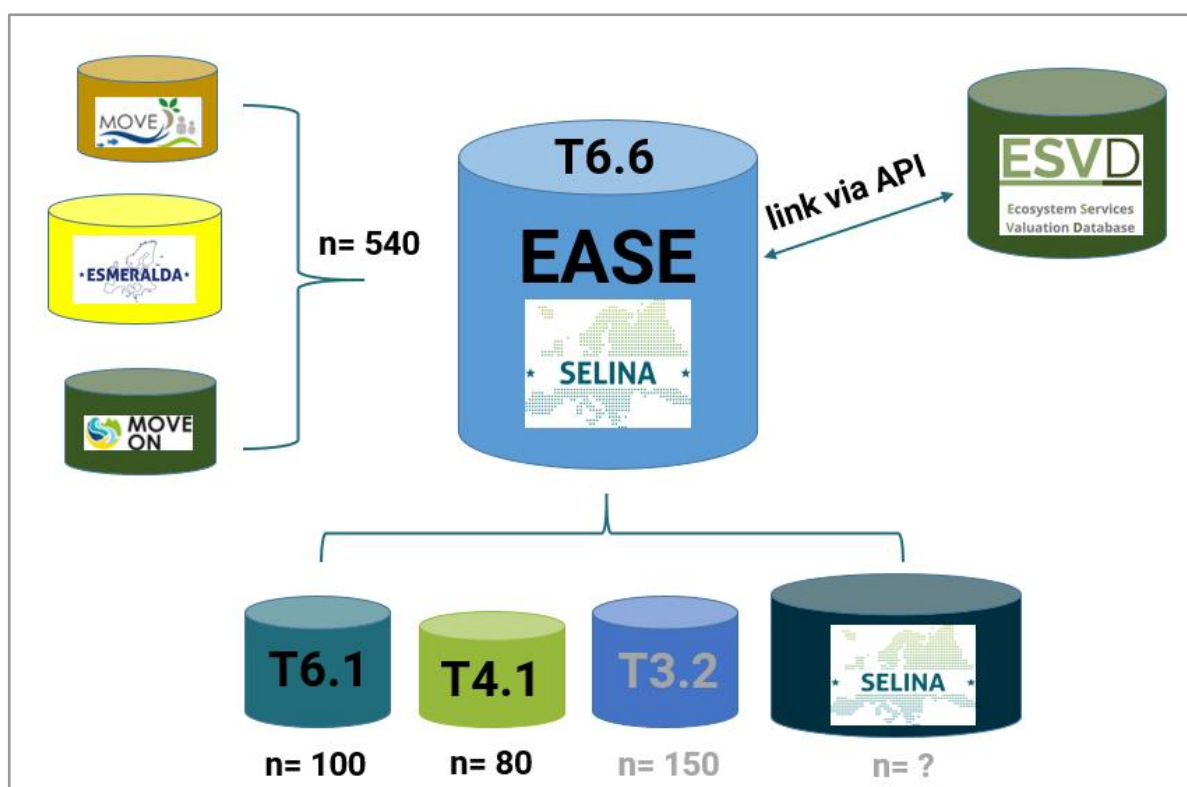


Figure 4: Sources for the EASE literature database and approximated numbers (n)



6 Database search

6.1 Functionality description

The aim of the EASE database is to provide a platform to search a large collection of recent scientific literature on ecosystem services mapping and assessment. With this key functionality, the literature included, analysed and structured within the SELINA project has been made publicly available and searchable based on SELINA relevant outputs. With the EASE, the SELINA project contributes to the further progress of ecosystem services assessments and uptake into policy. The EASE database contains information from over 700 scientific studies on ecosystem services, ecosystem condition, methods, location and bibliographical information.

6.2 Querying the EASE database

The EASE database displays a mapping query and a query based on several filters including a free text search. The queried literature is displayed in a table structure and is also linked to a map, portraying the countries of the query output.

The following filters can be applied:

1. Free text search in title & authors: Allows to freely browse for tailored queries.
2. Ecosystem condition indicator class: Allows to query based on different types of ecosystem condition indicator classes based on the Ecosystem Condition Typology (see chapter 6).
3. Ecosystem service method: Allows queries based on different types of biophysical, economic and social ecosystem service methods. The categorisation and definitions of methods are taken from the ESMERALDA project (Burkhard et al., 2018a).
4. Ecosystem service class: Allows queries based on the Common International Classification of Ecosystem Services (CICES).
5. Ecosystem type class: Allows to query based on 14 high-level ecosystem types relevant within the SELINA project.
6. Publication year

The mapping structure displays the search queries based on country information of the literature. Based on the free text search 20 literature items are displayed in the mapping output (see Fig. 5).





Figure 5: Map display of search query results

The table structure displays bibliographical information of the query, country and detailed information on location and types of ecosystem. Based on the free text search 20 literature items are displayed in the table output of the EASE and over 600 in the ESVD via an API (see Fig. 6 and chapter 6.3 on the ESVD API).

Literature Items (20 Items found)	ESVD results (607 Items found)
Can process-based modelling and economic valuation of ecosystem services inform land management policy at a catchment scale? (2020)	
Economic valuation of food provisioning of agricultural ecosystems in Israel - part of the Israel NEA (2017)	
Pollination services mapping and economic valuation from insect communities: a case study in the Azores (Terceira Island). (2017)	
An Economic evaluation of black locust (<i>Robinia pseudoacacia</i>) in west Slovenia (2016)	
Economic valuation of coral reef ecosystem service of coastal protection: A pragmatic approach (2016)	
Economic valuation of ecosystem services for designing policies of sustainable use of forest resources (2016)	
Economic valuation of ecosystem services provided by the Willandw Park. A benefit transfer study (2016)	
Economic valuation of ecosystem services for policy. A pilot study on green infrastructure in Oslo (2015)	
Evaluation of the socio economic impact of the FLANDRE project on the local economy, population and restoration of ecosystem services. Interim report. (2015)	
<p>Authors: De Nocker, L., Broekx, S., Demeyer, R., Simoens, I., Turkelboom, F., Provoost, S., Van der Biest, K.</p> <p>Locations (Countries): Belgium, France</p> <p>Detailed location: Dune regions at Belgian and French North Sea coast</p> <p>Ecosystem Types: Coastal</p> <p>Ecosystem Service Methods: Damage cost avoided, Photo-elicitation surveys</p> <p>Ecosystem Condition Indicators:</p> <p>URL: https://www.natuurwaardeverkenner.be/download/Evaluation_Flandre_life_interim_project_report_2015_EN_final.pdf</p>	show details

Figure 6: Table display of search query results

The functionality also allows exploring additional information of a literature item. This detailed view shows information on different ecosystem services assessment aspects relevant in SELINA. It shows various types of information related to bibliographical information of the literature item (see Fig. 7).

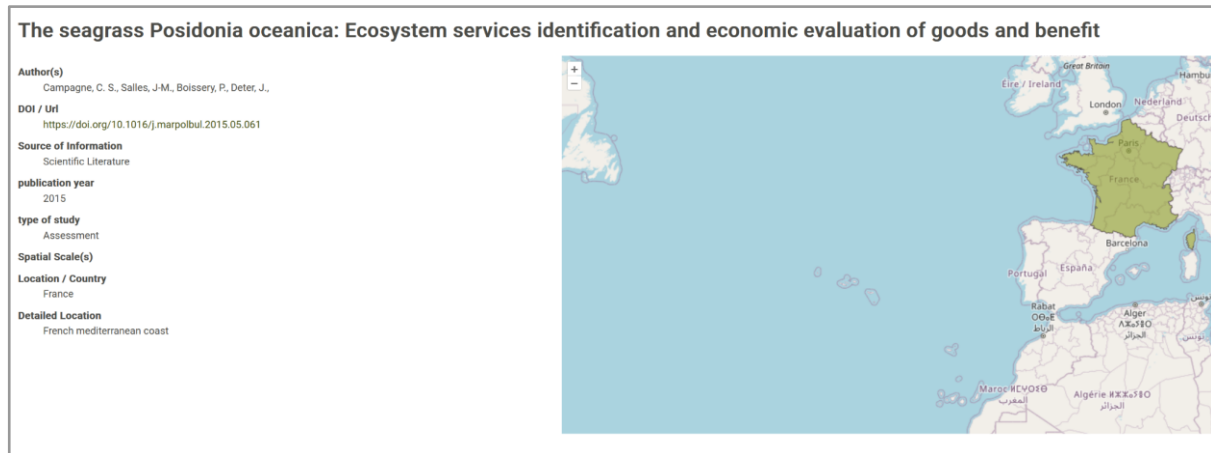


Figure 7: Detailed display of selected literature item

Additionally, the EASE provides information on the ecosystem services researched in the literature item, the ecosystem service method and the ecosystem types in the detailed display view (see Fig. 8).

Ecosystem Service		
Underlying terminological concept		
ES aspect		
Ecosystem Service Information		
Select ES method	ES class(es) according to GIES	Ecosystem type(s)
ECO: Market price (12)	<ul style="list-style-type: none"> Scientific None Materials from plants, algae and animals for agricultural use 	Coastal
ECO: Damage cost avoided (17)	<ul style="list-style-type: none"> Global climate regulation by reduction of greenhouse gas concentrations None Wild animals and their outputs Mass stabilisation and control of erosion rates 	Coastal
ECO: Value transfer (benefit transfer) (28)	<ul style="list-style-type: none"> Mediation of waste, toxics and other nuisances (by natural chemical and physical processes, by solid (mass), liquid and gaseous (air) flows) Bio-remediation by micro-organisms, algae, plants, and animals Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals Filtration/sequestration/storage/accumulation by ecosystems Hydrological cycle and water flow maintenance Maintaining nursery populations and habitats 	Coastal
ECO: Production function (21)	<ul style="list-style-type: none"> None Ventilation and transpiration Maintaining nursery populations and habitats 	Coastal

Figure 8: Detailed display of selected literature item

6.3 API with the Ecosystem Services Valuation Database

Finally, the EASE database is connected to the Ecosystem Services Valuation Database (ESVD) via an application programming interface (API). The ESVD is the largest structured collection of economic valuation studies, containing over 10,800 monetary values from 1,300 studies. With the API, the output of the search queries in the EASE displays relevant literature in the ESVD. For further investigation of the query in the ESVD, the API redirects to esvd.net where the query is shown with its corresponding standardised monetary values in int\$/hectare/year (see Fig. 9).



SELINA View									
Here you find the standardized monetary values of your study as collected in the ESVD. The ESVD provides information on the ecosystem types, different ES classifications, the monetary value and valuation method and some location and bibliographical information. Use the bar below to scroll to the right for additional information. You can also view the results on a map by clicking on 'Show Map'. Note that if a value estimate cannot be standardised to the common set of units used in the ESVD (m\$5/ha/yr), this field will be left empty. If you want to query the full ESVD, please create a free account or log-in on the top right of the screen.									
Valuations: 28 of 10874							Database Version: APR2024V1.1		
							Show Map		
Biomes	Ecozones	Ecosystems	TEEB services	CICES services	SEEA services	Value 2020 \$/ha/yr	Valuation Method	Countries	Location Name
Marine	Shelf sea	Coral reefs	Opportunities for recreation a...	Characteristics of living syste...	Recreation-related services	58664	Input-Output Modelling	Mexico, United Mexican States	Quintana Roo
Marine	Shelf sea	Coral reefs	Opportunities for recreation a...	Characteristics of living syste...	Recreation-related services		Input-Output Modelling	Guatemala, Republic of	Izabal
Marine	Shelf sea	Coral reefs	Opportunities for recreation a...	Characteristics of living syste...	Recreation-related services	1875	Input-Output Modelling	Honduras, Republic of	Honduras Mesoamerica
Marine	Shelf sea	Coral reefs	Opportunities for recreation a...	Characteristics of living syste...	Recreation-related services	1369	Input-Output Modelling	Belize	Belize Mesoamerica
Marine	Shelf sea	Coral reefs	Food	Wild animals (terrestrial and ...	Wild fish and other natural aq...	416.1	Input-Output Modelling	Mexico, United Mexican States	Quintana Roo

Figure 9: Search results from the Ecosystem Services Valuation Database (ESVD)

There is still work in progress to link the EASE to the Valuation Studies List (VSL) of the ESVD. The VSL consists of basic information on over 3,000 economic valuation studies. Some of these studies have already been completely included in the ESVD, but those that have not, might still contain some relevant information for the EASE users. In the future, we plan to return search queries in the EASE with information on study references, ecosystem and ecosystem services as is included in the VSL.

7 Ecosystem condition indicators

The database of studies included in the MAES Method Explorer did not contain any information on Ecosystem Condition (EC) as formerly this was not a central component of an ecosystem services assessment. Recent research, however, recommends that information on the condition, health or status of an ecosystem should be considered an essential part of an integrated ecosystem assessment (Burkhard et al., 2018b).

In consultation with SELINA WP3, “Ecosystem type, biodiversity & condition mapping and assessment”, and notably Task 3.2, the T6.6 team developed a relevant set of parameters that would be a useful addition to the already collected information per study item. The newly reviewed literature items that are included in the EASE database over the course of the SELINA project and beyond were and will also be screened for the following aspects.

- Motive for assessing EC
- EC indicator
- Ecosystem Condition Typology (ECT) class
- (Measurement) unit
- Ecosystem Type

Additional information on the possible response options for each parameter are given in the following.

7.1 Included parameters related to Ecosystem Condition

This section describes the newly included parameters and, where applicable, all possible response options related to the Ecosystem Condition concept (see Table 1). The selection of relevant information was agreed upon in consultation with SELINA WP3.



Table 1: Ecosystem Condition parameters collected for the new EASE literature items

Parameters	variable type	response options
Motive for assessing/ measuring Ecosystem Condition in this study	Predefined options, multiple select possible	1 = development of an ecosystem account 2 = mapping/ assessment of ecosystem services 3 = mapping/ assessment of ecosystem condition 4 = planning or evaluation of restoration 5 = reporting to or development of concept for international directives (Restoration Directive, Habitats Directive, WFD etc.) 6 = academic study (i.e. no policy or ES implication mentioned) 7 = other 8 = unclear
Ecosystem condition indicator	Free text	
Corresponding Ecosystem Condition Typology Class	Predefined options	A1 = physical state A2 = chemical state B1 = compositional state B2 = structural state B3 = functional state C1 = landscape, seascape characteristics XENV = stable environmental characteristics XES = ecosystem services XEE = ecosystem extent XAG = pre-aggregated indicators XMA = natural resource management XAC = accessibility XPA = protected areas XRP = pressures B2/C1 = embedded (sub)types
Ecosystem condition - Applied methodology	Predefined options, multiple select possible	1 = input data used for direct quantification 2 = input data used for index calculation 3 = input data further processed by a model or algorithm 4 = unclear/ not specified/ not applicable



Unit of ecosystem condition indicator	Free text - separate multiple entries using ";"	
Ecosystem type(s)	Predefined options, multiple select possible	1 = urban 2 = cropland 3 = grassland 4 = woodland and forest 5 = heathland and shrub 6 = sparsely vegetated land 7 = wetlands 8 = rivers and lakes 9 = coastal 10 = marine inlets and transitional waters 11 = marine (incl. shelf and open ocean) 12 = other 13 = unclear/ not specified

7.2 Classification and filter for Ecosystem Condition indicators

As the methods to assess EC are manifold (Czúcz et al., 2021b) and new indicators are constantly tested and developed, it was neither feasible nor useful to use the same ‘method-finder’ approach for EC parameters as was done for ES parameters (Santos-Martín et al., 2018b). However, it was agreed that one classification is required as a filter option in order to increase the user-friendliness of the database. To align with national accounting approaches, it was decided to follow the SEEA EA (System of Environmental-Economic Accounting - Ecosystem Accounting) typology (United Nations et al., 2021)⁵. Hence, the EC indicators recorded in the EASE database are classified according to the SEEA EA Ecosystem Condition Typology (ECT) (United Nations et al., 2021) and additional ECT+ classes as described in Czúcz et al. (2021a). As this classification is very recent and not many authors apply it yet in their scientific publications, an expert group from the SELINA consortium reviewed all the studies and classified the EC indicators used therein accordingly. This classification scheme has been added as an additional filter function to the EASE.

The older literature items inherited from ESMERALDA, MOVE, and MOVE-ON have not been updated with information on EC indicators and corresponding ECT classes, but it is assumed that a large share of them does not specifically address the EC concept.

⁵ EU Member States need to prepare ecosystem accounts, as a means to present data on the extent and condition of ecosystem assets and the services they provide to society and economy. In order to do so, they are encouraged to adopt the SEEA EA framework in their Systems of National Accounts to organize and report environmental and economic data systematically and coherently. More research on this is conducted in WP3 and WP5.

into three categories: biophysical, economic and social. The categorisation and definitions of methods are taken from the ESMERALDA project (Burkhard et al., 2018a).

Biophysical methods are used to quantify ecosystems' capacity to deliver ecosystem services (also referred to as "supply") and the amount of harvested yield of such capacity for human benefit (also referred to as "use" or "demand") (Vihervaara et al., 2018). Economic methods measure the contribution of ES to human well-being, generally but not necessarily, expressed in monetary units (Brander and van Beukering, 2016; Brander et al., 2018). Social methods measure the relative importance of ES to people, thus revealing the demand side of ES. Social methods attempt to reflect the multi-dimensional nature of human well-being derived from ES (Santos-Martin et al., 2018).

In the EASE, users can select between these three categories of ecosystem assessment methods using the heading tabs (see Fig. 12). Each category contains a list of relevant methods shown in alphabetical order. Selecting a method displays a brief explanation of the method and an option to find literature items in the database that apply the method (see Fig. 13). Clicking on the "find items using this method in our database" button takes the user to the Search Literature Database page and displays search results in a table and on a map (see chapter 6.2).

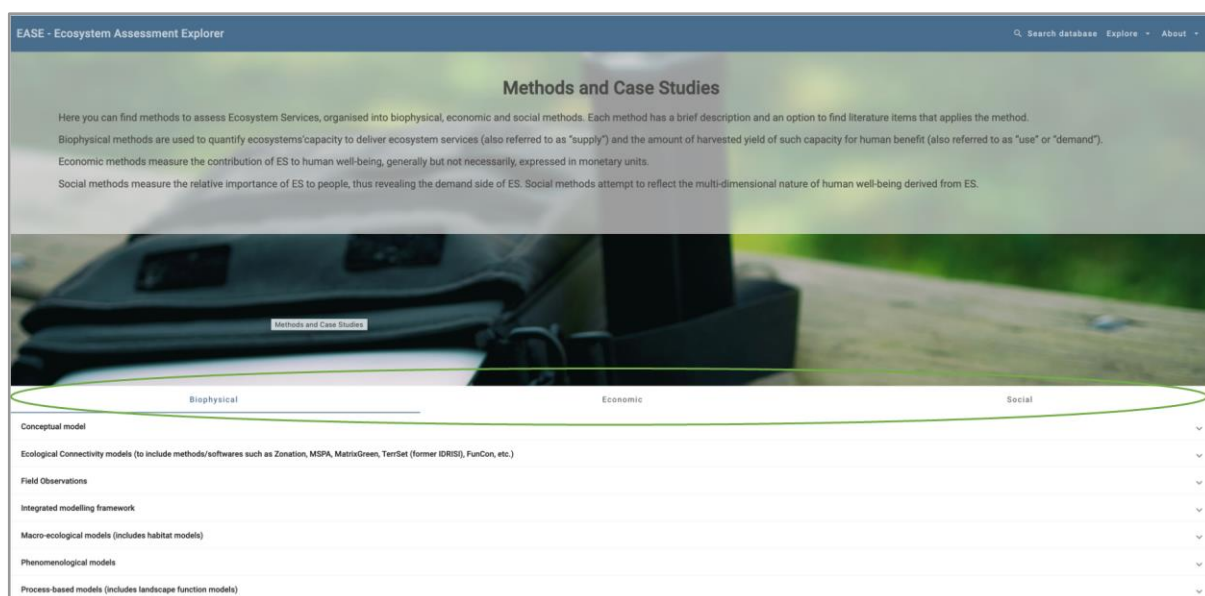


Figure 12: Ecosystem Service Methods page



EASE - Ecosystem Assessment Explorer			Search database	Explore	About
Biophysical	Economic	Social			
Conceptual model					
Ecological Connectivity models (to include methods/software such as Zonation, MSPA, MatrixGreen, TerrSet (former IDRISI), FunCon, etc.)					
Field Observations					
Integrated modelling framework					
Macro-ecological models (includes habitat models)					
Phenomenological models					
Process-based models (includes landscape function models)					
Remote sensing and earth observation derivatives (NDVI, land cover, surface temperature)					
Remote sensing and earth observations					
The role of novel Earth observation techniques and data sets is becoming increasingly important in environmental monitoring, both for biodiversity (Vihavaara et al. 2017b), and for ecosystem services (Cord et al. 2017). Satellite Earth observation as well as airborne and drone observations have huge potential to improve quantification, mapping and assessment of ecosystems and their services. Optical, radar and LiDAR data can be used for direct measurements, or to gather information that feed in the models.			Find items using this method in our database		
Spatial proxy methods					
State and transition model					
Statistical models					
Surveys and questionnaires					
Trail-based models					
Use of statistical and socio-economic data					

Figure 13: Example method definition and option to find literature items

9 Ecosystem types crosswalks

9.1 Purpose and target user

The Ecosystem Typology database was developed under Task 3.1 on “Integrating dataflows to map, assess and test ecosystem types”. The objective of the task was to operationalize the mapping of ecosystem types and connect it to relevant EU and global typologies and existing spatial information systems. While not an explicit deliverable of the task, the process led to the compilation of much information on European and global ecosystem typologies to better understand their structure, and the relationship both between them and with national ecosystem typologies in use. As this information was not previously available in a unified manner, the database was developed to allow basic typology information to be compared while providing links to the source information behind them.

The aim of the database was to create a simple interface, showing the basic information on the structure and class labels, and with links to wider information such as detailed class descriptions. An element of the task was also to explore crosswalks and mapping of ecosystem extents, therefore information on mainly published crosswalks has been compiled along with freely available Earth Observation (EO)-based data sources to assist with ecosystem extent mapping. A crosswalk describes a link between two or more different ecosystem typologies based on relationships between class definitions. It may also describe the nature of the relationship, for example, where a class definition in one typology has the equivalent in another typology (1:1 relationship) or where a class definition might have multiple but partially related classes in another typology (1:M), and vice-versa.

After receiving feedback from SELINA consortium members in July 2024, it was decided to add available information on ecosystem typologies developed and used at national level, in addition to European or global typologies.



Potential users of this database include those:

- seeking broad information on the array of typologies in use, national, European or global, and links to the sources of information behind them;
- seeking to compare semantically ecosystem groups or classes between national, European or global typologies, with links to detailed class descriptions;
- interested in crosswalks between ecosystem typologies;
- interested in delineating ecosystem extents with open EO data e.g., spatial data scientists.

The European and global typologies in the database at the time of this report are listed below in Table 2, as the original aim of the database was to collect information on these typologies only. Data on national ecosystem typologies is in the process of being added, so the database should therefore be taken as in draft mode until the end of the SELINA project. It will be frequently updated throughout the project and the date of update will be listed on the ecosystem typology main page.

Table 2: List of European and global ecosystem typologies added to the ecosystem typology database (as of October 2024). To note that national ecosystem typologies are in the process of being added.

<i>European and Global Ecosystem Typologies</i>	
Bern Convention Resolution 4 habitats	HELCOM list of biotopes, habitats and biotope complexes
Broad Typology for rivers and lakes in Europe	IUCN Global Ecosystem Typology
Corine Land Cover (CLC)	Land Use Land Use Change & Forestry (LULUCF)
Dynamic World Land Cover Land Use classification taxonomy	LUCAS - land cover
EUNIS 2012	LUCAS - land use
EUNIS Marine	MAES
EUNIS Terrestrial	MSFD reference list of habitats
European Ecosystem Typology	Natura 2000 general habitat classes
FAO Global Ecological Zones (GEZ)	OSPAR list of threatened and/or declining habitats
FAO Land Cover Classification System (LCCS)	European Red List - Marine
Habitats Directive Annex I list	European Red List - Terrestrial

Ecosystem typologies can be directly compared in the tool or downloaded for personal use. Where published crosswalks were available, they are listed in Table 3. As noted above, only crosswalks involving European or global typologies are listed below. Those involving national typologies are in the process of being added.



Table 3: List of crosswalks included in the ecosystem typology database including crosswalk direction: source and target (as of October 2024).

<i>Typology crosswalks</i>	
<i>Source typology</i>	<i>Target typology</i>
Corine Land Cover (CLC)	Mapping of Ecosystems and their Services (MAES)
EUNIS 2012	Corine Land Cover
EUNIS Marine	Habitats Directive Annex I list
EUNIS Marine	European Red List - Marine
EUNIS Terrestrial	Habitats Directive Annex I list
IUCN GET	European Ecosystem Typology
LUCAS Land Cover	Mapping of Ecosystems and their Services (MAES)
Mapping of Ecosystems and their Services (MAES)	Habitats Directive Annex I list
Mapping of Ecosystems and their Services (MAES)	EUNIS 2012
Natura 2000 general habitat classes	EUNIS 2012
European Red List - Terrestrial	EUNIS Terrestrial
European Red List - Terrestrial	EUNIS Marine

9.2 Structure of typology database

The database consists of 2 main components; ecosystem typologies & crosswalks (9.2.1) and additional information resources (9.2.2) - see Fig 14.

Data on ecosystem typologies and crosswalks is filterable and downloadable through the EASE interface, while additional resources as standalone files.



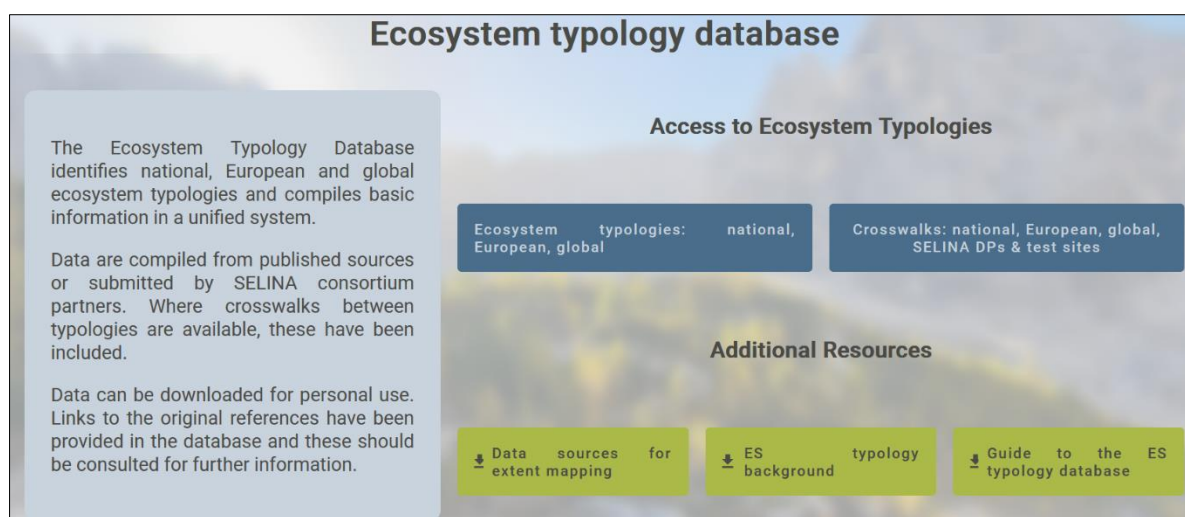


Figure 14: Ecosystem typology page

The database is structured in a unified way so that it can be updated throughout the SELINA project with additional information on typologies or crosswalks. At the time of writing, there is limited information included on national typologies. However, these, and any additional crosswalks identified or developed, can be added as they become available. Additionally, updates to the database are currently undertaken internally by the T6.6 workgroup.

9.2.1 Ecosystem typologies and crosswalks

The primary features for the two components of the ecosystem typology database are summarised in Table 4. A guide to the elements in each tab is accessible under “Guide to the ES typology database” (Additional resources).

Table 4: The main elements of the ecosystem typologies and crosswalks database.

	Ecosystem typologies	Crosswalks
Purpose	<p>gathers information on ecosystem typologies in a unified manner</p> <p>shows basic information on the type and structure of typologies</p> <p>demonstrates the array of typologies in existence for different reporting purposes</p>	<p>shows the relationship (and degree of/nature of, in some cases) between different typology classes</p> <p>shows a semantic comparison between class labels</p>



Information	type structure labels (typology and class) codes (where applicable) level of class reference + link qualifiers (where applicable) Broad grouping ⁶	source + target typology information (labels, codes) level of crosswalk qualifiers (where applicable) MAES grouping ⁷ reference ⁸
User profile	a need to have a general background on the ecosystem typologies in use to undertake a semantic comparison of classes between typologies an interest in the basic information on structure, type etc with a view to developing crosswalks, extent mapping etc	to compare relationships between ecosystem typologies/classes an interest in exploring existing crosswalks in relation to specific reporting obligations an interest in crosswalks for ecosystem extent mapping
Downloadable	yes	yes
Does not contain	information on class descriptions (although, a reference to the source information is provided for further analysis)	an exhaustive set of crosswalks between all typologies listed a tool for developing automatic crosswalks between ES typologies
Typology types	national, European & global	national, European & global
Source	published information for national, European and global typologies information on national typologies (forwarded by SELINA consortium partners via national survey on ecosystem types in Task 3.1) plus additional national	mostly published crosswalks (reference provided) crosswalks completed in-house for extent mapping purposes (SELINA test sites)

⁶ Level 1 or broad ecosystem group of the typology itself. Terminology between ES typologies differ.

⁷ Shown where a crosswalk to MAES is included (4 crosswalks in current draft). This modified ecosystem grouping is also used elsewhere in SELINA.

⁸ The reference for a crosswalk is not always the same as the typology reference.



	typologies identified beyond SELINA	
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Ecosystem typologies

The database is structured to allow selected information to be downloaded and queried. Information can be selected by a series of filters or through using a free text field.

Figure 15 shows the result of a simple query using the free text filter 'Class label' for 'mesic grasslands'. This example shows the different ecosystem typologies where a class exists using the term 'mesic grasslands'. The number of records filtered for each selection is given in the upper right-hand corner of the main information window.

Ecosystem typologies

Explore information on ecosystem typologies. You can go back to [Ecosystem Typology Home](#) or find information on [Ecosystem Typology Crosswalks](#).

Typology Name ▾ Typology Scope ▾ Class Label: **mesic grasslands** Type ▾ Structure ▾ Level ▾ Broad Groupin... ▾ [clear all](#)

Items per page: 100 ▾ 1 - 3 of 3

Typology name	Code	Label	Class level	Maximum level	Broad Grouping
EUNIS 2012	E2	Mesic grasslands	2	8	Grasslands and lands dominated by forbs, mosses or lichens
EUNIS Terrestrial	R2	Mesic grasslands	2	8	Grasslands and lands dominated by forbs, mosses or lichens
Habitats Directive Annex I list	6270	Fennoscandian lowland species-rich dry to mesic grasslands	1	1	Grasslands

Typology Type: ecosystem type
Typology Structure: list
Reference: [Interpretation Manual of European Union Habitats, version EUR 28 \(2013\). European Commission, DG-ENV.](#)
Reference Year: 2013

[Download as CSV](#)

Figure 15: Example query of ecosystem typologies

In addition to the main filtered data, a separate window lists the basic information on the typology itself such as the structure and background documentation (hyperlinked). This information changes on hovering over different records from classes filtered, where multiple typologies are filtered. This information is also downloadable along with the main information window.

The filters on the database are:

Typology name: The long name of the typology and the commonly used acronym, if used.

Typology scope: These three sub-divisions are national, European and global typologies. Information on national typologies is being updated in the database throughout the project duration. All typology information is presented in the same format, allowing for, for example, a national user to download both their national typology and a European or global one for an easy comparison on the structure or class definition (not to be confused with a crosswalk exercise between typology classes).

Class label: A free text field that allows for individual class labels to be filtered. This is useful where there is interest in a semantic comparison between similar classes in different typologies.



Type: The typologies in the database are divided into 3 broad ‘type’ groups based on their purpose or use. The land cover/land use typologies were developed to categorise land cover based on physical characteristics or specific uses, while ecosystem typologies were developed to categorise based on structural, functional or compositional characteristics. Typologies are also developed to combine these two approaches. For this database (and the work undertaken in Task 3.1) the term ‘ecosystem typology’ is used in the broad sense when describing all these types.

Structure: The typology structure given information on whether a typology is a list, hierarchical or a combination of these. There are examples of typologies with 2 levels that are labelled as ‘list’ due to limited classes present in each category

Level: Where a typology is hierarchical in nature, the level of the class is shown. Hierarchical typologies in the database can have up to 8 levels.

Broad ecosystem group: This is the broad grouping or usually the level 1 ecosystem group of the selected typology. This can be different between typologies, for example, where Corine Land Cover used the term ‘Artificial areas’, the European Ecosystem Typology uses ‘Settlements and other artificial areas’, LUCAS Land Cover uses ‘Artificial land’ and MAES uses ‘Urban’, when describing similar classes. This grouping is linked to the typology ‘type’ field.

For simplicity, class descriptions have not been included however links to this information have been provided. Information on source documentation behind the ecosystem typology is hyperlinked.

Ecosystem crosswalks

The typologies with published crosswalks are included in the database. Where crosswalks have been developed in the context of the SELINA test sites, these will be added when completed. An example of these are Sao Miguel, Azores and the Peloponnese in Greece, both the focus of Task 5.2 on “Enhancing the spatial and temporal resolution of ecosystem accounts using satellite data”, and which are crosswalked to the European Ecosystem Typology.



Ecosystem crosswalks

Explore information on ecosystem typology crosswalks. You can go back to [Ecosystem Typology Home](#) or find information on [Ecosystem Typology Database](#).

Source typology: MAES (51) Target typology: EUNIS 2012 (51) MAES Ecosystem Group: clear all

Source typology	Source - Class Code	Source - Class Label	Source - Level	Target typology	Target - Class Code	Target - Class Label	Target - Level	MAES Ecosystem Group
MAES	-	Urban	2	EUNIS 2012	J5	Highly artificial man-made waters and associated structures	2	Urban
MAES	-	Urban	2	EUNIS 2012	J6	Waste deposits	2	Urban
MAES	-	Cropland	2	EUNIS 2012	I1	Arable land and market gardens	2	Cropland
MAES	-	Cropland	2	EUNIS 2012	I2	Cultivated areas of gardens and parks	2	Cropland
MAES	-	Grassland	2	EUNIS 2012	E1	Dry grasslands	2	Grassland
MAES	-	Grassland	2	EUNIS 2012	E2	Mesic grasslands	2	Grassland
MAES	-	Grassland	2	EUNIS 2012	E3	Seasonally wet and wet grasslands	2	Grassland

Source Typology - Max. Level: 2
Target Typology - Max. Level: 8
Qualifier or relationship:
Reference:
Reference Year:

Download as CSV

Figure 16: Example query of ecosystem crosswalks

The main information that can be filtered is on the source and target typologies. The direction of the crosswalk is important to define as a class in one typology may have multiple relationships with classes in another typologies, and class relationships may exist at different levels of different typologies. Information on the source and target typology includes the class label, code and the level at which the crosswalk occurs.

Crosswalks can be between national, European or global typologies.

9.2.2 Additional elements

Additional elements included in the ecosystem typology database include data sources for extent mapping, background information on each typology, and a guide to the ecosystem typology database (see Fig. 17).

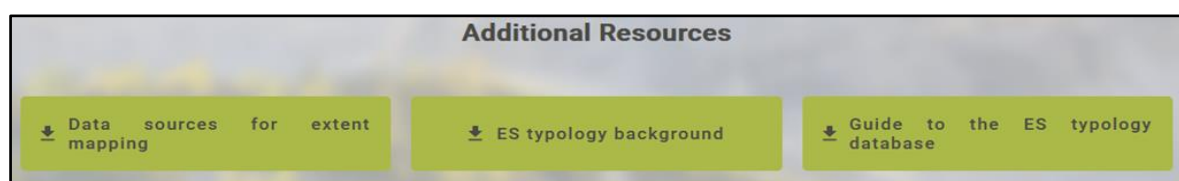


Figure 17: Additional resources on ecosystem typologies

Data sources for extent mapping

This section is a compilation of open EO data sources geared towards spatial scientists wishing to undertake an ecosystem crosswalk and/or extent mapping. The dataset was compiled as part of an exercise to crosswalk a national (Ecosystem Map of Hungary) and a European typology (European Ecosystem Typology) with the purpose of delineating ecosystem extents for accounting (Task 3.1 Integrating data flows to map, assess and test ecosystem types. Freely available EO-based data products (Copernicus products, CLMS, non-CLMS) used as part of this task to map extents of level 2 of the European Ecosystem Typology are provided. This information can be used as a starting point to identify EO-based data sources for further extent mapping.



Freely available EO-based data sources were also compiled for the *Land Cover Components (LCC)* of the EAGLE data model. The EAGLE data model is a system of characterisation is based on comparing similar terms or definitions for class descriptions and is independent of any specific typology. The EAGLE data model describes a land unit using land cover components, land use attributes or land cover characteristics, creating a structured system for semantic comparison of units or classes.

An additional tab on *dataflows* is included, which is a compilation of dataflows linked to ecosystem typologies, or those that can aid with ecosystem extent mapping. A description of the datasets is provided, along with a link to background data, how the data is/can be used (in the context of typologies in general and Task 3.1) and basic information such as the update cycle of available data.

Please refer to the [read me](#) tab in the file for more information on the contents.

Ecosystem typology background

A [summary document](#) is provided outlining background descriptive information on the main European and global ecosystem typologies shown in the database, including the scope, purpose and development of the typologies. This document is a modified version of information contained in the SELINA T3.1 deliverable ‘Integrating data streams to define and map ecosystem types’ (Rendón et al. 2023).

10 Additional online resources

A final functionality included in the EASE is the ‘Additional online resources’. This functionality allows users to browse resources for conducting ecosystem services assessments. Tools, databases and information created in the SELINA project builds on existing knowledge. Additionally, there are many relevant resources currently developed related to ecosystem services assessment. The resources are broad in scope and can include tools, databases and projects that support the evaluation of natural capital, biodiversity, ecosystem condition, and ecosystem services.

Users can filter the functionality using a free text search based on the name and description, the keywords and the target audience (see Fig. 18 for a screenshot of the additional online resource web page).

The functionality includes the following information:

1. Acronym: Describes the abbreviation of the online resource.
2. Name: Describes the name of the online resource.
3. Description: Includes information on the purpose and goal of the online resource
4. Link: Includes a link to the online resource.
5. Keywords: Based on existing information, the online resource is classified in SELINA-related keywords to quickly understand the themes of the resource in relation to the SELINA project. Options include ecosystem service methods, ecosystem services




indicators, ecosystem condition indicators, ecosystem accounting, policy uptake, tool and database. Note that multiple options can be selected.

6. Target audience: Describes the possible target audiences of the online resource. Options include public sector, private sector, financial sector, NGO sector and Academia and research sector. Note that multiple options can be selected.
7. Regular update: Describes whether the online resource is still updated. Options include yes or no.
8. Geographic scope: Describes the scope of the online resource on continent level. Options include Europe, Asia, Africa, North America, South America, Oceania, Antarctica and Global.

Additional online resources

On this page you can find other online resources for conducting ecosystem service assessments. These include other projects, tools and databases that support the evaluation of natural capital, biodiversity, ecosystem condition, and ecosystem services. Use the search function to find online resources relevant to your needs.



Fulltext search in name and description Keywords Target Audience

Acronym	Name	Description	Link	Keywords	Target audience	Is regularly updated?	Geographic scope
POLICYMIX	Assessing the role of economic instruments in policy mixes for biodiversity conservation and ecosystem services provision	POLICYMIX focuses on the role of economic instruments for biodiversity conservation and ecosystem services provided by forest ecosystems. POLICYMIX evaluates the cost-effectiveness and benefits of a range of economic versus regulatory instruments in a variety of European and Latin American case studies.	https://policymix.rnrm.eu/	Policy uptake, Databases, Tool	Public sector	no	Global
Openness		The overall objective of the OpenNESS project was to translate the concepts of ecosystem services and natural capital into operational frameworks that provide tested, practical and tailored solutions for informing sustainable land, water and urban management at different locales and scales.	https://openness.eu/groups/openness/openness-project	Ecosystem services methods, Policy uptake, Ecosystem services indicators		no	Global European
ENCORE	Exploring Natural Capital Opportunities, Risks and Exposure	ENCORE sets out how the economy – sectors, subsectors and production processes – depends and impacts on nature. Financial institutions in particular can use data from ENCORE to identify nature-related risks they are exposed to through their lending, underwriting and investment in high-risk industries and sub-industries.	https://encoreplatform.org/en/about/about-encore	Tool, Policy uptake, Ecosystem services indicators	Private sector, Financial sector	yes	Global
IBAT	Integrated Biodiversity Assessment Tool	IBAT aims to provide data, tools, and guidance to help organisations act on biodiversity related risks and opportunities, and provide sustainable funding to support biodiversity datasets	https://www.ibat-alliance.org/	Tool, Policy uptake, Ecosystem condition indicators	Private sector, Financial sector	yes	Global
BES	Biodiversity and Ecosystem Services Index	The Swiss Re Institute Biodiversity and Ecosystem Services (BES) Index assesses which economic sectors are most reliant on nature and evaluates the exposure each country has to BES decline.	https://www.swissre.com/institute/research/topics-and-risk/diligence/climate-and-natural-capital/the-risk-reporter	Tool, Ecosystem services indicators, Policy uptake	Private sector, Financial sector	yes	Global

Figure 18: Additional online resources page

11 Future Roadmap

The EASE is now operational and provides an online platform for participants of the SELINA consortium, the wider research community and others to obtain relevant literature and other information on ecosystem service assessment methods, ecosystem condition indicators, ecosystem typologies, and other relevant online resources.

The future roadmap for the EASE is to ensure that it stays relevant and up-to-date by making it a living database. In practical terms, this means that the databases that are made available through the EASE will continue to be updated through the lifespan of SELINA and beyond.

Within the lifespan of SELINA, the databases will be supplemented with additional literature items, typologies and other online resources using the same data upload process as currently applied. In particular, results and publications from the SELINA Demonstration Projects and test sites will be added to the database of literature items, as will be additional results from the literature reviews (notably from Task 3.2). Moreover, it is possible that new research outcomes, e.g. referring to the use of EC indicators and respective classifications



(see chapter 6) may entail a modification of the currently implemented filter function or the presentation of EC indicator lists per ecosystem type.

Beyond the timeframe of SELINA, it will be made possible for users to supplement the databases with additional information using online forms. For each database, fields in the corresponding form are used to fill the columns in the database. Input will be limited to the relevant data formats and categories used in the database. Through this functionality, users, including SELINA consortium members and the wider research community, can add relevant data and share their results. This process will also include an editorial function by which new data is checked for relevance by a member of the development team before it is made available online through the EASE.

Moreover, as the ecosystem services concept is a highly interdisciplinary approach, it is essential that different stakeholder groups communicate successfully and understand the applied terminology. SELINA aims at improving this mutual understanding and communication flow by providing a suitable terminology and adapting the language, where necessary, to be more appropriate to the respective target user(s) and increasing the implementation of EC and ES assessments. Further research on this aspect is carried out in WP6 and WP10 and relevant outcomes are expected to be incorporated on the frontend of the EASE. For instance, the target audience categories for the additional online resources (see chapter 10) may potentially be modified.

A final important element of the future roadmap for the EASE is its long term web hosting. The intention is for all online SELINA products, including the EASE and the Compendium of Guidance (CoG), to be hosted by one partner organisation. However, the domain name has not yet been decided. Once, the domain and server have been determined and the CoG website has been set up, the EASE platform will be shifted to the same location and its URL will be adapted accordingly. Technical as well as linguistic links and interconnections between both products will be implemented wherever useful. Furthermore, as part of the CoG, it is also envisioned to develop an EASE user manual to guide users to specific parts of the EASE that match the user's objectives.



12 Acknowledgements

We gratefully acknowledge the invaluable feedback and constructive suggestions for improvement from the SELINA partners that tested the EASE during development.



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<https://project-selina.eu/>



14 Annex: User feedback questionnaire

Ecosystem Assessment Explorer (EASE) development questionnaire

Introduction

The purpose of this questionnaire is to collect feedback from potential users within the SELINA consortium on the structure, content and functionality of the Ecosystem Assessment Explorer (EASE)

Instructions

Before completing the questionnaire, please visit the Ecosystem Assessment Explorer (EASE), browse each page, and try using the search options to find information.

The structure of the questionnaire follows the structure of the EAE web-interface

About you

1) Name*

2) Email*

3) Organisation*

4) Type of user? - select all that are relevant*

☐ Researcher

☐ Demonstration project

☐ Test site

☐ Other - Write In: _____

General questions

5) As a potential user, what would you use the EASE for? Select all that are relevant*

☐ Finding information on methods

☐ Finding example applications of ecosystem assessment methods

☐ Finding scientific papers on ecosystem assessment

☐ Finding information on ecosystem condition indicators

☐ Finding other online resources related to ecosystem assessment

☐ Finding information on ecosystem typologies

☐ Finding information on crosswalks between ecosystem typologies

☐ Other - Write In: _____

6) What do you see as the added value of this website as a source of information?*



7) Is the navigation of the site intuitive/user friendly?*

- ☐ Not at all
☐ Somewhat
☐ Mostly
☐ Completely

8) Are the page titles clear and understandable?*

☐ No - Write In (please give the page title and suggest how to improve):

☐ Yes

9) Is the explanatory information for each page clear and understandable?*

☐ No - Write In (please give the page title and suggest how to improve):

☐ Yes

10) Suggestions for improving the site navigation?

11) Please rank the pages in order of relevance/importance to you*

- _____ Ecosystem condition indicators
_____ Ecosystem service methods
_____ Factsheets
_____ Search Database
_____ Ecosystem Typology database
_____ Additional online resources

12) Did you experience any bugs (e.g. loading/accessing search results)?*

☐ No

☐ Yes - Write In: _____

13) Any suggestions for general improvements?

Home page

14) Does the home page provide clear information about the purpose, scope and content of the database?*

☐ No - Write In: _____

☐ Yes

15) Other suggestions for improvement?



Ecosystem Condition Indicators

16) Is the purpose of the page clear?*

() No - Write In: _____

() Yes

17) Other suggestions for improvement?

Ecosystem Service Methods

18) Is the purpose of the page clear?*

() No - Write In: _____

() Yes

19) Are the method descriptions clear and complete?*

() No - Write In: _____

() Yes

20) Other suggestions for improvement?

Search Database

21) Is the purpose of the page clear?*

() No - Write In: _____

() Yes

22) Suggestions for additional/alternative search filters?

23) Is there any other information that you would like to see in the details of each literature item?

24) Other suggestions for improvement?

Ecosystem Typology database

25) Is the purpose of the page clear?*

() No - Write In: _____

() Yes

26) Is the layout of the database coherent (e.g. typologies/crosswalks separate to data resources)?*

() No - Write In: _____



☐ Yes

27) Any suggestions for other typologies/crosswalks to add to the database?

28) Is there other information you would like to add to the typology/crosswalk tabs (as additional fields)?

29) Would it be useful to download the typology/crosswalks information?*

☐ No

☐ Yes

30) Would you use the information under the 'data resources' tab for your work in SELINA?*

☐ No

☐ Yes - Please list task number or describe:

31) Do you see the need to connect information in the typology database (typology/data resources) with other tabs in the SELINA database (e.g. filtering a specific ecosystem type to lead to information in another tab – or vice-versa)?*

☐ No

☐ Yes - please describe: _____

32) Other suggestions for improvement?

Additional online resources

33) Is the purpose of the page clear?*

☐ No - Write In: _____

☐ Yes

34) Suggestions for additional/alternative search filters?

Suggestions for additional relevant online resources to be included on the page? Please add to this Google Sheet

35) Other suggestions for improvement?

Metadata

36) Is the purpose of the page clear?*

☐ No - Write In: _____



() Yes

37) Suggestions for improvement?

Any other comments?

38) Please make any other comments or suggestions here

Thank You!

Thank you for taking our survey. Your response is very important to us.