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Ecosystem Type Map v3.1 – Terrestrial and marine ecosystems

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**with an ETC/ULS UAB contribution from Raquel Ubach and
an ETC/ULS UMA contribution from Ana Isabel Marin**

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1 Background

1.1 Ecosystem Type Map 2006 v2.1

The first Map of European Ecosystem Types (Ecosystem Type Map v2.1, ETM) was published in 2014 and based mainly on input datasets from reference year 2006 (e. g. CLC 2006). The aim of the dataset was to combine spatially explicit land cover information with non-spatially referenced habitat information to improve our knowledge about ecosystems and their distribution across Europe.

Furthermore, the objective of the ecosystem data set produced by EEA and its Topic Centre ETC/SIA was to improve the biological description of land cover based ecosystem types. The dataset represented the first map with an estimation of the spatial distribution of EUNIS habitat at European level.

Figure 1.1 Ecosystem Type Map v2.1



1.2 Update Ecosystem Type Map 2012 v3.1

Meanwhile, updated versions of most input datasets became available. Also, new datasets such as the Local Components (LoCo) consisting of Urban Atlas (UA), Riparian Zones (RZ) or Natura 2000 (N2k) and furthermore the High Resolution Layers (HRL) Grasslands and HRL Permanent Water Bodies have been developed within and are provided by the Copernicus Land Monitoring Service.

Therefore, Task 1.7.5.A is dedicated to produce an updated version of the ETM based on datasets with main reference year 2012.

The methodology of the mapping process grounds very much on the approach of the previous version of the ETM. Nevertheless, four distinct improvements have been implemented for the ETM 2012 v3.1:

1. Improvement of the mapping ruleset
In 2017, a validation of a testing version of the ETM 3.0 was undertaken by ALTERRA. The validation was based on more than 1 million in-situ vegetation relevés (assigned to EUNIS classes based on the EUNIS habitat classification 2007 and not the EUNIS habitat classification review 2017). The vegetation plots have been compared with EUNIS classes of the ETM and some mapping rules have been adapted consequently as result from the insights.
2. Use of updated input datasets:
 - Corine Land Cover 2012 accounting layer (instead of CLC 2012 status layer)
 - HRL Forests 2012 (Forest Type, Tree Cover Density)
 - HRL Imperviousness 2012
 - OpenStreetMap (OSM) data 2015 (main roads, land use information)
3. Integration of new available Copernicus data
 - Urban Atlas 2012
 - Riparian Zones 2012
 - Natura 2000 2012
 - HRL Grassland 2012
 - HRL Permanent Water Bodies 2012

For integration of the new datasets crosswalks/mapping rules had been developed. The mapping rules for Local Components and HRL can be found in section 5.2 and section 0.

4. Spatial extension of the map to include Azores and fitting to CLC land mask.

1.3 Version history of the Ecosystem Type Map

The following table gives an overview of the past, current and upcoming versions of the ETM:

Table 1.1: Version history of the Ecosystem Type Map

Version	Reference year	Ruleset	Description	Date of production	Comments
V 1.1	2006	1.1	First draft map	2013-10-06	Errors due to overlap of classes, aggregated CODE values not correct
V 1.3	2006	1.3	First quality checked results	2013-10-25	First wall-to-wall map, main errors removed; Consultation meeting with Lubos Halada
V 1.4	2006	1.4	Inclusion of Greece	2013-12-03	Greece included with CLC 2000, refinement of thematic rules,
V 2.0	2006	2.0	Complete update	2014-07-31	Data included from: New Art. 17 2013 report and WFD Adapted rule set
V 2.1	2006	2.0	Final map 2014	2014-08-30	Integration of marine ecosystem types in one dataset
V3.0	2012	2.0	Test version	2015	Not published
V 3.0	2012	3.0	First draft map of Terrestrial ecosystems	2018-03-30	First delivery of wall-to-wall map including integration of new available Copernicus datasets and ruleset 3.0
V 3.1	2012	3.1	Final map	June 2018	Integration of marine ecosystems Changes in ruleset 3.0*

*) Changes from CLC-ruleset 3.0 to 3.1:

- Exclusion/deletion of former class “A1 – Littoral rock and other hard substrata”. This class is not existent in the new classification of marine habitats developed by ETC/ULS;
- Change of rules regarding HRL Permanent waterbodies: the HRL is excluded from transitional marine CLC/EUNIS classes “Estuaries” and “Coastal lagoons” to prevent overwriting of these classes by the HRL Permanent waterbodies.

2 Workflow description

2.1 Basic mapping approach

Though simple in the fundamental approach, the methodology for the production of the ETM develops complexity through the handling of different mapping rulesets and managing of numerous input and output datasets. Basically, the mapping process is built upon the four following elements, each consisting of a list of several datasets: Land Cover, Stable core input datasets, Variable input datasets and different mapping rulesets (see Figure 2.1 below).

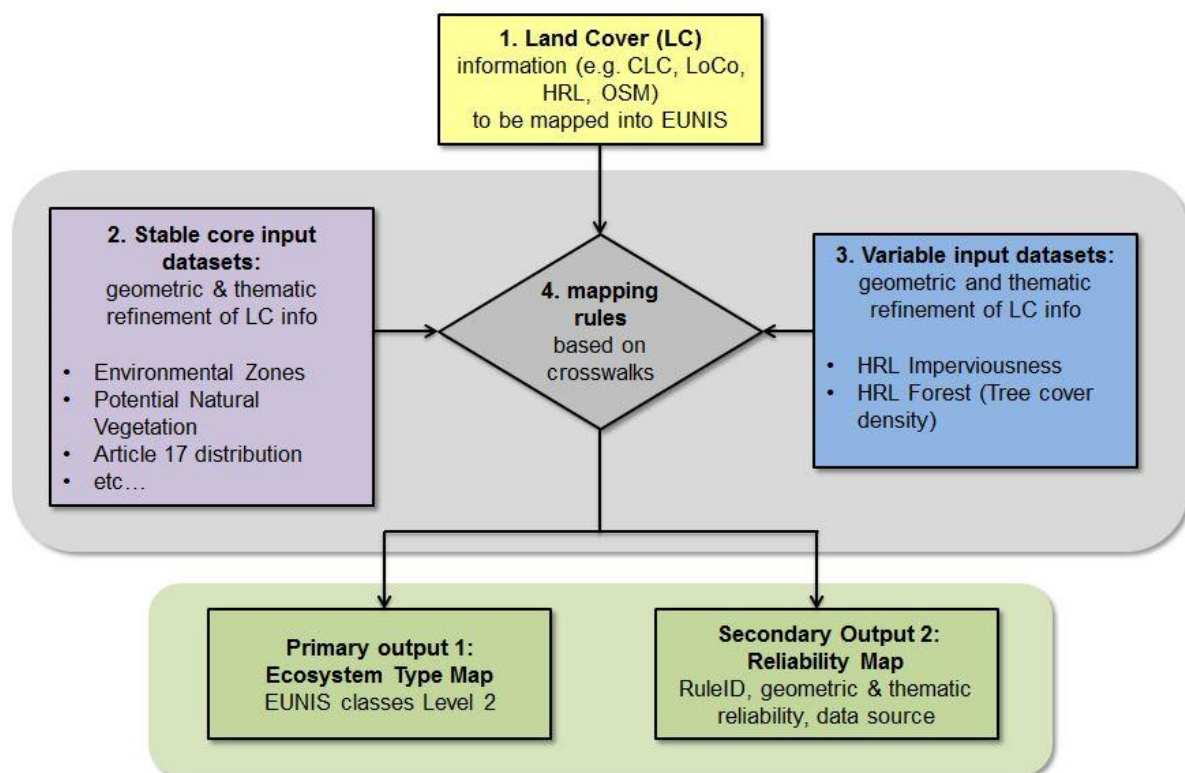


Figure 2.1: Basic mapping approach scheme

In few words:

- The ETC/BD approach for ecosystem type mapping is the geographic and thematic refinement of certain land cover input datasets to translate the original LC information into the EUNIS classification.
- Crosswalks provide the information, from what origin land cover information EUNIS classes can be derived.
- Mapping rules define which (stable and variable) datasets are needed for the refinement and how they have to be classified (e.g. setting thresholds) to translate the original LC information into the EUNIS classification.
- Primary output (ETM) is the actual map representing EUNIS classes on Level 2 with a resolution of 100 x 100 m. The Reliability Map is the secondary output containing a Rule_ID, geometric & thematic reliability, input data source and MAES Level 2 classification for each raster cell.

2.1.1 Land cover information to be mapped into EUNIS

The datasets in this group all contain information on land cover that is going to be mapped into one or more different Level 2 EUNIS classes. For the current version there are 10 input datasets that have been chosen and prepared to be integrated into the ETM 2012:

Table 2.1: Land Cover input datasets included in ETM 2006 v2.1 and 2012 v3.1

Priority from low to high	ETM 2006 v2.1	ETM 2012 v3.1	Classes available in total	Classes selected for ETM mapping
1	CLC 2006	CLC 2012 accounting	44	42
2	-	Urban Atlas 2012	27	20
3	-	Riparian Zones 2012	56	53
4	-	Natura 2000 2012	62	59
5	HRL Imperviousness 2006	HRL Imperviousness 2012	No classes	No classes
6	OSM land use	OSM land use 2015	>30	11
7	-	HRL Grassland 2012	1	1
8	-	HRL Permanent Water Bodies 2012	1	1
9	OSM main roads	OSM main roads 2015	>30	2
10	HRL Forest 2006	HRL Forest 2012 (Forest Type)	3	3

2.1.2 Stable core input datasets

The stable core input datasets are used for the geometric and thematic refinement of the original LC input dataset. In general, datasets of this group are considered stable as they usually do not change or only in long terms. Further, datasets of this group do not rely on current land use. Examples are the Environmental Zones Map or Map of the Potential Natural Vegetation¹. Updates are not foreseen for every new version of the ETM. Nevertheless, datasets of this group can be updated if newer versions (e.g. Article 17 distribution maps) or versions with a higher spatial resolution become available. Though, it has to be mentioned that updating one or more datasets affects the comparability with older versions of the ETM.

A comprehensive list of all stable core datasets used for the ecosystem type mapping is given in section 3.

2.1.3 Variable input datasets

Such as the stable core input datasets, this group's function is to contribute to the geometric and/or thematic refinement of the original land cover information. But in opposition to the stable core datasets, such data depend on current land use and therefore have to be updated with every new version of the ETM. In the previous versions and the current version of the mapping ruleset, this involves two datasets, namely the HRL Forests – Tree cover density and the HRL Imperviousness.

¹ Bohn, U., and Neuhäusl, R., 2000, Map of the Natural Vegetation of Europe/Karte der Natürlichen Vegetation Europas, BfN-Schriftenvertrieb http://www.floraweb.de/vegetation/dnld_eurovegmap.html

Table 2.2: Variable input datasets for the ETM

ETM 2006 v2.1	ETM 2012 v3.1	Range
HRL Forests 2006 – Tree cover density	HRL Forests 2012 – Tree cover density	0 - 100
HRL Imperviousness 2006	HRL Imperviousness 2012	0 - 100

2.1.4 Crosswalks and Mapping rules

For each LC input dataset a crosswalk needs to be developed that gives guidance into what EUNIS class an original LC can be mapped. A first CLC/EUNIS crosswalk was developed by ETC/BD for the production of the ETM 2006 v2.1.

According to this crosswalk, in many cases there is a 1:1 relation between CLC and EUNIS. For example, CLC-class 211 (Non-irrigated arable land) can directly be mapped into EUNIS class I1 (Arable land and market gardens).

In other cases original LC classes can be differentiated into two or even more distinct EUNIS classes. CLC-class 231 (Pastures), for example, can be assigned to the following five different EUNIS classes:

- E4 – Alpine and subalpine grasslands
- B1 – Coastal dunes and sandy shores
- E7 – Sparsely vegetated areas
- E3 – Seasonally wet and wet grasslands
- E2 – Mesic grassland

Therefore, in the course of the production of ETM v2.1, ETC/SIA developed corresponding mapping rules for the practical implementation of the CLC/EUNIS crosswalk. For instance, to map into EUNIS-class E4 a pixel of CLC-231 has to fall into an area that is to be considered alpine or subalpine. This thematic refinement is achieved by integrating a layer that represents alpine and subalpine areas in Europe. Consequently, the mapping rules combine the LC input information with stable core input datasets (such as the alpine zone) or variable input datasets.

Technically, the mapping rules are stored in an Excel table (see Table 2.3 for an example) and implemented as Python based scripts that produce two raster data outputs:

1. **Primary output map:** the ecosystem type map (ETM) itself, displaying EUNIS classes on Level 2
2. **Secondary output map:** the reliability map for cross reference to geometric & thematic reliability, data source and MAES Level 2.

Besides the main information on the destined EUNIS class, each single mapping rule is given a unique Rule_ID code as well as an estimation of the reliability regarding the geometric and thematic accuracy of the rule (see section 5.1.1 for further details). As fourth attribute, the name of the LC input dataset is also given - so in the final map, it can be determined whether a pixel results from CLC, UA or RZ etc. Additionally, each rule output is also assigned to a class on MAES Level 2 (see Annex 8.1.6):

Table 2.3: Example for mapping rules as stored in Excel

Rule ID	Land cover input data set	Original LC-class	Original LC-code	Rule/variable	pre-condition	Target EUNIS class	Target EUNIS code	Output grid	Python Code	Reliability geometric	Reliability thematic	MAES Level 2
2	CLC	112	2	HRL_sealing	<=30	J2	55	g112_J2	g112_J2_c = Con ((lc ==2) AND (HRL_sealing==<=30),55,0) g112_J2_r = Con ((lc ==2) AND (HRL_sealing==<=30),2,0)	9	3	1
3	CLC	112	2	Standard		J1	54	g112_J1	g112_J1_c = Con ((lc ==2) AND (g112_J2_c ==0),54,0) g112_J1_r = Con ((lc ==2) AND (g112_J2_c ==0),3,0)	5	4	1
366	RZ	4220	4220	Standard		E4	26	g4220_E4	g4220_E4_c = Con (lc ==4220,26,0) g4220_E4_r = Con (lc ==4220,366,0)	7	5	3

For example, the rule with ID 366 addresses land cover information from Riparian Zone 4220 (Alpine and subalpine natural grassland). It is a standard rule mapping RZ-4220 in a 1:1 relationship directly into EUNIS-class E4 (Alpine and subalpine grassland). This means, all pixels of RZ-4220 will show up as EUNIS E4 in the ETM v3.1 (unless they are not overwritten by another LC dataset with higher priority, such as HRL Forest). The Excel table also contains two lines of Python scripts that each will be used to create raster datasets: one representing the final EUNIS class (= g4220_E4_c) and one representing the secondary output of the reliability map (= g4220_E4_r). The Python code lines are processed one after one for each class of the input land cover data set and afterwards merges all raster datasets together to form interim output datasets.

The second example in Table 2.3 addresses CLC-class 112 (Discontinuous urban fabric). This class does not show a 1:1 relationship. CLC-112 can be mapped into EUNIS class J2 (Low density building), but only if the degree of soil sealing (determined by HRL Imperviousness) is less than 30 %. This means, all pixels of CLC-112 that do not exceed this threshold determined by HRL Imperviousness will be mapped into J2 according to Rule_ID 2. All other pixels of this class according to standard Rule_ID 3 will be mapped into J1 (Buildings of cities, towns and villages). A comprehensive tabular version of the current CLC/EUNIS crosswalk and ruleset v3.1 can be found in section 5.1. Regarding the integration of LC from LoCo, HRL & OSM within this task individual crosswalks for each dataset have been developed. These crosswalks mainly base on the CLC/EUNIS crosswalk and can be found in section 5.2 and section 0.

2.2 Combination and prioritisation of output datasets

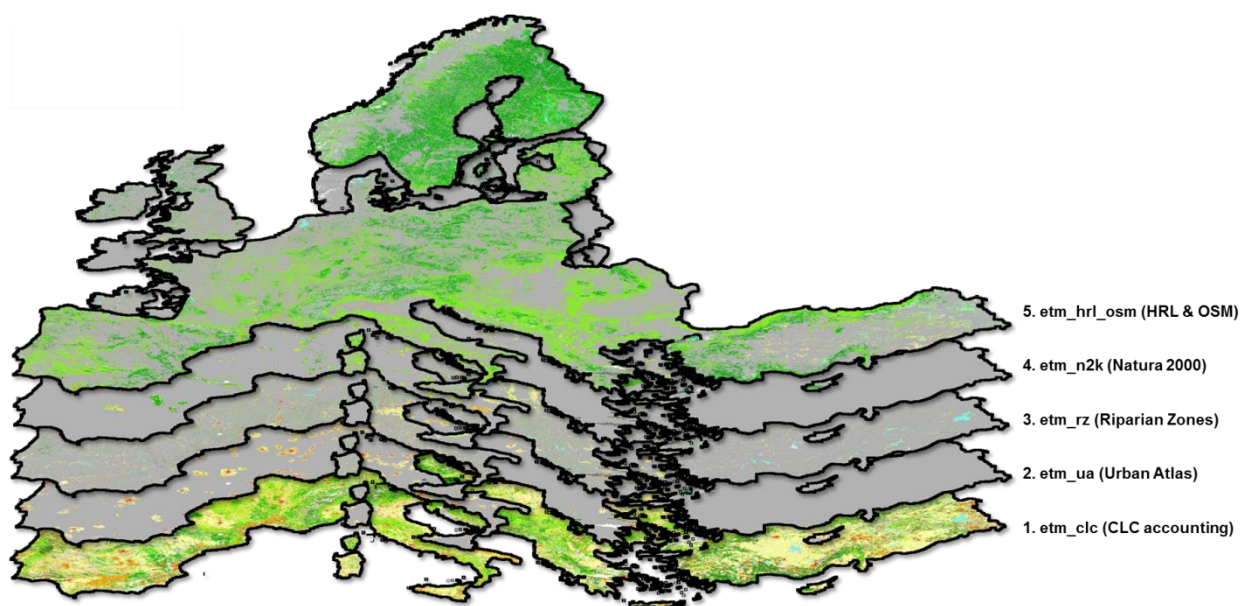
The processing of the original land cover classes of each dataset into the EUNIS classification is undertaken in parallel and independently from each other. Only the HRL and OSM datasets are combined into one integrated dataset as they do not contain so many different LC classes. This means that for the production of the ETM, five primary interim and five secondary interim output maps are produced:

Table 2.4: Primary and secondary interim maps

Order	Name	Information	Derived from
1	etm_clc_c etm_clc_r	EUNIS classes Level 2 Reliability/Rule_ID/MAES Level 2	CORINE Land Cover accounting
2	etm_ua_c etm_ua_r	EUNIS classes Level 2 Reliability/Rule_ID/MAES Level 2	Urban Atlas
3	etm_rz_c etm_rz_r	EUNIS classes Level 2 Reliability/Rule_ID/MAES Level 2	Riparian Zones
4	etm_n2k_c etm_n2k_r	EUNIS classes Level 2 Reliability/Rule_ID/MAES Level 2	Natura 2000
5	etm_hrl_osm_c etm_hrl_osm_r	EUNIS classes Level 2 Reliability/Rule_ID/MAES Level 2	HRL & OpenStreetMap

For the final composition of the ETM, the five interim maps are mosaicked into a new single raster, beginning with etm_clc as lowest layer in the stack. Step by step it is overruled by the interim maps with higher spatial and thematic accuracy. This operation is processed for both the primary output representing the actual EUNIS classes and the secondary output containing the reliabilities and Rule_ID etc. for each raster cell (see Annex **Erreur ! Source du renvoi introuvable.** for a detailed workflow chart):

Figure 2.2: Mosaicking of interim maps



3 Stable core input data

3.1 Overview of stable core input datasets

The following table contains a list of all “stable” datasets (for geometric and thematic refinement) that are needed as inputs to execute the mapping rules based on the CLC/EUNIS crosswalk. They form a core dataset that represents information not changing through time (or at least from one version of the ETM to the next update, e.g. the natural potential vegetation zone or distance to the coast etc. and therefore are called “stable”). The vast majority of these datasets has been prepared for the first production of the ETM v2.1 and are in detail documented in the report of ETC/SIA (2014).

For the current update the stable input datasets only minor modifications have been made, most of all to make the datasets fit seamlessly to the CLC land mask and to include the Azores. Only two datasets have been produced new because they are required in the updated ruleset v3.1.

Table 3.1: List of stable core input datasets

Grid	variable	format	range	units	comment
subalpine	nominal	binary	0/1	classes	0...not subalpine 1...subalpine
macaronesia	nominal	binary	0/1	classes	1...Madeira and Canary Islands
geology	nominal	integer	1-3	classes	1...calcareous 2...sediment 3... siliceous
mix_ara_gras	nominal	integer	1-3	classes	1...arable 2...grassland
evergreen	nominal	integer	1,2	classes	1...deciduous 2...evergreen
drygrass	nominal	integer	0/1	classes	0...other land surfaces 1...dry grasslands,
jrc_riparian	continuous	integer	0-100	percent	recalculated from 1*1km grid (x/1600)
dist_coast	continuous	integer	0-15.000	meters	distance > 15.000 m excluded
potnatveg14	nominal	integer	1-14	classes	1...Vegetation of coastal sand dunes... 2...Ombrotrophic mires (bogs) ... 13...Arctic shrub tundras 14...Atlantic dwarf shrub heaths
potNatVeg910	nominal	binary	0/1	classes	1...potNatVeg class 9 & 10
potnatveg1213*	nominal	integer	0/1	classes	1...potNatVeg class 12 & 13
slope_degree	continuous	integer	0-90	degrees	Slope
soil_acid	nominal	binary	0/1	classes	1...acid soils
soil_wet	nominal	binary	0/1	classes	1...wet soils

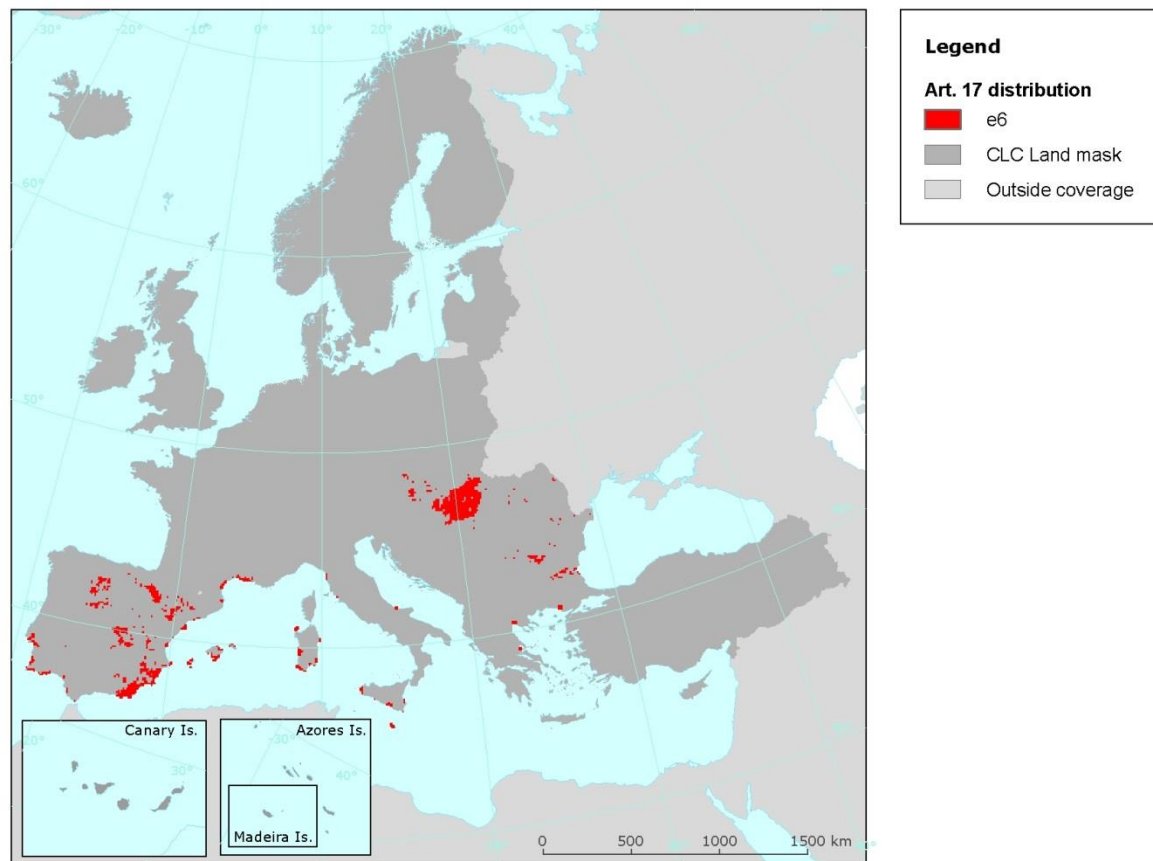
ecoregions	nominal	integer	1-13	classes	Alpine North (ALN) 2...Boreal (BOR) 3...Nemoral (NEM) 13...Mediterranean Mountains (MDM)
ecoreg_north	nominal	binary	0/1	classes	1...BOR, ALN, ATN & ALS 0...all other environmental zones
coastal_rocks	nominal	binary	0/1	classes	1...Adjacent to coast rocks 0...not adjacent
around_lake	nominal	integer	1	classes	1...class 411 in direct neighbourhood to a lake
rivers_wfd_ex	nominal	integer	1-3; 9	classes	1...natural 2...heavily modified 3...artificial
lakes_wfd_ex	nominal	integer	1-3; 9	classes	1...natural 2...heavily modified 3...artificial
b1_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - B1
b1b2_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - B1 & B2
b2_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - B2
b3_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - B3
d1_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - D1
d2_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - D2
d3_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - D3
d4_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - D4
d5_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - B5
d6_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - D6
e6_art17*	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - E6
f3_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - F3
f4_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - F4
f5_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - F5
f6_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - F6
f7_art17	nominal	binary	0/1	classes	1...distribution of Art. 17 habitats - F7

**) created new for ruleset 3.1*

3.2 Creation of new datasets as a consequence of adapted mapping rules

Due to the changes in the mapping rules, two new raster datasets had to be created.

Map 3.1: Article 17 distribution map for E6



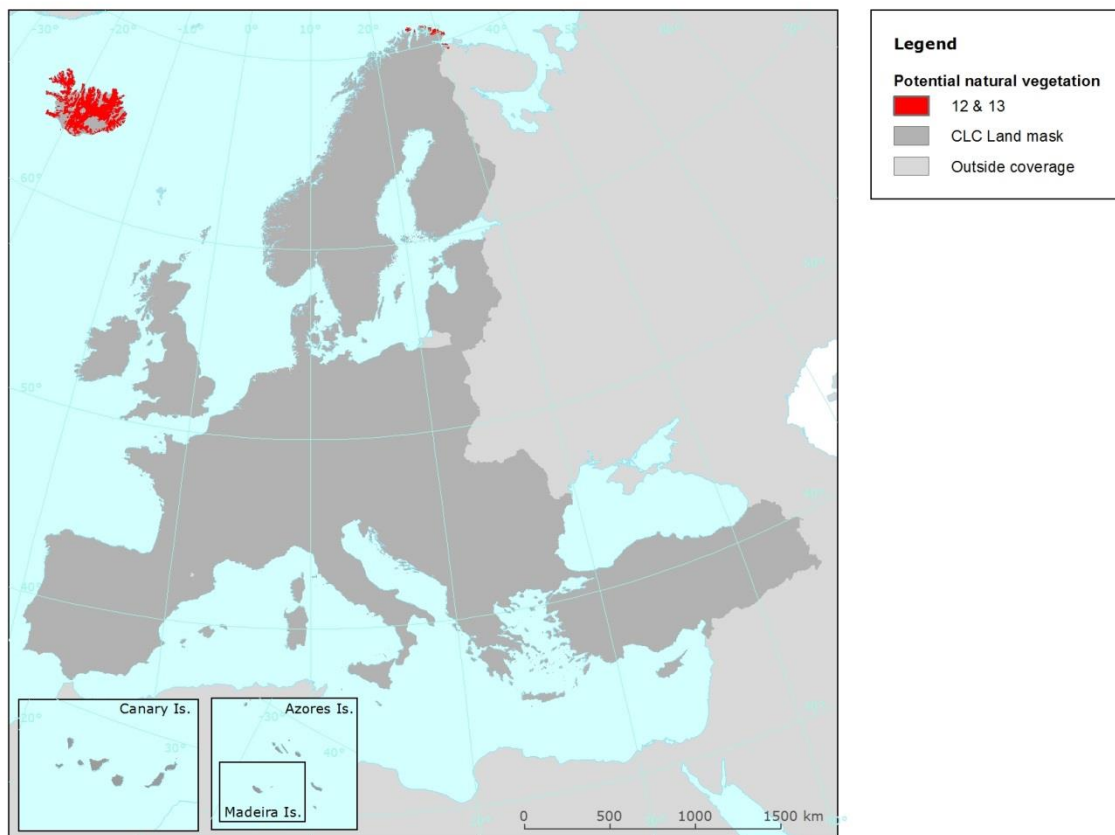
3.2.1 Article 17 distribution map for E6

Dataset name: e6_art17

Dataset description: The map above is derived from the 2013 Art. 17 distribution dataset and shows the distribution of Article 17 habitats that are related to EUNIS-class E6 (Inland salt steppes).

3.2.2 Potential natural Vegetation

Map 3.2: Potential natural vegetation zone 12 & 13



Dataset name: potnatveg1213

Dataset description: The dataset contains two zones of the Potential Natural Vegetation.

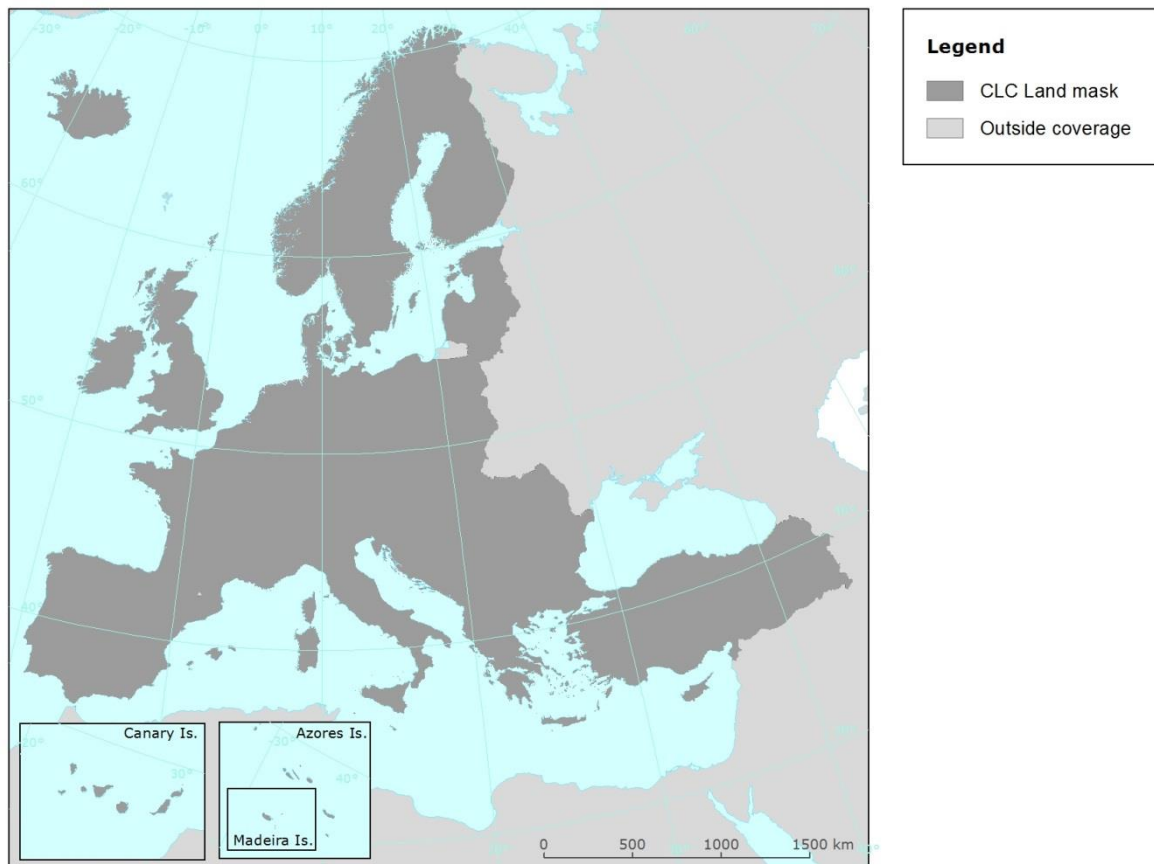
- 12 - Arctic polar deserts, Northern arctic tundras, Middle arctic tundras, Southern arctic tundras, Mountain tundras and sparse mountain vegetation (Island, Kola peninsula and Ural)
- 13 – Arctic shrub tundras

The dataset is used for assignation of CLC-class 322 (Moors and heathland) to EUNIS-class F1 (Tundra).

4 Variable Input Data

4.1 CLC 2012 100m reference land mask

Map 4.1: CLC land mask



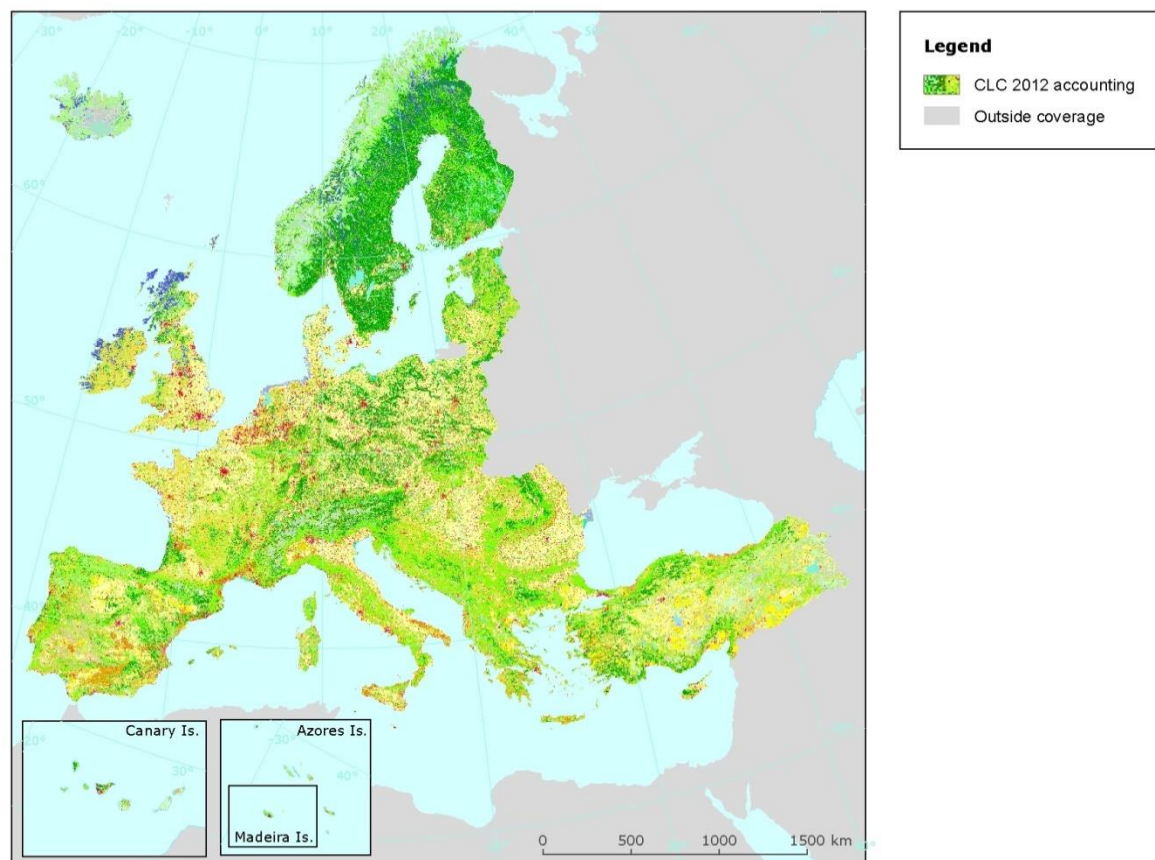
Dataset description:

The CLC 2012 land mask is a dataset derived from CLC 2012. It is intended to be used as a reference dataset for data harmonisation within the EEA. The mask contains exactly 586,082,332 pixels with any valid land cover class value in CLC2012, except for class 523 (Sea and ocean). This dataset is used as mask for the calculation of the terrestrial ecosystems of the ETM to ensure a seamless integration of the marine ecosystems that will be provided by ETC/ULS.

- 100m raster
- Version 18.5
- Source: EEA
- Spatial extent:
 - Top: 5500000; Left: 900000; Right: 7400000; Bottom: 900000
 - Number of columns: 65000; Number of rows: 46000

4.2 Corine Land Cover 2012 accounting layer

Map 4.2: CLC 2012 accounting



Dataset description:

The CLC accounting layers combine CLC status and change layers in the 100 x 100 m raster form. They have been developed in order to create homogeneous quality time series of CLC / CLC-change layers for accounting purposes. To facilitate the change analyses of further versions of the ETM, the CLC accounting layer 2012 has been chosen instead of the CLC 2012 status layer.

- 100m raster
- Version 18.5
- Source: EEA

The CLC 2012 accounting layer is not fully coherent with the CLC land mask in some coastal regions. Therefore, some few missing pixels and gaps in the accounting layer have been filled with information of the CLC 2012 status layer.

4.3 Local Components

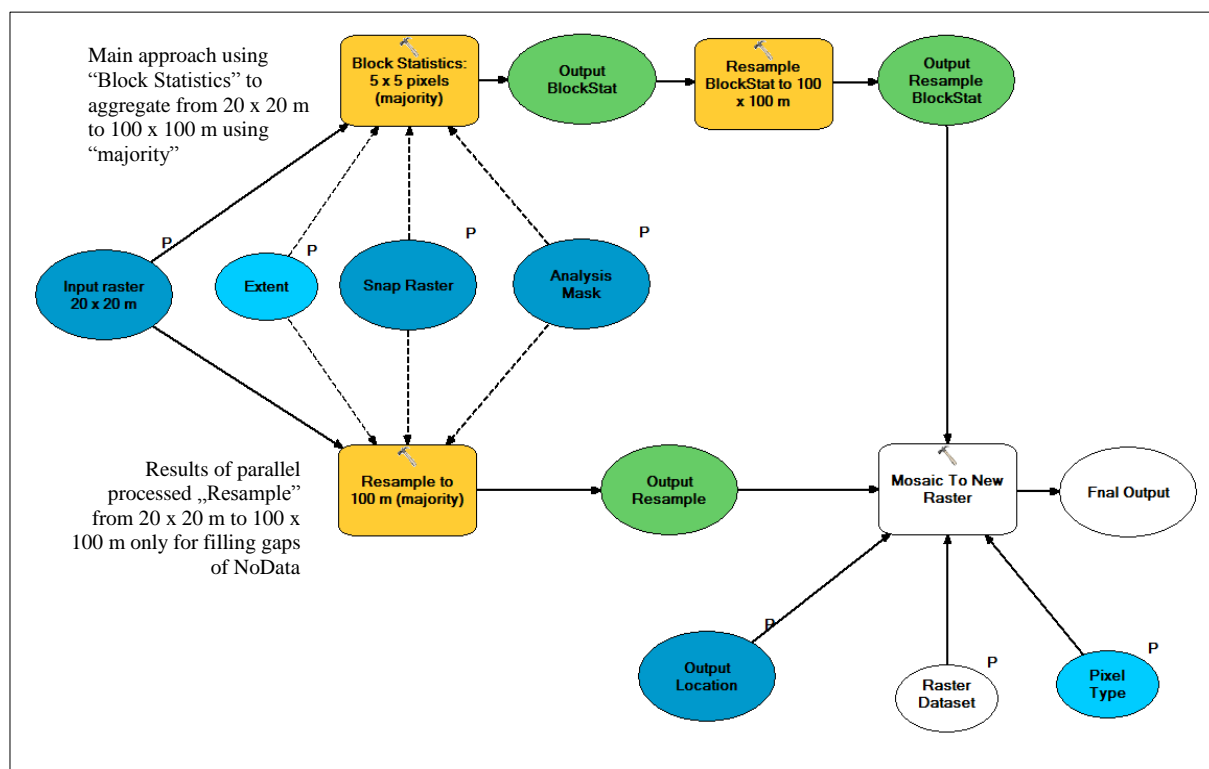
According to the [Copernicus website](#) the LoCo are coordinated by the European Environment Agency and aim to provide specific and more detailed information that is complementary to the information obtained through the Pan-European components (such as CORINE Land Cover or the High Resolution Layers).

At the moment there are three datasets available:

- Urban Atlas
- Riparian Zones
- Natura 2000

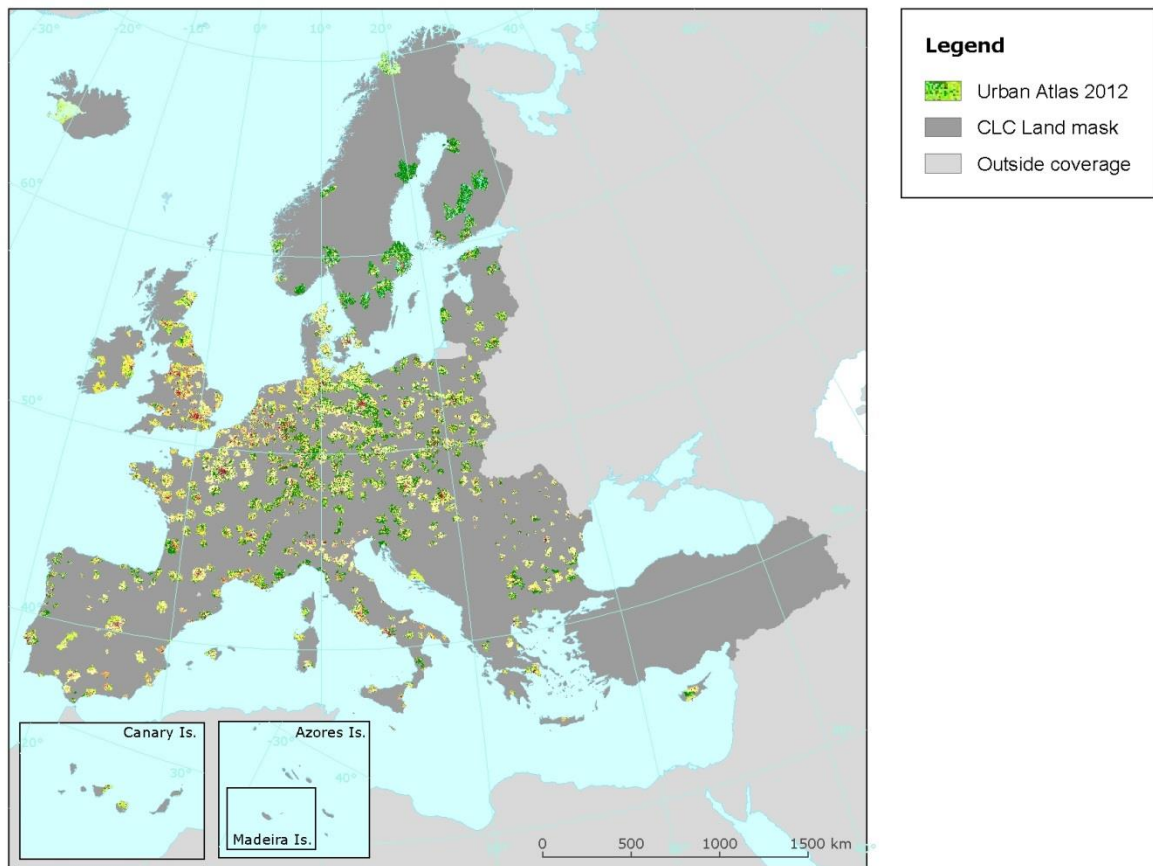
These datasets in vector format are available for free download on the Copernicus website. Rasterized versions of the Local Components with a spatial resolution of 20 x 20 m (cell-centre-method) were provided by ETC/Uls. In order to integrate the information of the datasets into the ETM, the datasets have been aggregated to a resolution of 100 x 100 m. The aggregation to a lower raster resolution by choosing the dominant value is actually a complex procedure. The aggregation was processed as shown in the following workflow:

Figure 4.1: Model for aggregation to lower spatial resolution



The "Resample" tool in ArcMap only considers pixels around the cell centre of the desired new raster resolution. It therefore cannot be used as single process to determine the majority of a class. Consequently, to avoid misleading results, the main resampling process is undertaken using block statistics. If there is more than one majority value within a neighbourhood, all of the cells for that block will receive NoData on the output. In case of this, all NoData gaps are filled with the results of a parallel processed "Resample". This workflow was used for aggregation of Urban Atlas, Riparian Zones and Natura 2000.

Map 4.3: Urban Atlas 2012



4.3.1 Urban Atlas 2012 (UA 2012)

Dataset description:

The Urban Atlas 2012 consists of 697 Functional Urban Areas (FUAs), including 301 existing already in UA 2006. It covers most EU-28 cities with a population of over 50,000 inhabitants and comprises urban and rural classes:

- 17 urban classes with MMU 0.25 ha
- 10 Rural Classes with MMU 1ha

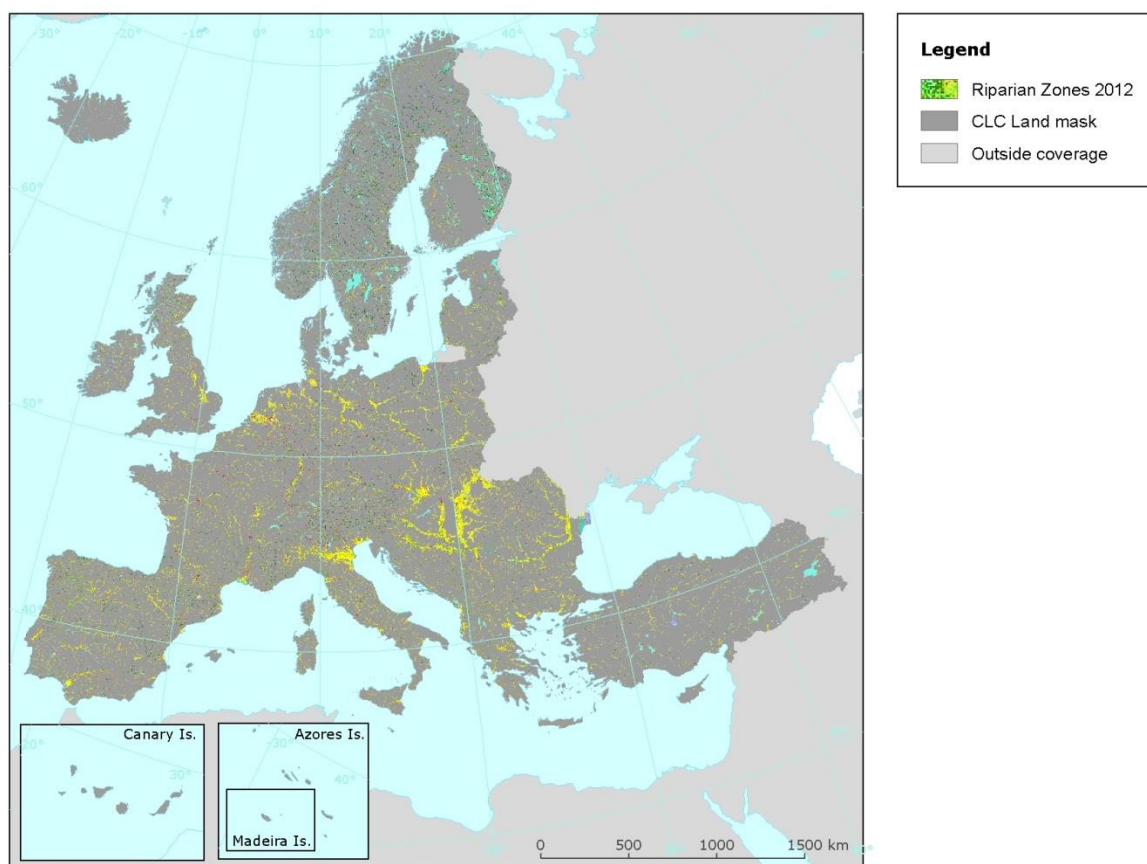
Some of the rural classes combine thematically two or more CLC-classes. Due to their coarse thematic resolution not included in the ETM were:

- 22000 Permanent crops (vineyards, fruit trees, olive groves)
- 25000 Orchards at the fringe of urban classes
- 31000 Forests => partially compensated by HRL Forest
- 32000 Herbaceous vegetation associations
- 33000 Open spaces with little or no vegetation
- 40000 Wetlands => compensated by Local Component "Riparian Zones"
- 50000 Water bodies => compensated by Local Component "Riparian Zones" and HRL Permanent waterbodies

Data processing for the ETM:

- Aggregation from 20 x 20 m to 100 x 100 m
- The selected classes of UA 2012 are processed either as CLC-classes or directly to EUNIS according to the developed UA-crosswalk (see section 8.2.1).

Map 4.4: Riparian Zones 2012



4.3.2 Riparian Zones 2012 (RZ 2012)

Dataset description:

The Riparian Zones product addresses land cover and land use in areas along rivers, i.e. the riparian zones. It contains large and medium-sized European rivers with Strahler levels from 3 to 8 (derived from EU-Hydro).

- Minimum Mapping Unit (MMU) of 0.5 ha
- Minimum Mapping Width (MMW) of 10 m

The nomenclature of the current available product (nomenclature 2015) will not be used in the future updates of Riparian Zones. Therefore, the classes of RZ have been reclassified to the nomenclature 2017 for reasons of comparability (see annex 8.1.4)

Data processing for the ETM:

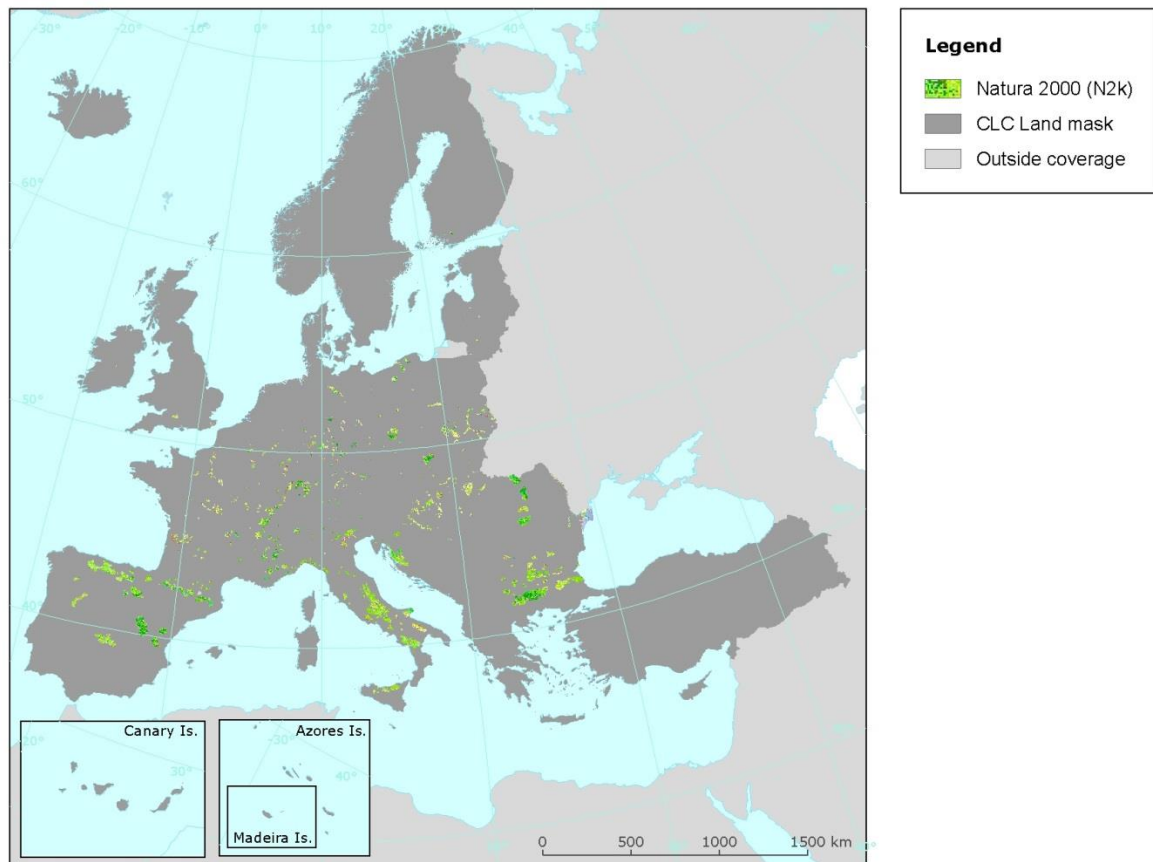
- Reclassification from nomenclature 2015 to nomenclature 2017
- Aggregation from 20 x 20 m to 100 x 100 m
- The selected classes of RZ 2012 are processed either as CLC-classes or directly to EUNIS according to the developed UA-crosswalk (see annex 8.2.2).

Excluded from analysis:

- 3500 – Damaged forest (Reason for exclusion: no differentiation into coniferous, broadleaved or mixed forest possible)

4.3.3 Natura 2000 (N2k 2012)

Map 4.5: Natura 2000 2012



Dataset description:

The Natura 2000 dataset comprises a selection of grassland-rich sites (containing 5 grassland habitats types 6210, 6240, 6250, 6510 and 6520) and was mapped in order to assess their actual area, condition and development over time. An inclusion of other grassland-rich sites not selected in the previous versions will be implemented in further updates, as well as an inclusion of sites containing other important habitat types.

- Minimum Mapping Unit (MMU) of 0.5 ha
- Minimum Mapping Width (MMW) of 10 m

Data processing for the ETM:

- Aggregation from 20 x 20 m to 100 x 100 m
- The selected classes of UA 2012 are processed either as CLC-classes or directly as EUNIS classes according to the developed UA-crosswalk (see annex 8.2.3)

Excluded from analysis:

- 3500 – Damaged forest (Reason for exclusion: no differentiation into coniferous, broadleaved or mixed forest possible)

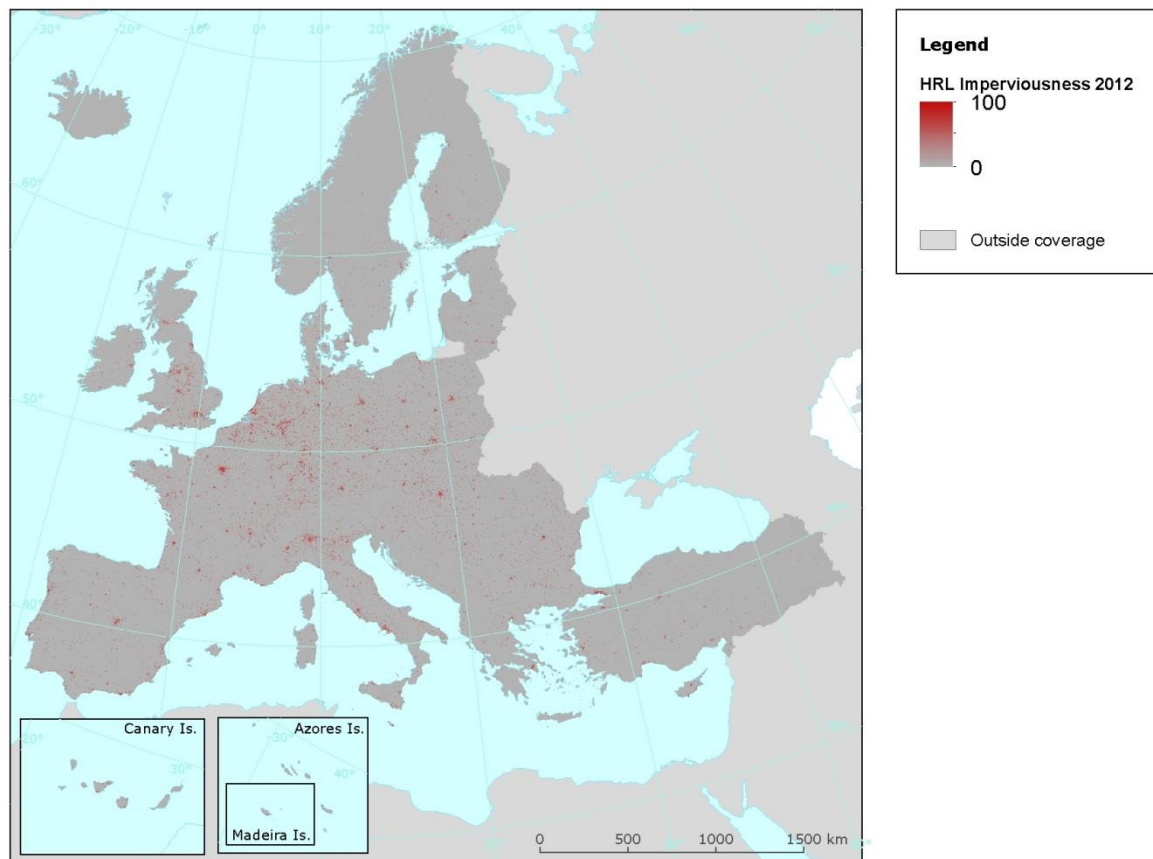
4.4 High Resolution Layers (HRL)

According to the [Copernicus website](#) the High Resolution Layers provide information on specific land cover characteristics and are complementary to land cover / land use mapping such as in the CORINE land cover or Local Components. The HRLs are produced from 20 m resolution satellite imagery through a combination of automatic processing and interactive rule based classification. Nonetheless, ready-to-use 100 m versions are available for all HRL products. So far, five HRL themes are available of which four have been selected to be included in the ETM:

- HRL Imperviousness 2012: used as indicator dataset in the mapping ruleset for thematic and geometric refinement and also as land cover input dataset
- HRL Forests - Tree Cover Density 2012: used only as indicator dataset in the mapping ruleset for thematic and geometric refinement
- HRL Forests - Forest Type 2012: used as land cover input dataset
- HRL Grassland 2012: used as land cover input dataset
- HRL Wetlands 2012: As the differentiation in wetland subtypes (inland marshes, peat bogs, salt marshes etc.) is not possible this HRL could not be included in the ETM
- HRL Permanent Water Bodies 2012: used as land cover input dataset

4.4.1 High Resolution Layer Imperviousness 2012

Map 4.6: HRL Imperviousness 2012



Dataset description:

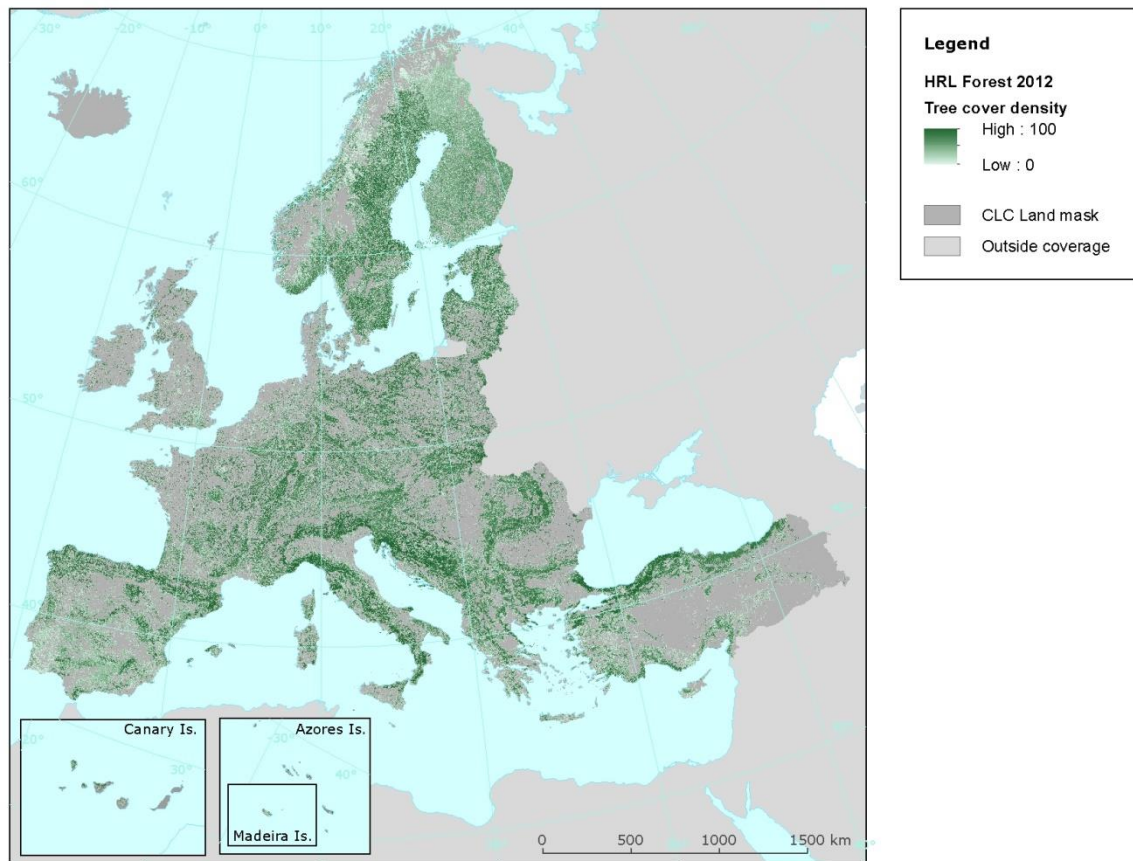
The imperviousness HRL captures the spatial distribution of artificially sealed areas, including the level of sealing of the soil per area unit. The percentage of sealed soil (imperviousness degree 1-100%) is estimated by using an automatic algorithm based on calibrated NDVI (Normalized Difference Vegetation Index).

Data processing for ETM:

- Pixels are only processed outside the selected classes of Local Components
- Pixels are only processed outside CLC-urban classes
- If sealing $\geq 50\%$ => Reclassification to EUNIS-class 54 (=J1, buildings of cities, towns and villages)
- If sealing $< 50\%$ => Reclassification to EUNIS-class 55 (=J2, Low density buildings)

4.4.2 High Resolution Layer Forests - Tree Cover Density 2012

Map 4.7: HRL Forest 2012 – TCD



Dataset description:

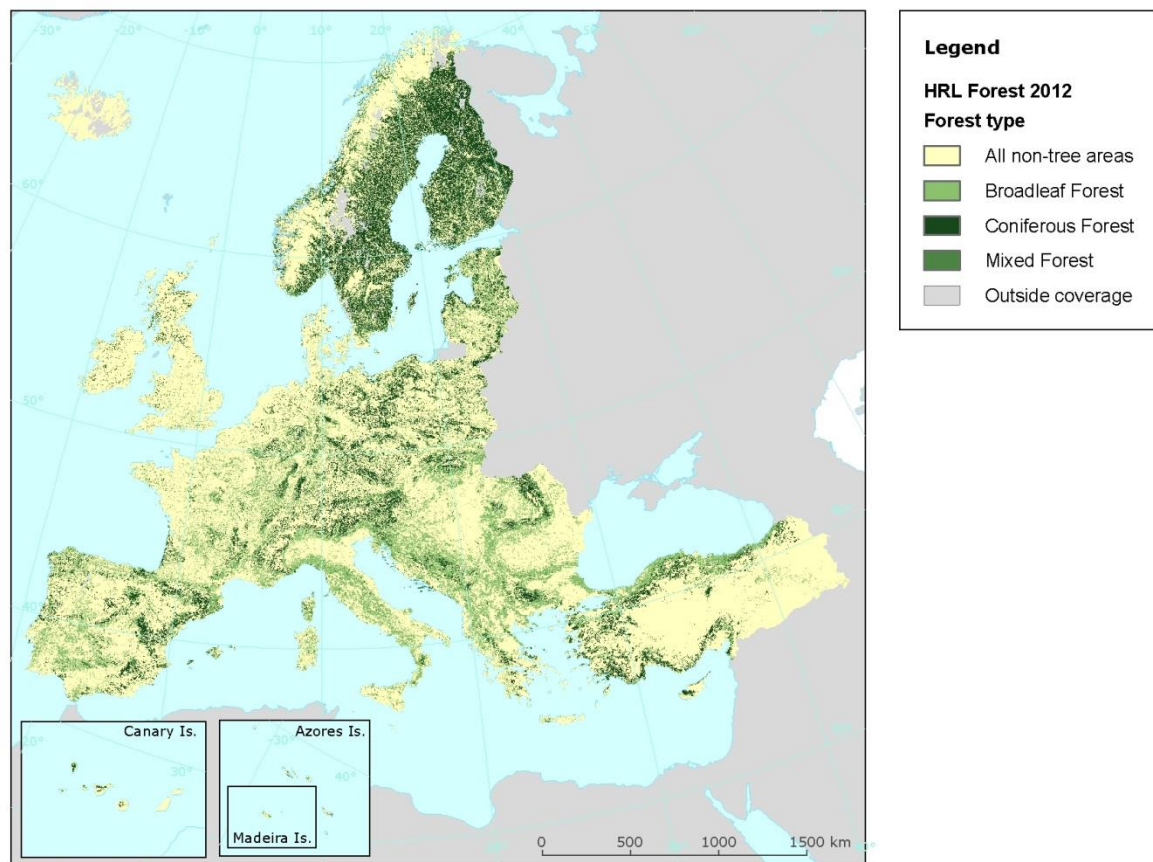
The dataset shows the tree cover density (in percentage) in 100 m spatial resolution. The dataset results from the aggregation of HRL - TCD dataset at 20 m of Copernicus Programme. The tree cover density dataset, which maps the level of tree cover density in a range from 0-100%, has no MMU (minimum number of pixels to form a patch) and a minimum mapping width of 20 m.

Data processing for the ETM:

- The dataset is used without any modification as qualifier indicator for thematic refinement in CLC/EUNIS and Local Components rulesets.

4.4.3 High Resolution Layer Forests 2012 – Forest Type

Map 4.8: HRL Forests 2012 - FTY



Dataset description:

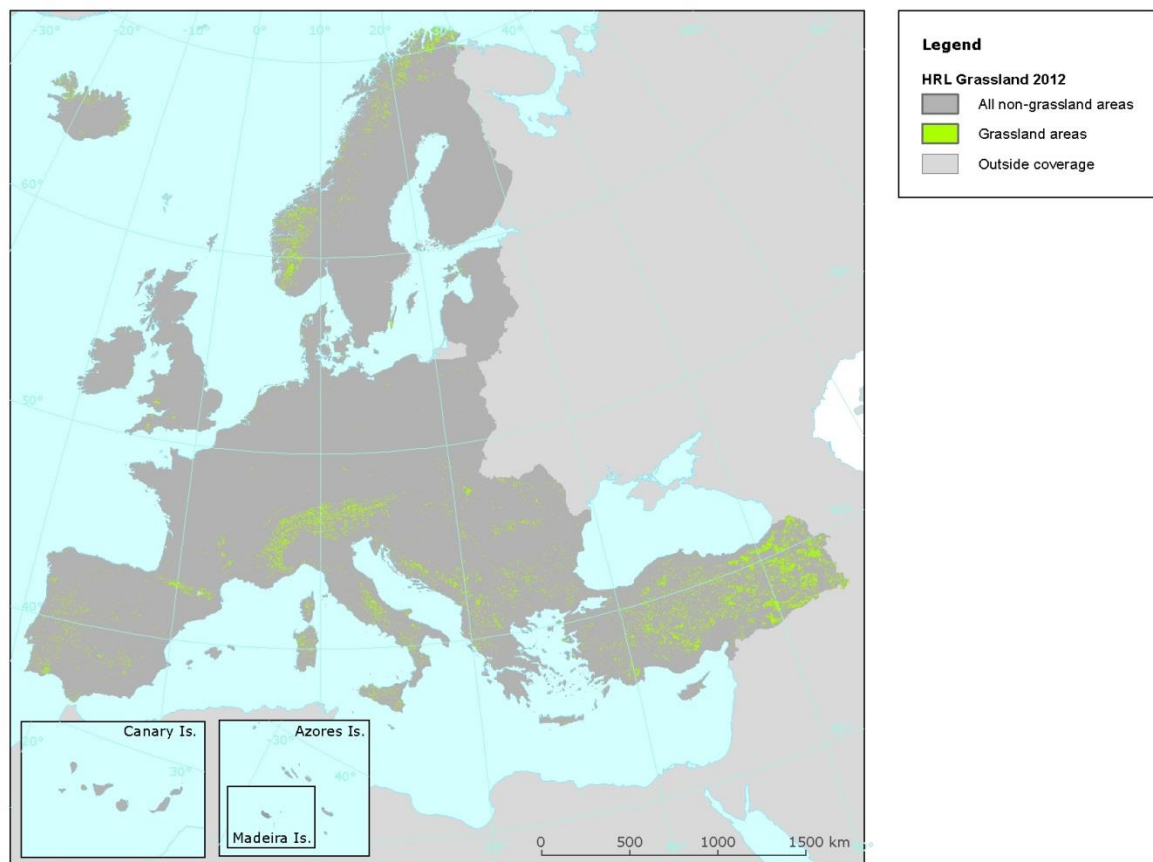
The HRL Forest Type (FTY) 2012 is a European mosaic of Forest Type in 20 m and 100 m spatial resolution and European projection. The Minimum Mapping Unit (MMU) is 0.5 ha. For the final 100 m product – that as used for the ETM – trees under agricultural use and urban context from the support layer are removed.

Data processing for the ETM:

- Pixels are only processed outside the selected classes of Local Components
- The pixel information contained in the dataset was treated like the corresponding CLC classes as follows:
 - Broadleaf Forest => treated like CLC-class 311 (Broad-leaved forest)
 - Coniferous Forest => treated like CLC-class 312 (Coniferous forest)
 - Mixed Forest => treated like CLC-class 313 (Mixed forest)

4.4.4 High Resolution Layer Grassland 2012

Map 4.9: HRL Grassland 2012



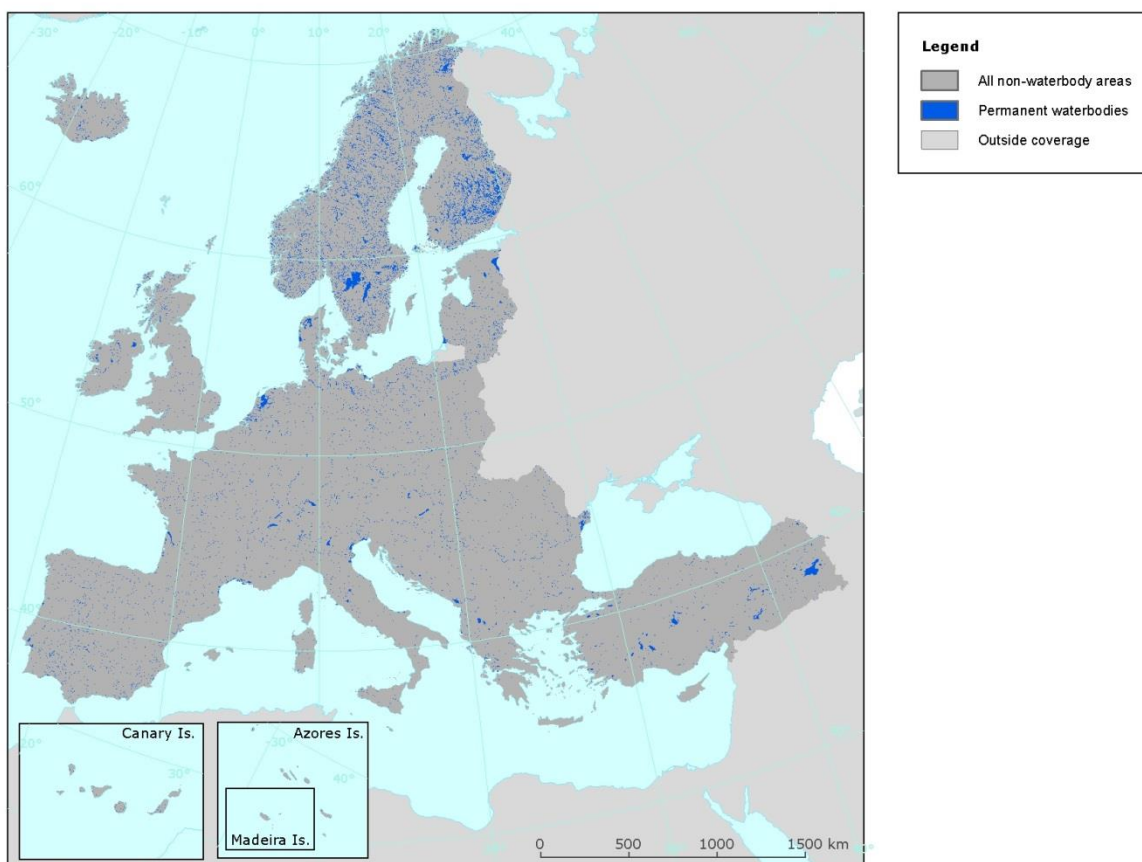
According to the data [HRL data description](#), an initially planned “permanent grassland” product (capturing all grasslands across the use-intensity spectrum) was stopped, and was modified when it became obvious that given the input data and mapping approach, sufficient quality was not reached. The final HRL Grassland 2012 product now available covers “natural and semi-natural grassland”. It’s focused on the natural grassland, but also covers some of the semi-natural grasslands. It is a binary product containing the information grassland/non-grassland. Besides the original 20 x 20 m version, there is also a 100 x 100 m version available that was integrated into the ETM. The aggregated 100 m version maps include the level of grassland coverage in a range from 0-100%.

Data processing for the ETM:

- Pixels are only processed outside the selected classes of Local Components
- Pixels are only processed outside CLC-class 231(Pastures)
- Pixels are only processed when showing an occurrence of grassland $\geq 50\%$
- The pixel information contained in the dataset was treated like the corresponding CLC class 321 (Natural grassland)

4.4.5 High Resolution Layer Permanent Water Bodies 2012

Map 4.10: HRL Permanent Water Bodies 2012



Dataset description:

The HRL maps permanent lakes and ponds, rivers and coastal water surfaces, such as lagoons and estuaries. It does not include the sea and ocean, as well as liquid dump sites.

Besides the original 20 x 20 m version (binary product: water/non-water) there is also a 100 x 100 m version available that was integrated into the ETM. The aggregated 100 m version maps contains the level of coverage by water bodies ranging from 0-100%.

Data processing for the ETM:

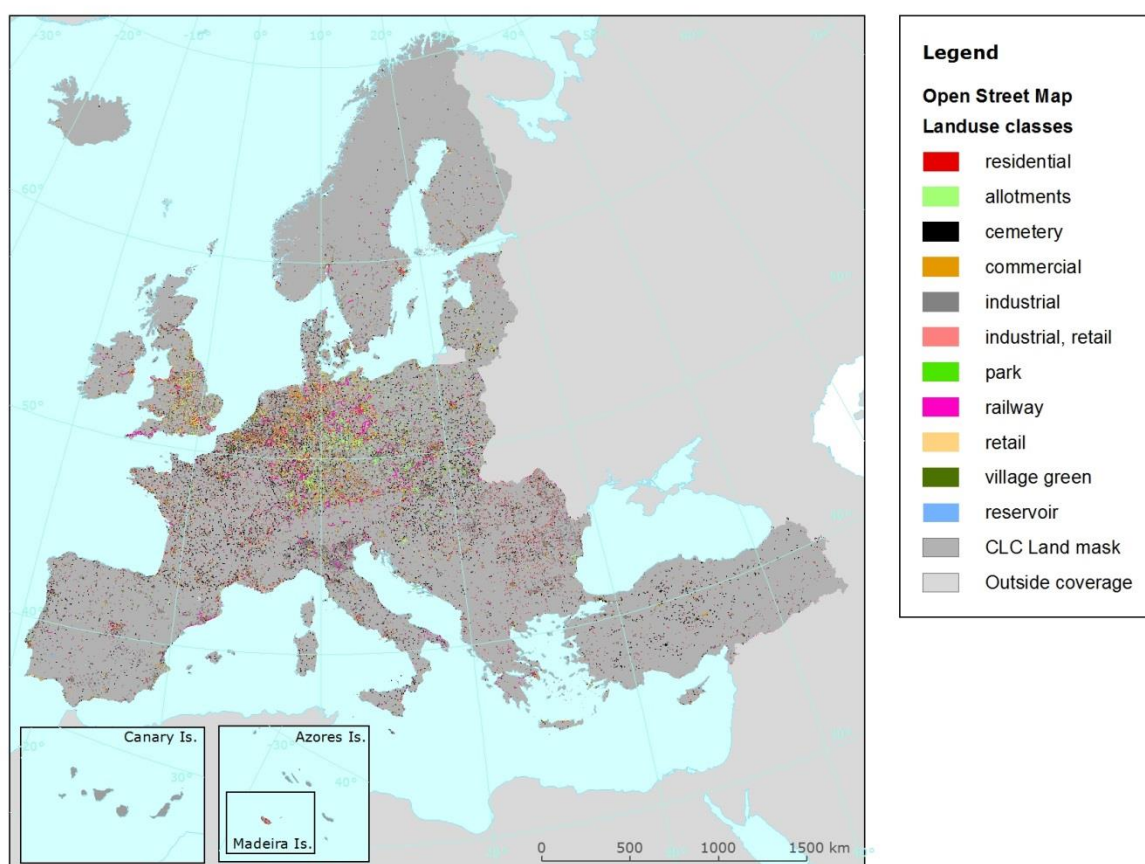
- Pixels are only processed outside the selected classes of Local Components
- Pixels are only processed outside CLC-classes 511(Water courses), 521 (Coastal lagoons) and 522 (Estuaries)
- Pixels are only processed when showing an occurrence of water bodies $\geq 50\%$
- The pixel information contained in the dataset was treated like the corresponding CLC class 512 (Water bodies)

4.5 Open Street Map (OSM)

According to [Wikipedia](#) OpenStreetMap (OSM) is a collaborative project to create a free and Open Source editable map of the world. The creation and growth of OSM has been motivated by restrictions on use or availability of map information across much of the world, and the advent of inexpensive portable satellite navigation devices. OSM is considered a prominent example of volunteered geographic information. OpenStreetMap data was originally published under the Creative Commons Attribution-ShareAlike licence (CC BY-SA) with the intention of promoting free use and redistribution of the data. In September 2012, the licence was changed to the Open Database Licence (ODbL) published by Open Data Commons (ODC) in order to more specifically define its bearing on data rather than representation.

There are numerous distributors and websites from where OSM datasets can be downloaded. The data used for the ETM were downloaded from [geofabrik.de](#).

Map 4.11: OSM Land use 2015



4.5.1 OpenStreetMap Land use 2015

Dataset description:

For land use, the OSM data includes already delineated polygons with land cover information. The dynamic of the dataset can be clearly demonstrated, as several years ago, the land use in open street map was a simple copy of the CORINE Land cover dataset. But nowadays much smaller features than in CORINE Land Cover (25 ha MMU) are mapped. Therefore, the relevant classes were extracted from the OSM land use and assigned to EUNIS classes as follows:

Table 4.1: Selected OSM land use classes for ecosystem mapping

OSM Land use TYPE	EUNIS Class	EUNIS Text
Village green	I2	Cultivated areas of gardens and parks
Park	I2	Cultivated areas of gardens and parks
Cemetery	I2	Cultivated areas of gardens and parks
Retail	J1	Buildings of cities, towns and villages
Residential	J1	Buildings of cities, towns and villages
Industrial, retail	J1	Buildings of cities, towns and villages
Industrial	J1	Buildings of cities, towns and villages
Commercial	J1	Buildings of cities, towns and villages
Allotments	J2	Low density buildings
Railway	J4	Transport networks and other constructed hard-surfaces areas
Reservoir	J5	Highly artificial man-made waters and associated structures

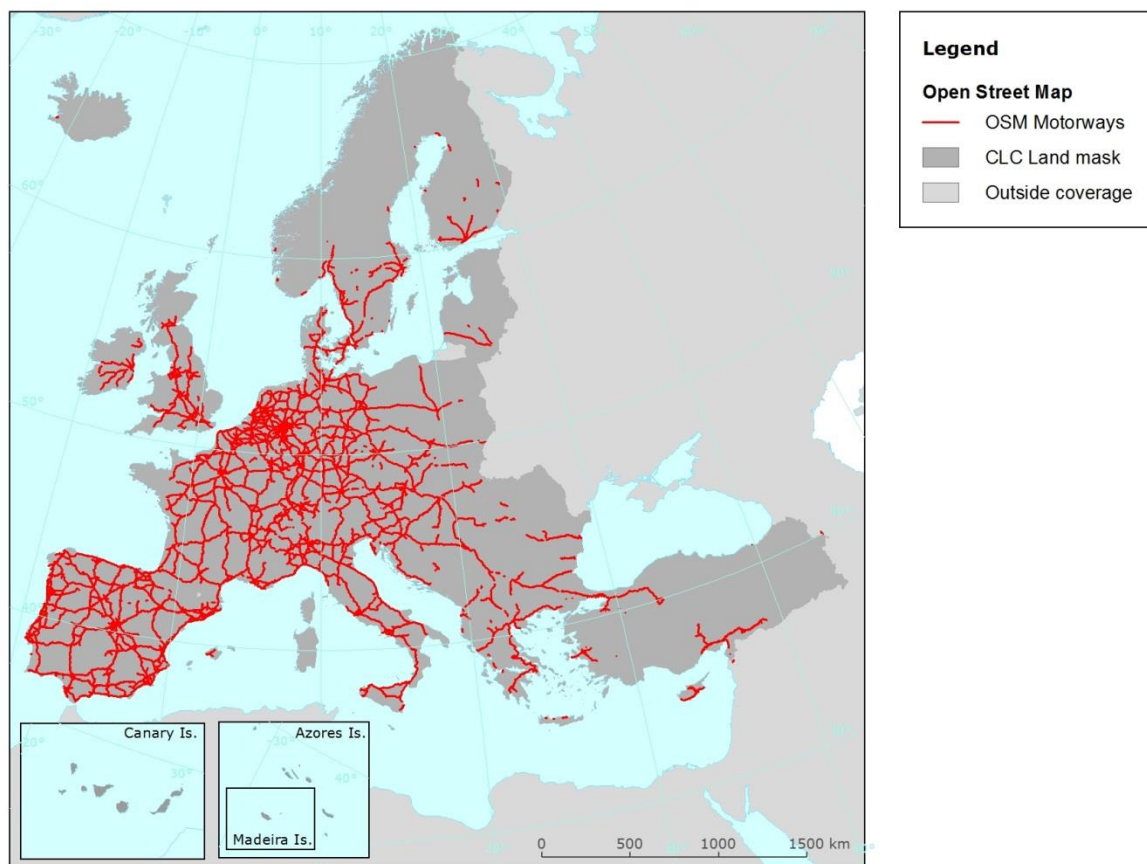
Furthermore, the land use data in OSM represent polygon features with varying quality. Therefore the HRL imperviousness was used as an additional dataset to increase the reliability of this data. Only pixels with a sealing degree $\geq 10\%$ were used.

Data processing from the OSM for the ETM:

- Reclassification of original OSM land use type to corresponding EUNIS class (see table above)
- Conversion of polygons to raster with resolution of 100 x 100 m (cell-centre-method)
- Pixels are only processed outside the selected classes of Local Components
- Pixels are only processed outside CLC non-artificial classes (111 – 142)
- Pixels are only processed when HRL Imperviousness $\geq 10\%$

4.5.2 OSM Roads

Map 4.12: OpenStreetMap 2015 - Roads



Dataset description:

The OpenStreetMap – as line vector dataset – regarding main roads, includes by far more detailed information than CORINE Land Cover. For roads only the main roads (highways) were selected, as they establish the main land cover per 100 x 100 m pixel. The average percentage of a road in a 100 x 100 m pixel can be estimated with 50-60% (4 lane or 6-lane roads).

The following OSM road types were selected from OSM to be included in the ETM:

Table 4.2: Selected OSM road classes

OSM TYPE	EUNIS Class	EUNIS Text
Motorway	J4	Transport networks & other constructed hard-surfaced areas
Motorway_link	J4	Transport networks & other constructed hard-surfaced areas

Data processing for the ETM:

- Reclassification of original OSM-road type to corresponding EUNIS class (see table above)
- Conversion of polylines to raster with resolution of 100 x 100 m (maximum-length-method)
- Pixels are also processed inside selected classes of Local Components

5 Crosswalks and mapping rules

5.1 CLC/EUNIS crosswalk and ruleset

The ETM 2012 is upgraded with new LC input datasets provided by the Copernicus Programme that have not been available for ETM 2006 v2.1. Nevertheless, the CLC/EUNIS crosswalk and the corresponding mapping rules to it are fundamental for the calculation of the map. CLC is still the only input data source that is available 100 percent area-wide and wall-to-wall for whole EEA-39. Also, all crosswalks for the integration of Local Components or HRL are directly or indirectly linked to the CLC ruleset.

Therefore, sound mapping rules are crucial for the accuracy and reliability of the final outcome. Besides the integration of new datasets with higher spatial resolution, the ETM 2012 v3.1 is also improved, revised and adapted by the ruleset v3.1 for the ecosystem type mapping. The mapping rules are listed in tabular form in section 5.1.2. in Table 5.4. The following table gives an explanation on the structure and contents of the ruleset:

Table 5.1: Structure of the CLC/EUNIS ruleset v3.1

Column	Explanation
CLC Code	Code of CLC-class to be mapped
CLC-Class name	Name of CLC-class to be mapped
Count EUNIS Relation	Number of EUNIS classes a CLC-class can be differentiated into
Comment/Priority	<p>If the relation is more than 1:1</p> <ul style="list-style-type: none"> All mapping rules are listed by naming all necessary variable and stable core datasets used for the geometric and thematic refinement The mapping rule also lists the thresholds assigned to a rule The rules are listed in order of their priority from high to low
Geometric reliability	Geometric reliability of the rule ranging from 1 - 10 (very low to very high)
Thematic Reliability	Thematic reliability of the rule ranging from 1 - 10 (very low to very high)
Exclude	EUNIS-classes that explicitly are not mapped from the CLC-class
Final EUNIS code	Code of the EUNIS-class Level 2 the CLC class is mapped into
MAES L2	assignment to MAES Level 2

Example: CLC-class 311 (Broad-leaved forest) can be mapped into two EUNIS-Classes:

- G2 (Broadleaved evergreen woodland) and
- G1 (Broadleaved deciduous woodland)
 - Rule 1: a pixel of CLC-311 is mapped into EUNIS-class G2 if it
 - falls into an area that according to the Potential Natural Vegetation Map is classified as zone 10 (Mediterranean sclerophyllous forests and scrub) AND
 - this area at the same time is classified as “evergreen” according to the HANTS
 - Rule 2: all other pixels of CLC-311 are mapped as the standard EUNIS-class G1.
- Geometric and thematic reliability are estimated 6/8 for rule 1 and 5/4 for rule 2.
- Exclusion: a former rule that mapped CLC-311 into EUNIS-class B1 (Coastal dunes and sandy shore) was excluded from the ruleset.

All mapping rules listed in Table have been incorporated into a Python based computer script that generates two outputs as mentioned previously: primary output is the actual map with the transformation of CLC into EUNIS; secondary output is a map with the geometric and thematic reliability.

5.1.1 Geometric and thematic reliability

For a complex mapping approach as implemented within this ecosystem mapping, it is necessary to document the reliability of the results. The resulting map is a mixture of various input datasets and depending on the input data, the reliability/accuracy of the maps can be improved either geometrically or thematically. These two parameters are considered as reliability measures. Each input data set is evaluated according to the information content. Some datasets provide an enhancement in geometrical terms and some in thematic terms. The potential improvement and thus the reliability of each of the two parameters are estimated by expert-judgment for each input data source in a range of [1-10]. A very high reliability is coded with 10 points, whereas no improvement or not reliability is coded with 1 point.

Table 5.2: Overview of geometric and thematic reliabilities for CLC/EUNIS

Reliability		Examples for geometric reliability	Examples for thematic reliability
1	very low	Resolution: 10 * 10 km: - Art. 17 data	- unclear CLC relation - 1:5 relation with CLC
2		Scale: 1:1 Mil. - Potential natural vegetation - Environmental Zones	-1:4 relation with CLC - geology from ESD
3		Resolution: 1 * 1 km - soil wetness - JRC riparian - CLC in mixed classes	- 1:3 relation with CLC - soil wetness indicator - HRL sealing
4		WFD info as point	- 1:2 relation with CLC - Art. 17 with minor coverage of all subtypes - HANTS - mixed classes
5	intermediate	Resolution: 500 * 500 m - CLC 25 ha MMU as reference - 500 m distance to coast	- 1:1 relation with CLC - JRC riparian - around lake
6		Resolution: 250 * 250 m - HANTS - WFD info as line - around lake	- Art. 17 with good coverage of all subtypes
7		Resolution: 100 * 100 m / MMU 1 ha, MMU 0,5 ha - alpine zone (DHM 30m + potNatVeg) - Urban Atlas (rural classes) - Riparian Zones - Local Component Natura 2000	- OSM land use - potNatVeg - Environmental Zones - HANTS-dry grassland
8		Resolution: 25 * 25 m / MMU 0,25 ha) - OSM land use - WFD info as polygon - Urban Atlas (urban classes) - HRL Forest 2006 (JRC)	- Art. 17 with complete coverage of all subtypes - alpine zone (better resolution, results only valid outside MED-area) - HANTS - evergreen broadleaved
9		Resolution: 20 * 20 m - HRL layers (Copernicus)	- WFD info on naturalness
10	very high	OSM-roads (line accuracy)	- OSM roads

Geometrical reliability:

Although the mapping is conducted on a 100 x 100 m pixel scale, the original minimum mapping unit (MMU) of CORINE Land Cover with 25 ha (= 25 pixels) and all other LC input datasets has to be considered. This means that every dataset that delivers information beyond this MMU improves the result geometrically.

The grade of the geometric reliability depends on the original resolution of the input data. Therefore it is necessary to know the MMU, scale, resolution and production logic of the input data. The high resolution layers e.g. provide a large reliability and thus improvement potential on a 100 x 100 m grid, as they are produced in the original resolution of 20 x 20 m. Whereas, the soil maps do not provide an adequate improvement of reliability, as their original scale is 1:1 million. The lowest geometric reliability is attached to the Art. 17 distribution data, as they are only given in a 10 x 10 km² raster (in addition we know that some countries e.g. France and Finland report even on larger entities).

Thematic Reliability:

The thematic reliability describes to which grade the mapping results can be improved in thematic sense. This means it improves the differentiation between closely related classes.

The Article 17 distribution data are one good example. If they broadly cover all subtypes (on EUNIS Level 3) of a specific ecosystem class, then they provide a very large reliability for the results, although their spatial resolution is quite coarse.

Combined Reliabilities:

In case where more than one dataset is used within a rule, the maximum of the reliability/accuracy is taken as reference values, as the technical rules are always combined with AND. This means that the higher reliability of one dataset overrules the lower reliability of another dataset.

An exemption of the rule is the usage of Article 17 data, as this data is regarded to be of high quality. Therefore the thematic quality of another dataset cannot overrule the thematic quality of Article 17 data.

Example: CLC-class 231 (Pastures) is mapped to E7 sparsely wooded land under the following conditions:

- Forest cover percentage > 10% AND
- Potential natural vegetation = 9 (forest steppes) OR 10 (sclerophyllous forest)

Table 5.3: Example for combined reliabilities

Reliability	Forest cover	Potential natural vegetation	Aggregated reliability (MAX)
Geometric	9	2	9
Thematic	6	7	7

For this specific combined rule, the geometric reliability is 9 and the thematic reliability is 7 (out of maximum 10 reliability points), which is a substantial improvement to the pure usage of the initial CORINE Land cover alone (geometric reliability 5 and thematic reliability in maximum 5).

5.1.2 CLC/EUNIS mapping ruleset v3.1

The following table gives a comprehensive overview on the mapping rules and how CLC classes are translated to EUNIS. It also contains the thematic and geometric reliabilities and how the rules are assigned to MAES class Level 2.

Table 5.4: CLC/EUNIS mapping ruleset v3.1

CLC Code	CLC-Class name	Count EUNIS Relation	Comment on mapping rules/Priority	Reliability		Exclude	Final EUNIS code	MAES L2
				g	t			
111	Continuous urban fabric	1	J1	5	5		J1	1
112	Discontinuous urban fabric	2	1. J2 if soil sealing <= 30	9	3		J2	1
			2. J1 = rest	5	4		J1	1
121	Industrial or commercial units	2	1. J2 if soil sealing <= 50	9	3		J2	1
			2. J1 = rest	5	4		J1	1
122	Road and rail networks and associated land	1	J4	5	5		J4	1
123	Port areas	1	J4	5	5		J4	1
124	Airports	1	J4	5	5		J4	1
131	Mineral extraction sites	1	J3	5	5	J2, H3	J3	1
132	Dump sites	1	J6	5	5		J6	1
133	Construction sites	1	J2	5	5		J2	1
141	Green urban areas	1	I2	5	5	E2	I2	1
142	Sport and leisure facilities	1	I2	5	5	E2	I2	1
211	Non-irrigated arable land	1	I1	5	5		I1	2
212	Permanently irrigated land	1	I1	5	5		I1	2
213	Rice fields	1	I1	5	5		I1	2
221	Vineyards	1	FB	5	5		FB	2
222	Fruit trees and berry plantations	1	FB	5	5	G1, G2	FB	2
223	Olive groves	1	G2	5	5		G2	2
231	Pastures	5	1. E4 in subalpine	7	8	E1	E4	3
			2. B1 in potNatVeg = coastal AND dist_coast < 500	5	7		B1	6
			3. E7 in potNatVeg = 9+10 AND forest>10%	9	7		E7	3
			4. E3 on wet soils	3	3		E3	3
			5. E2 = rest	5	1		E2	3
241	Annual crops associated with permanent crops	1	I1	5	5		I1	2
242	Complex cultivation patterns	2	1. I1 if HANTS mixed agriculture = arable	6	4	E2, I2	I1	2
			2. E2 = rest	5	4		E2	3
243	Land principally occ. by agr., with sign. areas of nat. veg.	2	1. E2 if HANTS mixed agriculture = grassland	6	4		E2	3
			2. I1 = rest	5	4		I1	2
244	Agro-forestry areas	1	E7	5	5		E7	2
311	Broad-leaved forest	2	1. G2 in potNatVeg = 10 AND HANTS = evergreen	6	8	B1	G2	4
			2. G1 = rest	5	4		G1	4
312	Coniferous forest	1	G3	5	5	B1	G3	4
313	Mixed forest	1	G4	5	5		G4	4
321	Natural grassland	4	1. E4 in subalpine	7	8	E2	E4	3
			2. E3 on wet soils	3	3		E3	3
			3. E6 in Art.17	1	5		E6	3
			4. E1=rest	5	2		E1	3

CLC Code	CLC-Class name	Count EUNIS Re-lation	Comment on mapping rules/Priority	Reliability		Ex-clude	Final EUNIS	MAES
				g	t			
322	Moors and heathland	5	1. F2 in subalpine	7	8		F2	5
			2. F9 in JRC riparian > 10%	3	5		F9	5
			3. F3 in Art. 17	1	4		F3	5
			4. F4 in Art. 17 AND potNatVeg=14 AND Soil_acid = 1	2	7		F4	5
			5. F1 in potNatVeg1213	2	7		F1	5
			6. F1 in ecoreg = 1	5	7		F1	5
			7. F3b = rest	5	1		F3	5
323	Sclerophyllous vegetation	5	1. F8 in Macaronesia	9	10		F8	5
			2. F6 in Art. 17 in MED	2	3		F6	5
			3. F7 in Art. 17 in MED	2	7		F7	5
			4. F5 in Art. 17 in MED	2	4		F5	5
			5. B1 in coast < 500	5	2		B1	6
			6. F5b = rest	5	1		F5	5
324	Transitional woodland shrub	1	G5	5	5	E1, E5	G5	4
331	Beaches, dunes, and sand plains	4	1. B1 in Art17_b1b2 AND potNatVeg = 1	1	2	E1, F3, F4	B1	6
			2. B2 in Art17_b1b2 AND dist_coast <500m	5	2		B2	6
			3. B1 in Art17_b1 AND dist_coast <500m	5	2		B1	6
			4. B2 in Art17_b2 AND dist_coast <500m	5	2		B2	6
			5. C3 in JRC_riparian	3	5		C3	8
			6. H2 = rest	5	2		H2	6
332	Bare rock	2	1. B3 in Art.17 AND dist_coast <500m	5	4		B3	6
			2. B3b adjacent to coast_rocks AND dist_coast <500m	5	5		B3	6
			3. rest = H3	5	4		H3	6
333	Sparsely vegetated areas	5	1. F2 in potNatVeg = 13 (arctic)	2	7	H6	F2	5
			2. F2b in subalpine	7	8		F2	5
			3. F1 in potNatVeg = 12 (polar mountains)	2	7		F1	5
			4. H3 in slope_degree >= 15	8	4		H3	6
			5. rest = H5	5	1		H5	6
334	Burnt areas	1	H5	5	5		H5	6
335	Glaciers and perpetual snow	1	H4	5	5		H4	6
411	Inland marshes	3	1. D5 in Art. 17	1	3	C2, C3, D6	D5	7
			2. D2 in Art 17, but not D4	1	8		D2	7
			3. D4 in Art. 17 but not D2	1	8		D4	7
			4. D4b, if Art17 = D4 AND soil=calcareous	2	8		D4	7
			5. D2b, if Art17 D2	1	7		D2	7
			6. C3 around lakes	6	5		C3	8
			7. D5b = rest	5	2		D5	7
412	Peatbogs	2	1. D3 in Art.17	1	7		D3	7
			2. D1 in Art. 17	1	8		D1	7
			3. D3b in ecoregNorth	2	7		D3	7
			4. D1b = rest	5	4		D1	7
421	Salt marshes	1	only D6 when inland!	5	5	E6	D6	7
422	Salines	1	J5	5	5		J5	9
423	Intertidal flats	-	not selected for terrestrial part of ETM (covered by marine part)	-	-	A2	A1	9
511	Water courses	2	1. J5 in WFD = artificial	6	9		J5	8
			2. C2 = rest	5	4		C2	8
512	Water bodies	2	1. J5 in WFD = artificial	6	9		J5	8
			2. C1 = rest	5	4		C1	8
521	Coastal lagoons	1	X2_3	5	5		X2_3	9
522	Estuaries	1	X1	5	5		X1	9
523	Sea and ocean	-	not selected for terrestrial part of ETM (covered by marine part)	-	-			9

5.2 Crosswalks and mapping rules for Local Components

In order to integrate the newly available datasets from the Copernicus Programme into the ETM within this task for each dataset a crosswalks has been developed. The crosswalks are built on the following principles:

- either an original LC-classes can be mapped directly to EUNIS Level 2 (relation = 1:1), or
- if further thematic refinement is needed, the original LC-classes are linked to corresponding CLC-classes and then processed according to the rules of the CLC/EUNIS ruleset. Deviations from these principles or details for the mapping are listed in a comment field.

The detailed crosswalks for the Local Components

- Urban Atlas
- Riparian Zones
- Natura 2000

can be found as comprehensive tables in Annex 8.2. In table below are given four examples from the Natura 2000 crosswalk to demonstrate its structure:

Table 5.5: Example for a LoCo crosswalk

N2k Code	Natura 2000 Class name	CLC Code	CLC name	Class	EUNIS Code	EUNIS Class name	Comment
4111	Managed grassland	231	Pastures		E4, B1, E7, E3 or E2		
4211	Semi-natural grassland with trees (T.C.D. >= 30%)	321	Natural grasslands		E4, E3, E6 or E1		
4212	Semi-natural grassland without trees (T.C.D. < 30%)	321	Natural grasslands		E4, E3, E6 or E1		
4221	Alpine and sub-alpine natural grassland				E4	Alpine and subalpine grasslands	

Explanation:

- N2k-class 4111 is mapped like CLC-class 231 into EUNIS-classes E4, B1, E7, E3 or E2 following the CLC-ruleset.
- N2k-classes 4211 and 4212 are both processed like CLC-class 321 into EUNIS-classes E4, E3, E6 or E1 following the CLC-ruleset.
- N2k-class 4221 can directly be mapped into EUNIS-class E4 without using the CLC-ruleset.

The following table gives an overview how the geometric and thematic reliability are determined. According to the CLC/EUNIS ruleset the standard values for the reliabilities can be overruled if within certain rules variables with a higher reliability are included (see section 5.1.1).

Table 5.6: Overview of geometric and thematic reliabilities for LoCo/EUNIS

Dataset	Standard geometric reliability	Standard thematic reliability
Urban Atlas	8 for urban classes (MMU = 0,25 ha) 7 for rural classes (MMU = 1 ha)	Standard: 5 (if relation = 1:1) Otherwise according to CLC/EUNIS ruleset
Riparian Zones	7 (MMU = 0,5 ha)	
Natura 2000	7 (MMU = 0,5 ha)	

5.3 Crosswalks and mapping rules for HRL and OpenStreetMap

The mapping rules for data from HRL and OSM are given as recap from the dataset description in the following table:

Table 5.7: Mapping rules for HRL and OSM datasets

Dataset	Mapping rules
HRL Imperviousness	<ul style="list-style-type: none"> • Pixels are only processed outside the selected classes of Local Components • Pixels are only processed outside CLC-urban classes • If sealing $\geq 50\%$ => Reclassification to EUNIS-class 54 (=J1, buildings of cities, towns and villages) • If sealing $< 50\%$ => Reclassification to EUNIS-class 55 (=J2, Low density buildings)
HRL Forests	<ul style="list-style-type: none"> • Pixels are only processed outside the selected classes of Local Components • The pixel information contained in the dataset was treated like the corresponding CLC classes as follows: <ul style="list-style-type: none"> ◦ Broadleaf Forest => treated like CLC-class 311 (Broad-leaved forest) ◦ Coniferous Forest => treated like CLC-class 312 (Coniferous forest) ◦ Mixed Forest => treated like CLC-class 313 (Mixed forest)
HRL Grasslands	<ul style="list-style-type: none"> • Pixels are only processed outside the selected classes of Local Components • Pixels are only processed outside CLC-class 231(Pastures) • Pixels are only processed when showing an occurrence of grassland $\geq 50\%$ • The pixel information contained in the dataset was treated like the corresponding CLC class 321 (Natural grassland)
HRL Permanent Water Bodies	<ul style="list-style-type: none"> • Pixels are only processed outside the selected classes of Local Components • Pixels are only processed outside CLC-class 511(Water courses), 521 (Coastal lagoons) and 522 (Estuaries) • Pixels are only processed when showing an occurrence of water bodies $\geq 50\%$ • The pixel information contained in the dataset was treated like the corresponding CLC class 512 (Water bodies)
OSM land use	<ul style="list-style-type: none"> • Reclassification of original OSM land use type to corresponding EUNIS class (see table below) • Conversion of polygons to raster with resolution of 100 x 100 m (cell-centre-method) • Pixels are only processed outside the selected classes of Local Components • Pixels are only processed outside CLC non-artificial classes (111 – 142) • Pixels are only processed when HRL Imperviousness $\geq 10\%$
OSM Roads	<ul style="list-style-type: none"> • Reclassification of original OSM-road type to corresponding EUNIS class (see table below) • Conversion of polygons to raster with resolution of 100 x 100 m (maximum-length-method) • Pixels are also processed inside selected classes of Local Components

The information from the four High Resolution Layers can be linked to CLC-classes and follow the same thematic refinement consequently as shown in the table below, but with higher geometric reliability:

Table 5.8: Overview of HRL classification and reliabilities

Dataset	Pro-cessed as CLC-class	Count EUNIS Re-lation	EUNIS Code Stan-dard	Comment on mapping rules/ Priority	Reliability		Ex-clude
					g	t	
HRL Imperviousness	121	2	J1	1. J2 if soil sealing <= 50 2. J1 = rest	9 9	3 4	
HRL Grasslands	321	4	E1	1. E4 in subalpine 2. E3 on wet soils 3. E6 in Art.17 4. E1=rest	9 9 9 9	8 3 5 2	E2
HRL Forests - Broad-leaved forest	311	2	G1	1. G2 in potNatVeg = 10 AND HANTS = evergreen 2. G1 = rest	9 9	8 4	B1
HRL – Forests - Coniferous forest	312	1	G3		9	5	B1
HRL Forests - Mixed forest	313	1	G4		9	5	
HRL Permanent Water Bodies	512	2	C1	1. J5 in WFD = artificial 2. C1 = rest	9 9	9 4	

The OSM data are mapped in 1:1 relation to EUNIS as shown in the table below:

Table 5.9: Overview of classification and reliabilities for OSM/EUNIS

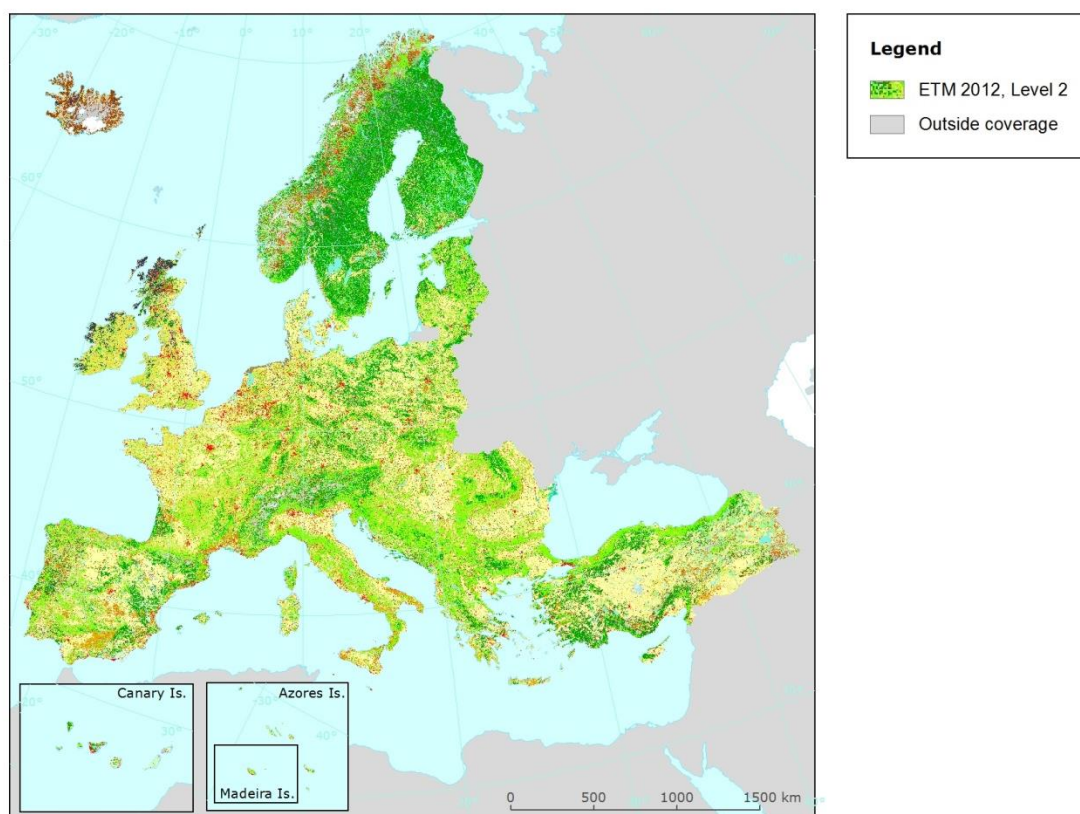
OSM TYPE	EUNIS Class	reliability	
		geometric	thematic
Village green	I2	8	7
Park	I2	8	7
Cemetery	I2	8	7
Retail	J1	8	7
Residential	J1	8	7
Industrial, retail	J1	8	7
Industrial	J1	8	7
Commercial	J1	8	7
Allotments	J2	8	7
Railway	J4	8	7
Reservoir	J5	8	7
Motorway	J4	10	10
Motorway_link	J4	10	10

6 Results

6.1 Ecosystem Type Map 2012 v3.1 Level 2

The map below shows the final product of this task, the Ecosystem Type Map 2012 with a spatial resolution of 100 x 100 m and displaying EUNIS habitats Level 2:

Map 6.1: Ecosystem Type Map 2012 Level 2



6.2 Distribution of EUNIS Classes Level 2

The following table gives an overview of the distribution of Level 2 EUNIS habitats in percentage. It has to be noted, that the table also contains the values for input datasets of CLC, Local Components (UA, RZ, N2k), HRL & OSM.

The mapping rules for these five groups have been processed in parallel and independently from each other – and these values are shown in the table. Step by step, the habitats of CLC are overwritten by information from UA, RZ, N2k and HRL in this order. The distribution of EUNIS habitats in the final map is shown in column ETM2012. In annex 8.3, a detailed distribution of how original CLC classes are distributed within CLC, UA, RZ, N2k and HRL & OSM can be found.

Example: When processing the CLC/EUNIS mapping rules with CLC 2012 accounting as input dataset, EUNIS-class C2 (Surface running waters) has a share of 0.22 percent. In Urban Atlas, HRL & OSM, this class is not existent, whereas C2 derived from Riparian zones has a share of 0.22 percent and 0.44 percent in Natura 2000. When mosaicking the input datasets of CLC, UA, RZ etc. together, class C2 finally ends up with a share of 0.24 percent.

Table 6.1: Distribution of EUNIS classes Level 2

EUNIS Code	EUNIS Class name	CLC	UA	RZ	N2k	HRL & OSM	ETM 2012
X1*	Estuaries	0.06		0.04	0.01		0.04
X2_3*	Coastal lagoons	0.11		0.29	0.40		0.06
B1	Coastal dunes and sandy shores	0.06	0.01	0.01	0.02		0.05
B2	Coastal shingle	0.00		0.001	0.01		0.001
B3	Rock cliffs, ledges and shores, including the supralittoral	0.01		0.001	0.001		0.01
C1	Surface standing waters	2.18		13.28	0.72	3.13	2.34
C2	Surface running waters	0.22		2.22	0.44		0.24
C3	Littoral zone of inland surface waterbodies	0.07		0.28	0.94		0.04
D1	Raised and blanket bogs	0.87		0.26	0.02		0.79
D2	Valley mires, poor fens and transition mires	0.04		0.24	0.01		0.04
D3	Aapa, palsa and polygon mires	1.09		0.71	0.0001		0.88
D4	Base-rich fens and calcareous spring mires	0.01		0.04	0.02		0.01
D5	Sedge and reedbeds, normally without free-standing water	0.12		0.83	0.63		0.14
D6	Inland saline and brackish marshes and reedbeds	0.09		0.24	0.06		0.08
E1	Dry grasslands	2.58		3.27	9.21	3.60	3.29
E2	Mesic grasslands	11.12	27.77	9.08	8.51		10.24
E3	Seasonally wet and wet grasslands	1.18	3.61	2.19	1.26	0.33	1.34
E4	Alpine and subalpine grasslands	1.00	0.06	0.18	2.21	2.63	1.48
E6	Inland salt steppes	0.08		0.23	0.45	0.02	0.08
E7	Sparsely wooded grasslands	0.58	0.22	0.47	0.35		0.26
F1	Tundra	1.47		0.34			1.33
F2	Arctic, alpine and subalpine scrub	1.87		0.15	0.81		1.46
F3	Temperate and mediterranean-montane scrub	1.20		0.12	0.10		0.93
F4	Temperate shrub heathland	0.01		0.28	1.14		0.07
F5	Maquis, arborescent matorral and thermo-Mediterranean brushes	1.17		0.66	1.89		0.85
F6	Garrigue	0.21		0.16	0.17		0.18
F7	Spiny Mediterranean heaths (phrygana, hedgehog-heaths and related coastal cliff vegetation)	0.38		0.17	0.61		0.31
F8	Thermo-Atlantic xerophytic scrub	0.02					0.02
F9	Riverine and fen scrubs	0.00		0.01	0.002		0.00
FB	Shrub plantations	1.42		1.21	1.06		1.09
G1	Broadleaved deciduous woodland	9.81		9.68	22.47	38.37	15.34
G2	Broadleaved evergreen woodland	1.03		0.50	3.05	0.42	0.97
G3	Coniferous woodland	14.11		7.17	13.80	37.19	14.84
G4	Mixed deciduous and coniferous woodland	5.12		3.51	4.68	12.43	5.06

EUNIS Code	EUNIS Class name	CLC	UA	RZ	N2k	HRL & OSM	ETM 2012
G5	Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice	5.14		3.02	2.30		2.74
H2	Screes	0.11		0.40	0.10		0.11
H3	Inland cliffs, rock pavements and outcrops	1.92		0.48	1.28		1.76
H4	Snow or ice-dominated habitats	0.27		0.00	0.01		0.27
H5	Miscellaneous inland habitats with very sparse or no vegetation	1.95		0.69	0.65		1.59
I1	Arable land and market gardens	27.02	48.18	29.39	16.68		24.58
I2	Cultivated areas of gardens and parks	0.27	2.21	0.64	0.21	0.004	0.34
J1	Buildings of cities, towns and villages	1.90	8.78	4.08	1.65	0.59	2.09
J2	Low density buildings	1.56	7.55	2.43	1.70	0.66	1.92
J3	Extractive industrial sites	0.14	0.57	0.31	0.16		0.16
J4	Transport networks and other constructed hard-surfaced areas	0.14	1.04	0.45	0.10	0.61	0.35
J5	Highly artificial man-made waters and associated structures	0.03		0.25	0.09	0.02	0.04
J6	Waste deposits	0.02					0.01
Total		100	100	100	100	100	100

*) Classes X1 and X2_3 are assigned to marine habitats, but as they are derived from CLC, RZ and N2k are processed by the CLC crosswalk they are also listed in this table.

6.3 Ecosystem Type Map 2012 Level 1

The following table shows the distribution of main habitat (EUNIS level 1) types all over Europe, a corresponding map is given in Map:

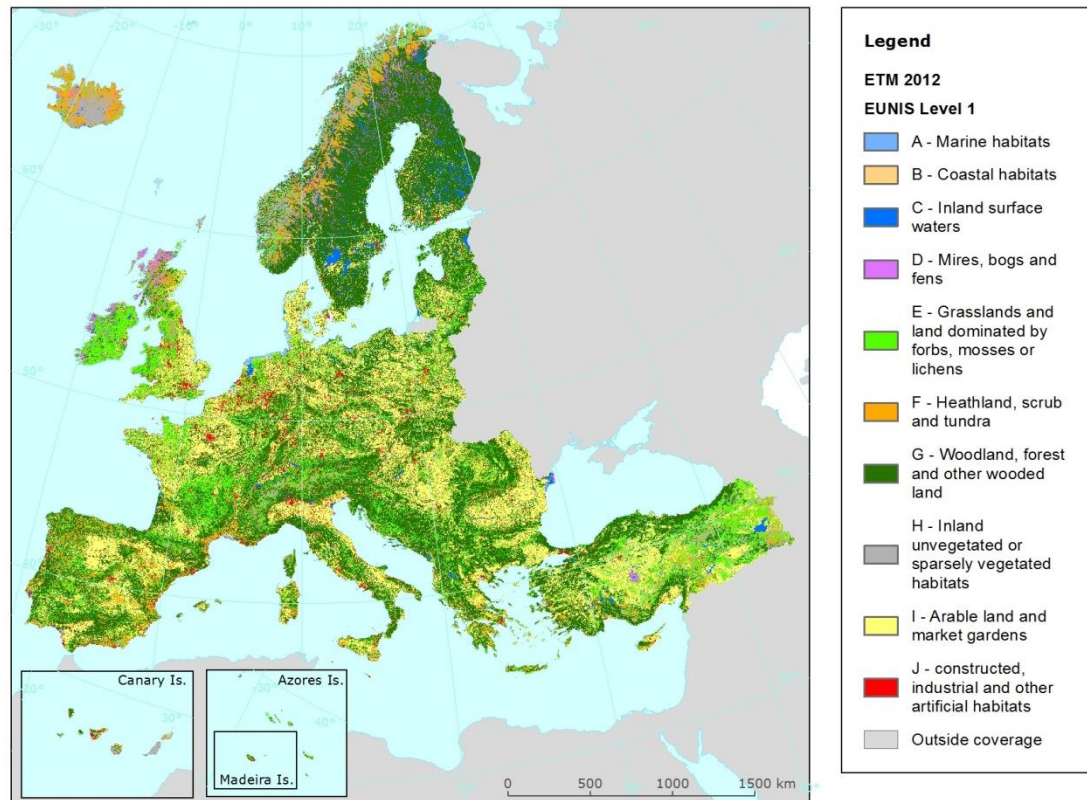
Table 6.2: Distribution of EUNIS classes Level 1

Main habitat type – EUNIS Level 1	Total Area of ETM v3.1 / EEA-39		EU-28	
	km ²	%	km ²	%
A – Marine*	25,883	0.44	23,839	0.54
B - Coastal	3,607	0.06	2,997	0.07
C - Waters	149,745	2.56	113,497	2.58
D - Mires	110,010	1.88	83,120	1.89
E - Grassland	977,990	16.69	711,215	16.17
F - Heathland	365,566	6.24	208,150	4.73
G -Forest	2,282,231	38.94	1,800,527	40.92
H - Unvegetated	218,319	3.73	41,378	0.94
I - Agricultural	1,460,216	24.91	1,176,485	26.74
J - Constructed	267,256	4.56	238,456	5.42
Total	5,860,823	100	4,399,665	100

*) Class A consisting of EUNIS-classes X1, X2_3 and marine habitats provided by ETC/ULS (see section 7) that cover the CLC land mask.

The map below shows the Ecosystem Type Map 2012 with a spatial resolution of 100 x 100 m and displaying EUNIS habitats aggregated to Level 1

Map 6.2: Ecosystem Type Map 2012 - EUNIS Level 1



6.4 Country Statistics

The table below shows the distribution of main habitat types (EUNIS Level 1) per country in percentage. A table with the distribution of habitats on EUNIS Level 2 per country can be found in annex 8.4 .

Table 6.3: Distribution of EUNIS classes Level 1 per country in percent

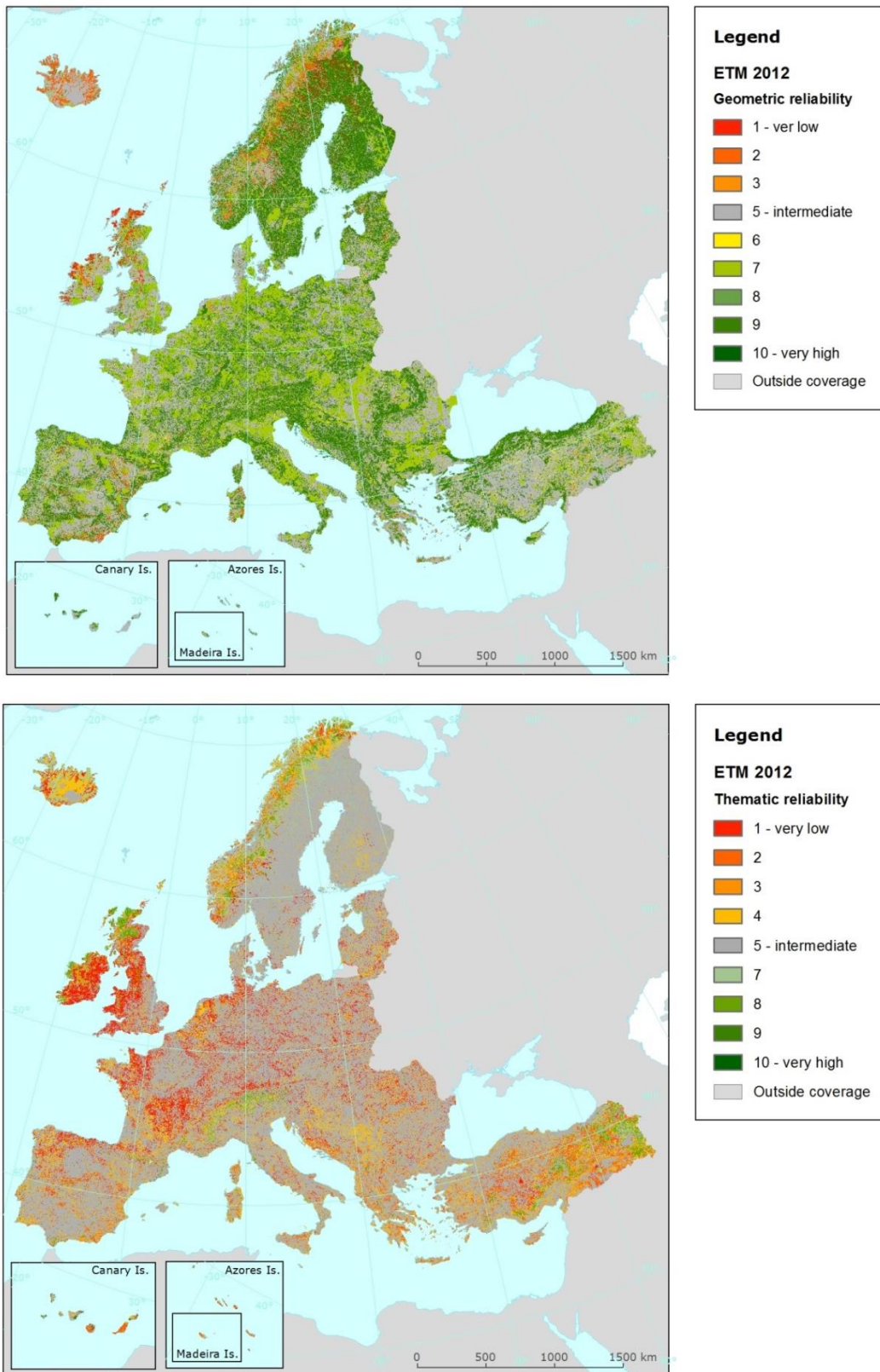
ICC	Name	EU-28	Total area [km ²]	A*	B	C	D	E	F	G	H	I	J	Total
AL	Albania		28,790	0.62	0.06	1.87	0.10	18.60	6.19	52.21	4.56	12.86	2.92	100
AT	Austria	x	83,944			0.91	0.19	19.86	4.58	47.59	3.64	17.89	5.34	100
BA	Bosnia and Herzegovina		51,201		0.01	0.58	0.06	20.53	2.00	64.51	1.24	8.78	2.30	100
BE	Belgium	x	30,684	0.13	0.01	0.64	0.20	27.22	0.54	23.98	0.03	27.35	19.89	100
BG	Bulgaria	x	110,995	0.01	0.01	0.84	0.07	16.65	1.63	40.74	0.31	35.13	4.62	100
CH	Switzerland		41,288			3.62	0.04	22.87	4.88	33.57	12.36	15.80	6.86	100
CY	Cyprus	x	9,248	0.21	0.83	0.22	0.05	8.36	13.68	27.39	1.65	39.33	8.28	100
CZ	Czech Republic	x	78,874			0.88	0.07	15.72	0.52	37.35	0.00	38.04	7.42	100
DE	Germany	x	362,109	1.33	0.01	1.20	0.29	19.03	0.60	31.98	0.07	35.20	10.28	100
DK	Denmark	x	44,153	3.16	0.14	1.04	0.61	8.37	0.92	12.33	0.04	65.21	8.18	100
EE	Estonia	x	45,380	0.04	0.07	4.62	3.54	11.59	0.15	59.64	0.02	18.02	2.32	100
ES	Spain	x	506,067	0.11	0.06	0.63	0.07	12.91	13.90	39.41	1.91	27.49	3.52	100
FI	Finland	x	337,985	0.04	0.02	9.90	5.01	0.62	1.60	73.57	0.32	7.42	1.49	100
FR	France	x	551,919	0.74	0.04	0.63	0.12	25.29	3.18	31.82	1.07	30.50	6.61	100
GB	United Kingdom	x	249,200	1.70	0.10	1.13	8.83	34.76	7.74	11.80	0.63	25.51	7.81	100
GR	Greece	x	132,088	0.41	0.76	0.76	0.14	13.63	14.50	41.51	1.86	22.77	3.66	100
HR	Croatia	x	56,455	0.01	0.28	0.81	0.23	20.46	2.30	51.64	1.15	18.64	4.48	100
HU	Hungary	x	93,012			1.71	0.90	15.48	1.58	23.23	0.02	50.28	6.81	100
IE	Ireland	x	70,675	1.15	0.18	1.82	14.34	57.80	1.29	10.72	1.02	8.30	3.38	100
IS	Iceland		103,492	0.88	0.07	2.61	6.34	6.37	44.33	0.69	38.09	0.31	0.30	100
IT	Italy	x	301,369	0.45	0.09	0.77	0.05	12.45	6.07	40.54	2.07	30.47	7.05	100
KS	Kosovo		10,907			0.25	0.01	22.72	0.82	51.08	1.15	19.92	4.06	100
LI	Liechtenstein		160			0.73	0.07	24.93	2.69	48.98	0.69	9.45	12.47	100

ICC	Name	EU-28	Total area [km ²]	A*	B	C	D	E	F	G	H	I	J	Total
LT	Lithuania	x	65,289	0.59	0.02	1.85	0.68	20.48	0.11	37.00	0.02	35.23	4.01	100
LU	Luxembourg	x	2,595			0.40	0.01	26.44	0.49	37.05		25.94	9.68	100
LV	Latvia	x	64,590	0.00	0.04	1.88	1.77	17.63	0.05	58.59	0.04	17.84	2.15	100
ME	Montenegro		13,882	0.01	0.10	2.40	0.09	14.26	1.01	69.62	4.41	6.18	1.93	100
MK	Macedonia		25,435			2.13	0.05	22.68	2.52	53.71	0.40	16.20	2.31	100
MT	Malta	x	316		2.65	0.02		11.35	7.24	2.44	1.94	44.68	29.69	100
NL	Netherlands	x	39,913	6.71	0.20	7.69	0.62	34.26	1.02	9.33	0.16	24.35	15.65	100
NO	Norway		323,770	0.14	0.07	5.09	5.04	5.91	19.92	39.70	19.95	3.32	0.85	100
PL	Poland	x	312,683	0.29	0.01	1.47	0.38	14.38	0.47	34.45	0.04	42.45	6.06	100
PT	Portugal	x	92,376	0.77	0.12	0.95	0.08	17.38	8.32	45.55	1.13	19.99	5.71	100
RO	Romania	x	238,406	0.31	0.01	1.83	0.51	17.08	2.80	34.05	0.23	37.91	5.27	100
RS	Serbia		77,484			1.06	0.24	16.05	0.44	41.22	0.20	36.57	4.21	100
SE	Sweden	x	450,047	0.09	0.03	8.58	5.35	2.63	6.07	67.61	1.59	6.53	1.52	100
SI	Slovenia	x	20,267	0.01		0.39	0.04	15.34	1.34	65.17	0.89	12.19	4.63	100
SK	Slovakia	x	49,026			0.70	0.07	9.93	0.65	49.08	0.16	33.38	6.02	100
TR	Turkey		779,491	0.06	0.03	1.61	0.46	24.67	5.24	29.12	8.31	28.43	2.08	100
ZZ	No Country / Disputed		5,258	1.02	0.02	9.07	2.54	14.04	2.96	50.70	2.45	14.69	2.52	100
Total ETM 2012 v3.1 / EEA-39			5,860,823	0.44	0.06	2.56	1.88	16.69	6.24	38.94	3.73	24.91	4.56	100
Total EU-28			4,399,665	0.54	0.07	2.58	1.89	16.17	4.73	40.92	0.94	26.74	5.42	100

*) consisting of EUNIS-classes X1, X2_3 and marine habitats provided by ETC/ULS (see section 7) that cover the CLC land mask.

6.5 Ecosystem Type Map 2012 – Geometric and thematic reliability

Map 6.3: Maps of geometric and thematic reliabilities



6.6 Ecosystem Type Map 2012 – MAES Level 2

The classification of habitats according to MAES Level 2 is contained as additional information in the Reliability Map. Spatial and statistical distribution are shown in Map and Table 6.4.

Map 6.4: Ecosystem Type Map 2012 – MAES Level 2

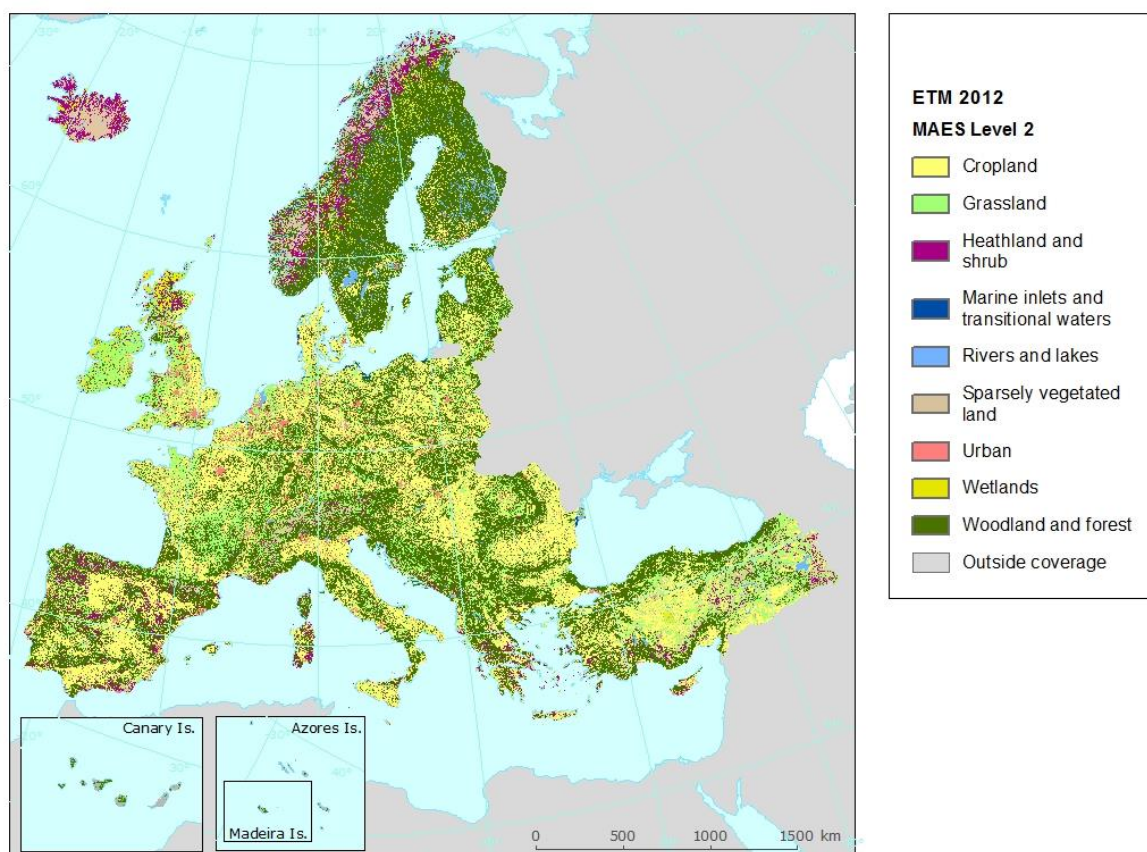


Table 6.4: Distribution of MAES Level 2 classes

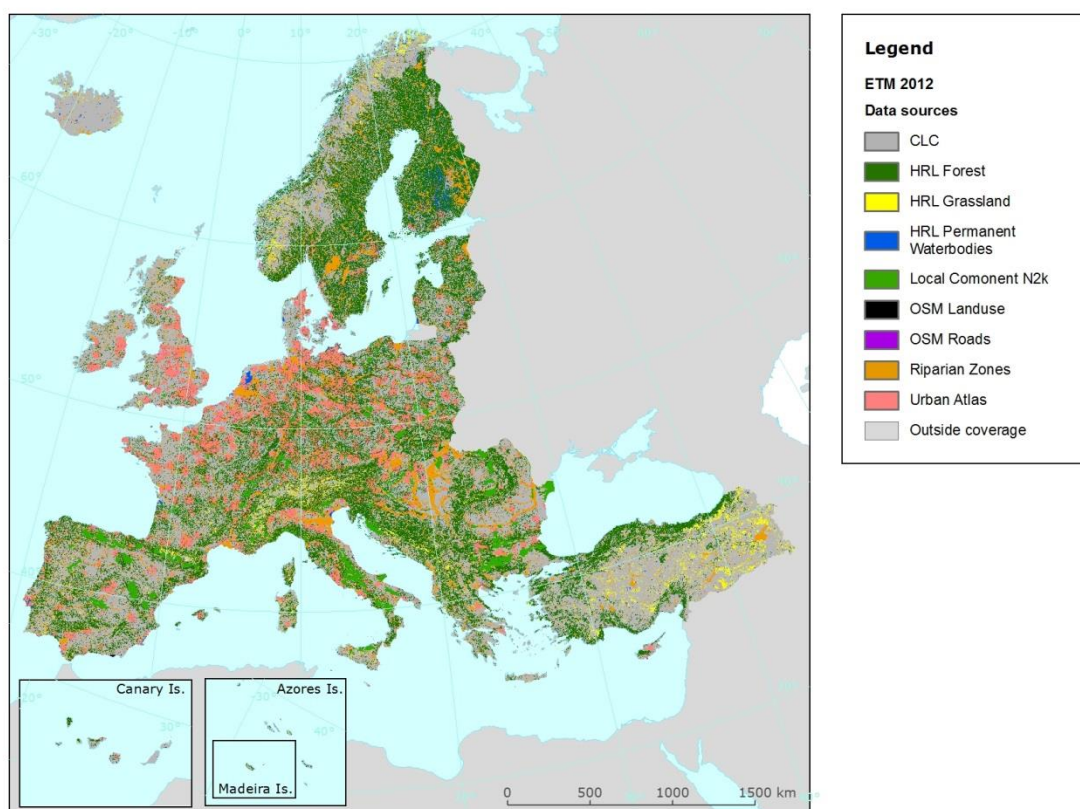
MAES Level 2	Total Area of ETM v3.1 / EEA-39		EU-28	
	km ²	%	km ²	%
Urban	284,954	4.9	255,070	5.8
Cropland	1,560,986	26.6	1,264,388	28.7
Grassland	964,535	16.5	697,797	15.9
Woodland and forest	2,238,631	38.2	1,761,303	40.0
Heathland and shrub	301,856	5.2	154,219	3.5
Sparsely vegetated land	221,925	3.8	44,375	1.0
Wetlands	110,010	1.9	83,120	1.9
Rivers and lakes	151,487	2.6	115,095	2.6
Marine inlets and transitional waters	10,170	0.2	9,462	0.2
Marine*	16,269	0.3	14,836	0.3
Total	5,860,823	100	4,399,665	100

**) marine areas not covered by terrestrial habitats but overlapping with the CLC land mask.*

6.7 Ecosystem Type Map 2012 – Data sources

The map below shows the spatial distribution of input datasets in the final Ecosystem Type Map 2012 v3.1.

Map 6.5: Spatial distribution of input datasets



According to the figures given in the table below, CORINE Land Cover with 46.42 percent is still the main input data source for the Ecosystem Type Map. Nevertheless, more than 50 percent of the area covered can now be derived from datasets with a much higher spatial resolution. In that matter, HRL Forest covers almost 30 percent of the EEA-39, but also the Local Components Urban Atlas, Riparian Zones and Natura 2000 sum up to 21 percent.

Table 6.5: Percentage of input datasets

Data source	Area in km ²	Percentage in ETM 2012
CLC 2012 accounting	2,720,878	46.42
HRL Forest 2012	1,690,676	28.85
Riparian Zones 2012	563,396	9.61
Urban Atlas 2012	507,741	8.66
Natura 2000 2012	162,131	2.77
HRL Grassland 2012	125,748	2.15
HRL Permanent Waterbodies 2012	54,682	0.93
OSM Land use 2015	23,879	0.41
OSM Roads 2015	11,694	0.20
Total	5,860,823	100

7 Integration of marine ecosystems

A map of marine ecosystems was produced within task AP2018 -1.8.4.1 by ETC/ULS and was submitted to ETC/BD to be integrated into a combined map representing both marine and terrestrial ecosystems. Fulfilling this operation, it was of great importance to ensure that marine and terrestrial part form a seamless map without any NoData gaps. Also, the marine part was given higher priority in case of overlaps between the two parts.

The first version of the terrestrial part was calculated based on ruleset 3.0 that included also class A1 (Littoral rock and other hard substrata) that directly was derived from CLC-class 423 (Intertidal flats) or other corresponding classes from LoCo RZ and N2k. However, for the calculation of the marine part, a new classification was developed by ETC/ULS. It replaces 8 original marine classes (A1 – A8) by combining four parameters such as the sea zone (bathymetry), substrate and sea ice coverage resulting in potential number of 126 classes (and even potential 630 classes when differentiated by 5 sea regions (see following Table 7.1). The transitional habitats X1 (Estuaries) and X2_3 (Coastal Lagoons) were derived separately based on information of CLC and Local components RZ and N2k according to the corresponding crosswalks and mapping rules.

Table 7.1: Parameters of marine ecosystem classification developed by ETC/ULS

Parameter	Value	Description
Sea region	1	Arctic
	2	Atlantic
	3	Baltic
	4	Mediterranean
	5	Black Sea
Sea zone	1	Littoral
	2	Infralittoral
	3	Circalittoral
	4	Offshore circalittoral
	5	Upper bathyal
	6	Lower bathyal
	7	Abyssal
	8	Estuaries
	9	Coastal lagoons
Ice coverage	0	no sea ice presence
	1	seasonal sea ice presence
	2	perennial sea ice
Substrate	0	undetermined substrate
	1	rock and biogenic
	2	biogenic
	3	coarse sediment
	4	mixed sediment
	5	sand
	6	mud

According to the methodology developed by ETC-ULS, each class is represented by a 4 digit numeric code.

- the first digit represents each sea region
- the second digit is for each sea zone
- the third digit provides information on the sea ice coverage
- the fourth defines the substrate

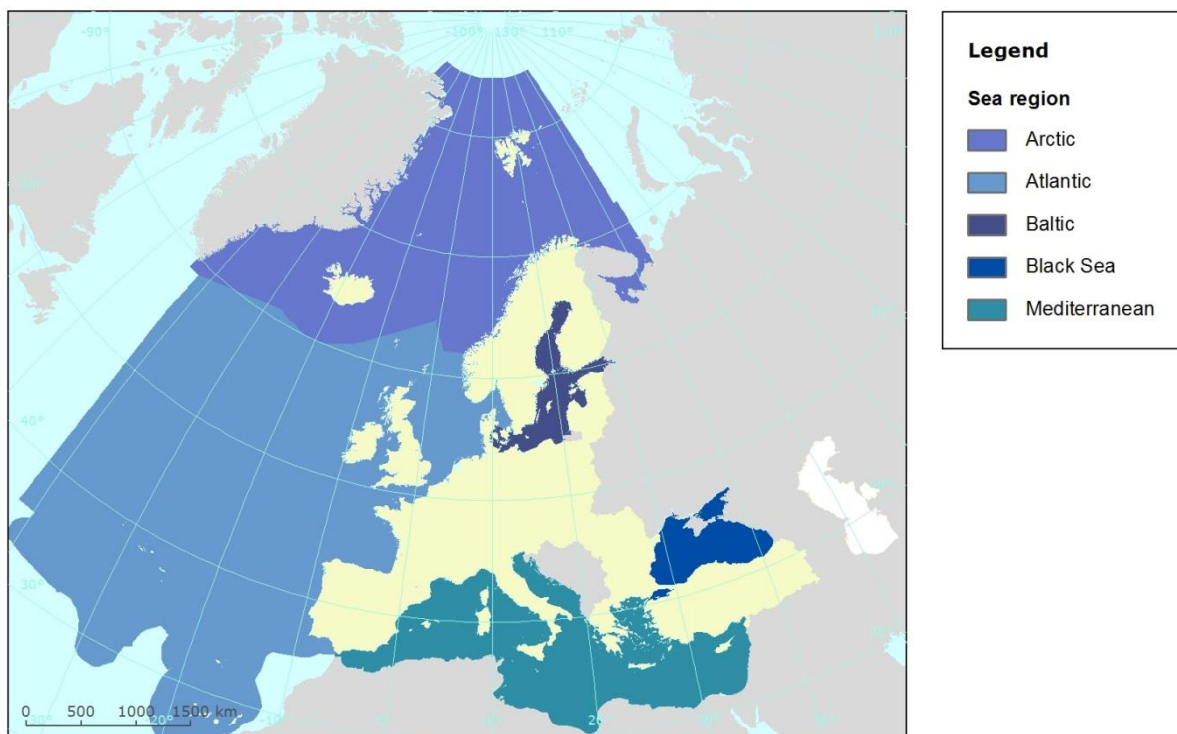
For example, class 1100 is Arctic littoral undetermined substrate and 1526 is for Arctic Upper bathyal with perennial sea ice and mud sediment.

The result of combining the marine part with the terrestrial part has shown some very few pixels of class A1 – that according to the new classification of the marine ecosystems is not existent any more. Therefore, each invalid pixel was assigned the information of the closest pixel representing a valid marine class.

It has to be noted, that for the standalone marine map the original classification with four digits was kept, whereas for the combined, no differentiation of sea region was made. This means that the information contained in the combined map only refers to Level 3 of the marine habitats (sea zone, substrate and ice coverage) as this equals to Level 2 of the terrestrial habitat classification. Also, as the marine part can overlap with the terrestrial part, the latter one is not anymore spatially identical to the CLC land mask.

The following maps show the four parameters for the marine habitat classification.

Map 7.1: Marine part – Sea regions



Map 7.2: Marine part – Sea zones

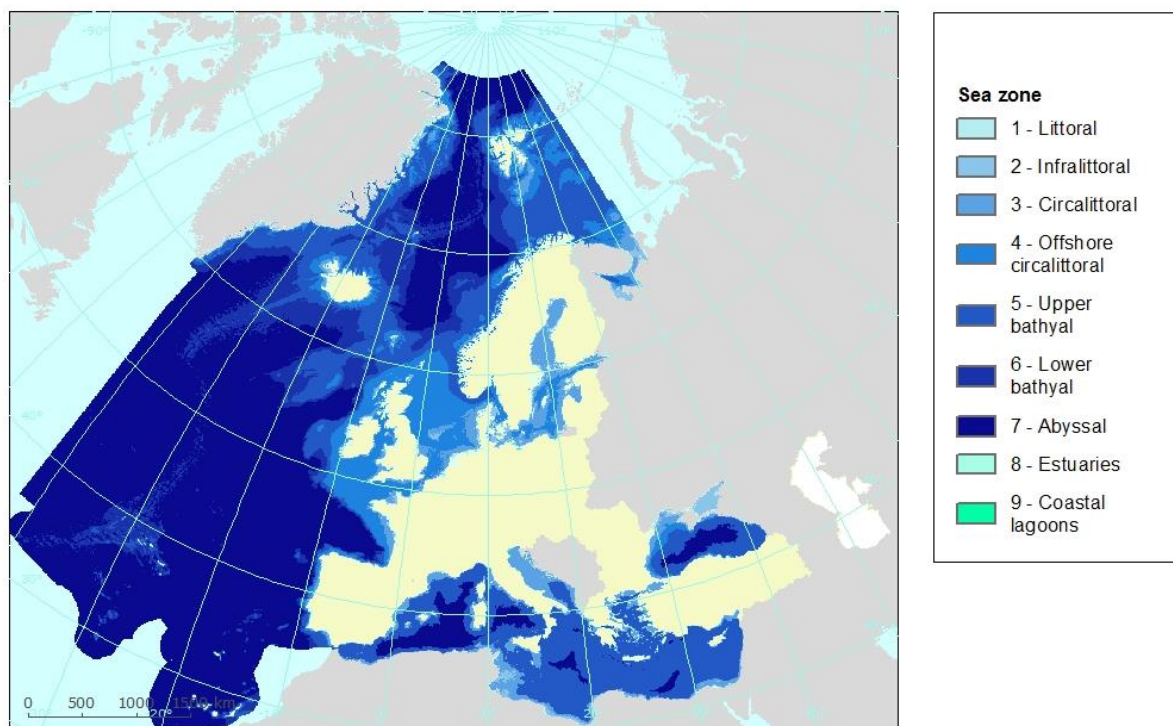
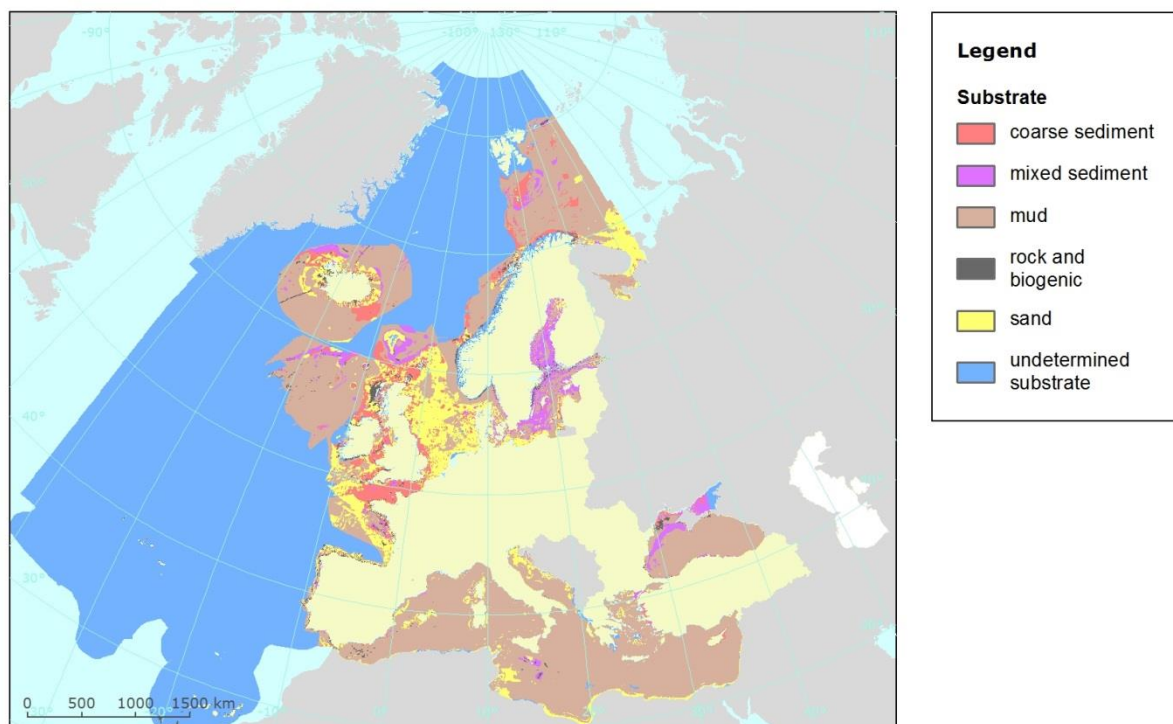


Table 7.2: Distribution of sea zones in the marine part of the ETM 2012 v3.1

MAES	CLC/EUNIS	Area in km ²					
		Arctic	Atlantic	Baltic	Black Sea	Medi-terranean	Total
Marine inlets & transitional waters	Estuaries	29	3,076	284		15	3,404
	Coastal Lagoons	240	565	2,687	732	1,986	6,210
Coastal	Littoral	15,441	13,448	702	2,802	2,651	35,044
	Infralittoral	108,955	52,929	61,454	55,385	83,311	362,034
	Circalittoral	171,982	216,415	249,763	55,117	418,720	1,111,997
Shelf	Offshore circalittoral	567,393	932,966	78,099	44,936		1,623,393
Open Ocean	Upper bathyal	1,671,694	643,481		216,677	1,692,833	4,224,685
	Lower bathyal	957,096	818,036				1,775,133
	Abyssal	1,291,903	7,283,335		98,826	318,085	8,992,150
Total:		4,784,464	9,960,611	390,018	473,743	2,515,600	18,124,436

Map 7.3: Marine part - Substrate

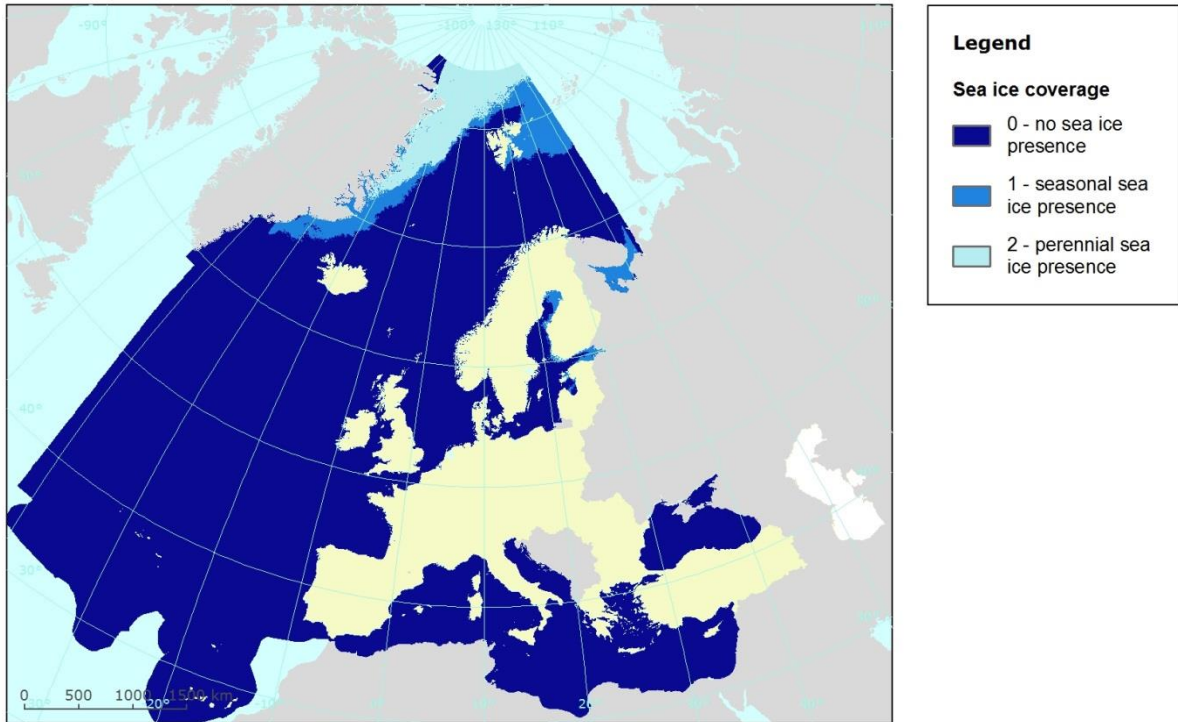


The following Table 7.3 gives an overview on substrate distribution for the total marine area. Tables representing the distribution of substrate for each sea region can be found in Annex 8.5).

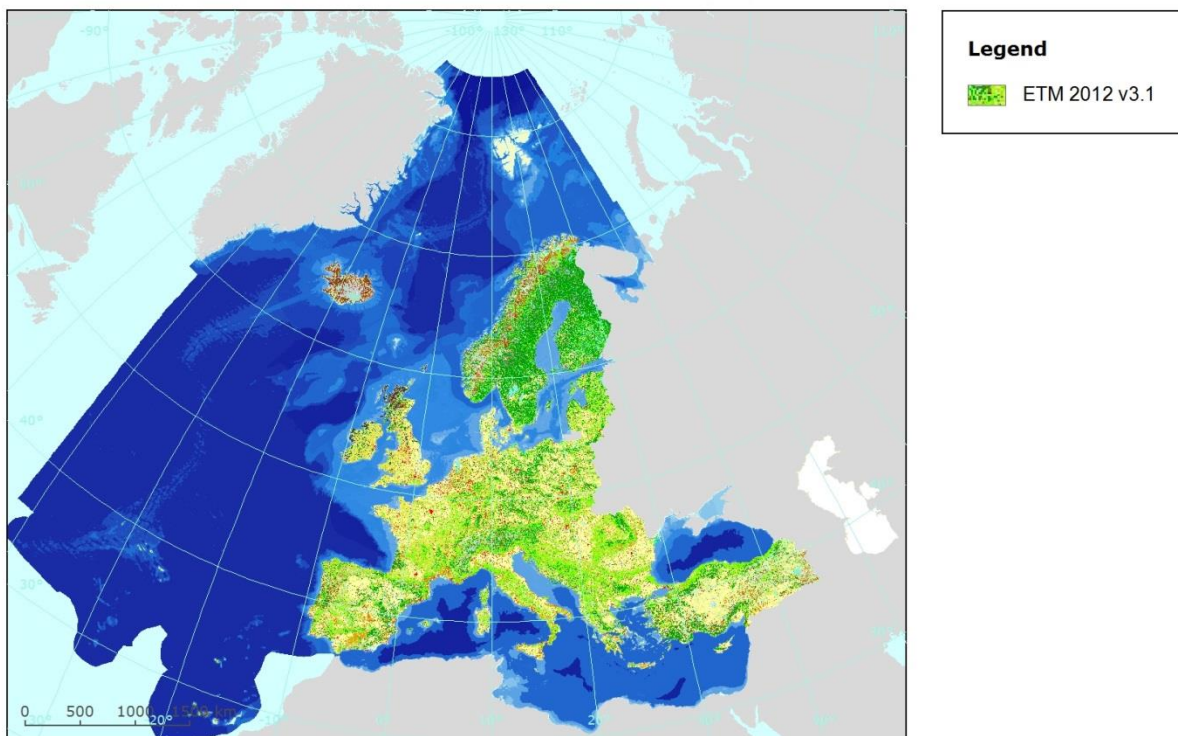
Table 7.3: Distribution of substrate in the marine habitats

Total sea area of ETM v3.1		Substrate [km ²]						Total
MAES	EUNIS	rock and biogenic	coarse sediment	mixed sediment	sand	mud	undetermined substrate	
Coastal	Littoral	753	661	1,290	6,482	2,618	23,240	35,044
	Infralittoral	19,484	27,046	47,979	124,528	45,689	97,308	362,034
	Circalittoral	49,764	106,783	133,315	258,965	476,850	86,320	1,111,997
Shelf	Offshore circalittoral	47,091	271,104	96,399	535,147	451,176	222,477	1,623,393
Open Ocean	Upper bathyal	22,639	124,189	106,880	117,183	2,951,106	902,689	4,224,685
	Lower bathyal	5,446	11,376	19,567	15,737	492,294	1,230,713	1,775,133
	Abyssal	4,781		8,019	24,002	725,855	8,229,493	8,992,150
Total		149,958	541,158	413,448	1,082,044	5,145,588	10,792,239	18,124,436

Map 7.4: Marine part - Sea ice coverage



Map 1: Full map of combined terrestrial and marine part



8 Annex

8.1 Nomenclatures

8.1.1 Nomenclature Corine Land Cover

CLC Code	CLC LABEL1	CLC LABEL2	CLC LABEL3
111	Artificial surfaces	Urban fabric	Continuous urban fabric
112	Artificial surfaces	Urban fabric	Discontinuous urban fabric
121	Artificial surfaces	Industrial, commercial and transport units	Industrial or commercial units
122	Artificial surfaces	Industrial, commercial and transport units	Road and rail networks and associated land
123	Artificial surfaces	Industrial, commercial and transport units	Port areas
124	Artificial surfaces	Industrial, commercial and transport units	Airports
131	Artificial surfaces	Mine, dump and construction sites	Mineral extraction sites
132	Artificial surfaces	Mine, dump and construction sites	Dump sites
133	Artificial surfaces	Mine, dump and construction sites	Construction sites
141	Artificial surfaces	Artificial, non-agricultural vegetated areas	Green urban areas
142	Artificial surfaces	Artificial, non-agricultural vegetated areas	Sport and leisure facilities
211	Agricultural areas	Arable land	Non-irrigated arable land
212	Agricultural areas	Arable land	Permanently irrigated land
213	Agricultural areas	Arable land	Rice fields
221	Agricultural areas	Permanent crops	Vineyards
222	Agricultural areas	Permanent crops	Fruit trees and berry plantations
223	Agricultural areas	Permanent crops	Olive groves
231	Agricultural areas	Pastures	Pastures
241	Agricultural areas	Heterogeneous agricultural areas	Annual crops associated with permanent crops
242	Agricultural areas	Heterogeneous agricultural areas	Complex cultivation patterns
243	Agricultural areas	Heterogeneous agricultural areas	Land principally occupied by agriculture, with significant areas of natural vegetation
244	Agricultural areas	Heterogeneous agricultural areas	Agro-forestry areas
311	Forest and semi natural areas	Forests	Broad-leaved forest
312	Forest and semi natural areas	Forests	Coniferous forest
313	Forest and semi natural areas	Forests	Mixed forest
321	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Natural grasslands

CLC Code	CLC LABEL1	CLC LABEL2	CLC LABEL3
322	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Moors and heathland
323	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Sclerophyllous vegetation
324	Forest and semi natural areas	Scrub and/or herbaceous vegetation associations	Transitional woodland-shrub
331	Forest and semi natural areas	Open spaces with little or no vegetation	Beaches, dunes, sands
332	Forest and semi natural areas	Open spaces with little or no vegetation	Bare rocks
333	Forest and semi natural areas	Open spaces with little or no vegetation	Sparsely vegetated areas
334	Forest and semi natural areas	Open spaces with little or no vegetation	Burnt areas
335	Forest and semi natural areas	Open spaces with little or no vegetation	Glaciers and perpetual snow
411	Wetlands	Inland wetlands	Inland marshes
412	Wetlands	Inland wetlands	Peat bogs
421	Wetlands	Maritime wetlands	Salt marshes
422	Wetlands	Maritime wetlands	Salines
423	Wetlands	Maritime wetlands	Intertidal flats
511	Water bodies	Inland waters	Water courses
512	Water bodies	Inland waters	Water bodies
521	Water bodies	Marine waters	Coastal lagoons
522	Water bodies	Marine waters	Estuaries
523	Water bodies	Marine waters	Sea and ocean
999	NODATA	NODATA	NODATA
990	UNCLASSIFIED	UNCLASSIFIED LAND SURFACE	UNCLASSIFIED LAND SURFACE
995	UNCLASSIFIED	UNCLASSIFIED WATER BODIES	UNCLASSIFIED WATER BODIES
990	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED

8.1.2 EUNIS habitat classification 2007 (Revised descriptions 2012)

Note: marine classes A1 – A8 are replaced by a new classification created by ETC-ULS based on combined parameters on sea region, sea zone, substrate and ice coverage.

EUNIS Level 1 Main habitat types	EUNIS Code L2	ID GridL2	EUNIS-Class name Level 2
A Marine habitats Transition zone	A1	4	Littoral rock and other hard substrata
	A2	2	Littoral sediment
	A3	3	Infralittoral rock and other hard substrata
	A4	4	Circalittoral rock and other hard substrata
	A5	5	Sublittoral sediment
	A6	6	Deep-sea bed
	A7	7	Pelagic water column
	A8	8	Ice-associated marine habitats
	X1	9	Estuaries
	X2_3	10	Coastal lagoons
B Coastal habitats	B1	11	Coastal dunes and sandy shores
	B2	12	Coastal shingle
	B3	13	Rock cliffs, ledges and shores, including the supralittoral
C Inland surface waters	C1	14	Surface standing waters
	C2	15	Surface running waters
	C3	16	Littoral zone of inland surface waterbodies
D Mires, bogs and fens	D1	17	Raised and blanket bogs
	D2	18	Valley mires, poor fens and transition mires
	D3	19	Aapa, palsa and polygon mires
	D4	20	Base-rich fens and calcareous spring mires
	D5	21	Sedge and reedbeds, normally without free-standing water
	D6	22	Inland saline and brackish marshes and reedbeds
E Grasslands and land dominated by forbs, mosses or lichens	E1	23	Dry grasslands
	E2	24	Mesic grasslands
	E3	25	Seasonally wet and wet grasslands
	E4	26	Alpine and subalpine grasslands
	E5	27	Woodland fringes and clearings and tall forb stands
	E6	28	Inland salt steppes
	E7	29	Sparsely wooded grasslands
F Heathland, scrub and tundra	F1	30	Tundra
	F2	31	Arctic, alpine and subalpine scrub
	F3	32	Temperate and mediterranean-montane scrub
	F4	33	Temperate shrub heathland
	F5	34	Maquis, arborescent matorral and thermo-Mediterranean

EUNIS Level 1 Main habitat types	EUNIS Code L2	ID GridL2	EUNIS-Class name Level 2
			brushes
	F6	35	Garrigue
	F7	36	Spiny Mediterranean heaths (phrygana, hedgehog-heaths and related coastal cliff vegetation)
	F8	37	Thermo-Atlantic xerophytic scrub
	F9	38	Riverine and fen scrubs
	FA	39	Hedgerows
	FB	40	Shrub plantations
G Woodland, forest and other wooded land	G1	41	Broadleaved deciduous woodland
	G2	42	Broadleaved evergreen woodland
	G3	43	Coniferous woodland
	G4	44	Mixed deciduous and coniferous woodland
	G5	45	Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice
H Inland unvegetated or sparsely vegetated habitats	H1	46	Terrestrial underground caves, cave systems, passages and waterbodies
	H2	47	Screes
	H3	48	Inland cliffs, rock pavements and outcrops
	H4	49	Snow or ice-dominated habitats
	H5	50	Miscellaneous inland habitats with very sparse or no vegetation
	H6	51	Recent volcanic features
I Regularly or recently cultivated agricultural , horticultural and domestic habitats	I1	52	Arable land and market gardens
	I2	53	Cultivated areas of gardens and parks
J Constructed, industrial and other artificial habitats	J1	54	Buildings of cities, towns and villages
	J2	55	Low density buildings
	J3	56	Extractive industrial sites
	J4	57	Transport networks and other constructed hard-surfaced areas
	J5	58	Highly artificial man-made waters and associated structures
	J6	59	Waste deposits

8.1.3 Nomenclature Urban Atlas

http://ec.europa.eu/regional_policy/sources/tender/pdf/2012066/annexe2.pdf

Urban Atlas Land Use/Land Cover			
UA No.	Code	Nomenclature	Additional Information
1		Artificial surfaces	
1.1		Urban Fabric	
1.1.1	11100	Continuous urban fabric (S.L. > 80%)	HRL IMD required
1.1.2		Discontinuous Urban Fabric (S.L. 10% - 80%)	
1.1.2.1	11210	Discontinuous dense urban fabric (S.L. 50% - 80%)	HRL IMD required
1.1.2.2	11220	Discontinuous medium density urban fabric (S.L. 30% - 50%)	HRL IMD required
1.1.2.3	11230	Discontinuous low density urban fabric (S.L. 10% - 30%)	HRL IMD required
1.1.2.4	11240	Discontinuous very low density urban fabric (S.L. < 10%)	HRL IMD required
1.1.3	11300	Isolated structures	
1.2		Industrial, commercial, public, military, private and transport units	
1.2.1	12100	Industrial, commercial, public, military and private units	zoning data / field check recommended
1.2.2		Road and rail network and associated land	COTS or OSM data required
1.2.2.1	12210	Fast transit roads and associated land	COTS or OSM data required

1.2.2.2	12220	Other roads and associated land	COTS or OSM data required
1.2.2.3	12230	Railways and associated land	COTS or OSM data required
1.2.3	12300	Port areas	zoning data / field check recommended
1.2.4	12400	Airports	zoning data / field check recommended
1.3		Mine, dump and construction sites	
1.3.1	13100	Mineral extraction and dump sites	
1.3.3	13300	Construction sites	
1.3.4	13400	Land without current use	
1.4		Artificial non-agricultural vegetated areas	
1.4.1	14100	Green urban areas	
1.4.2	14200	Sports and leisure facilities	
2		Agricultural areas	1 ha MMU
2.1	21000	Arable land (annual crops)	
2.2	22000	Permanent crops	
2.3	23000	Pastures	
2.4	24000	Complex and mixed cultivation	
2.5	25000	Orchards	
3		Natural and (semi-)natural areas	1 ha MMU
3.1	31000	Forests	
3.2	32000	Herbaceous vegetation associations	
3.3	33000	Open spaces with little or no vegetation	
4	40000	Wetlands	1 ha MMU
5	50000	Water	1 ha MMU
9.1	91000	No data (Clouds and shadows)	
9.2	92000	No data (Missing imagery)	

8.1.4 Nomenclature Riparian Zones

Level 4 (2015)	OLD	NEW	Level 4 (2017)
Continuous urban fabric (in-situ based or I.M.D. >80-100%)	1.1.1.1	1.1.1.1	Continuous Urban fabric (I.M.D. ≥80%)
Dense urban fabric (I.M.D. >30-80% + industrial, commercial, public, military and private units)	1.1.1.2	1.1.1.2	Dense urban fabric (I.M.D. ≥30-80%)
Industrial or commercial units	1.1.1.3	1.1.2.0	Industrial, commercial and military units
Low density urban fabric (I.M.D. 0-30%)	1.1.2.1	1.1.1.3	Low density fabric (I.M.D. <30%)
Road networks and associated land	1.2.1.1	1.2.1.0	Road networks and associated land
Railways and associated land	1.2.1.2	1.2.2.0	Railways and associated land
Port areas	1.2.1.3	1.2.3.0	Port areas and associated land
Airports	1.2.1.4	1.2.4.0	Airports and associated land
Mineral extraction, dump and construction sites	1.3.1.1	1.3.1.0	Mineral extraction, dump and construction sites
Land without current use	1.3.2.1	1.3.2.0	Land without current use
Green urban areas T.C.D. ≥ 30%	1.4.1.1	1.4.0.0	Green urban, sports and leisure facilities
Green urban areas T.C.D. < 30%	1.4.1.2	1.4.0.0	Green urban, sports and leisure facilities
Sports and leisure facilities T.C.D. ≥ 30%	1.4.2.1	1.4.0.0	Green urban, sports and leisure facilities
Sports and leisure facilities T.C.D. < 30%	1.4.2.2	1.4.0.0	Green urban, sports and leisure facilities
Non-irrigated arable land	2.1.1.1	2.1.1.0	Arable irrigated and non-irrigated land
Greenhouses	2.1.2.1	2.1.2.0	Greenhouses
Irrigated arable land and rice fields	2.1.3.1	2.1.1.0	Arable irrigated and non-irrigated land
Complex patterns of irrigated and non-irrigated arable land	2.1.4.1	2.1.1.0	Arable irrigated and non-irrigated land
Vineyards	2.2.1.1	2.2.1.0	Vineyards, fruit trees and berry plantations
High stem fruit trees (extensively managed)	2.2.2.1	2.2.1.0	Vineyards, fruit trees and berry plantations
Low stem fruit trees and berry plantations	2.2.2.2	2.2.1.0	Vineyards, fruit trees and berry plantations
Olive groves	2.2.3.1	2.2.2.0	Olive groves
Annual crops associated with permanent crops	2.3.1.1	2.3.1.0	Annual crops associated with permanent crops
Complex cultivation patterns	2.3.2.1	2.3.2.0	Complex cultivation patterns
Land principally occupied by agriculture with significant areas of natural vegetation	2.3.3.1	2.3.3.0	Land principally occupied by agriculture with significant areas of natural vegetation
Agro-forestry T.C.D. ≥ 30%	2.3.4.1	2.3.4.0	Agro-forestry
Agro-forestry T.C.D. < 30%	2.3.5.1	2.3.4.0	Agro-forestry
Riparian and fluvial Broadleaved forest	3.1.1.1	3.1.1.0	Natural & semi-natural broadleaved forest
Broadleaved swamp forest	3.1.2.1	3.1.1.0	Natural & semi-natural broadleaved forest
Other natural & semi natural broadleaved forest	3.1.3.1	3.1.1.0	Natural & semi-natural broadleaved forest
Broadleaved evergreen forest	3.1.4.1	3.1.1.0	Natural & semi-natural broadleaved forest
Highly artificial broadleaved plantations	3.1.5.1	3.1.2.0	Highly artificial broadleaved plantations
Riparian and fluvial coniferous forest	3.2.1.1	3.2.1.0	Natural & semi natural coniferous forest
Coniferous swamp forest	3.2.2.1	3.2.1.0	Natural & semi natural coniferous forest
Other natural & semi natural coniferous forest	3.2.3.1	3.2.1.0	Natural & semi natural coniferous forest
Highly artificial coniferous plantations	3.2.4.1	3.2.2.0	Highly artificial coniferous plantations
Riparian and fluvial mixed forest	3.3.1.1	3.3.1.0	Natural & semi natural mixed forest
Mixed swamp forest	3.3.2.1	3.3.1.0	Natural & semi natural mixed forest
Other natural & semi natural mixed forest	3.3.3.1	3.3.1.0	Natural & semi natural mixed forest
Highly artificial mixed plantations	3.3.4.1	3.3.2.0	Highly artificial mixed plantations
Transitional woodland and scrub	3.4.1.1	3.4.1.0	Transitional woodland and scrub
Lines of trees and scrub	3.4.1.2	3.4.2.0	Lines of trees and scrub
Forest damaged by fire	3.5.1.1	3.5.0.0	Damaged forest
Other damaged forest	3.5.1.2	3.5.0.0	Damaged forest
Managed grasslands with trees and scrubs (T.C.D. ≥ 30%)	4.1.1.1	4.1.0.0	Managed grassland
Managed grasslands without trees and scrubs (T.C.D. < 30%)	4.1.1.2	4.1.0.0	Managed grassland
Dry grasslands with trees (T.C.D. ≥ 30%)	4.2.1.1	4.2.1.0	Semi-natural grassland
Mesic grasslands with trees (T.C.D. ≥ 30%)	4.2.1.2	4.2.1.0	Semi-natural grassland
Dry grasslands without trees (T.C.D. < 30%)	4.2.2.1	4.2.1.0	Semi-natural grassland
Mesic grasslands without trees (T.C.D. < 30%)	4.2.2.2	4.2.1.0	Semi-natural grassland
Alpine and subalpine grasslands without trees (T.C.D. < 30%)	4.2.2.3	4.2.2.0	Alpine and sub-alpine natural grassland

Level 4 (2015)	OLD	NEW	Level 4 (2017)
Heathlands and Moorlands	5.1.1.1	5.1.1.0	Heathland and Moorland
Other scrub land	5.1.1.2	5.1.2.0	Other scrub land
Sclerophyllous vegetation	5.2.1.1	5.2.0.0	Sclerophyllous vegetation
Sparsely vegetated areas	6.1.1.1	6.1.0.0	Sparsely vegetated areas
Beaches	6.2.1.1	6.2.1.0	Beaches and dunes
Dunes	6.2.1.2	6.2.1.0	Beaches and dunes
River banks	6.2.1.3	6.2.2.0	River banks
Bare rocks and rock debris	6.2.2.1	6.3.1.0	Bare rocks and rock debris
Burnt areas (except burnt forest)	6.2.2.2	6.3.2.0	Burnt areas (except burnt forest)
Glaciers and perpetual snow	6.2.2.3	6.3.3.0	Glaciers and perpetual snow
Inland freshwater marshes	7.1.1.1	7.1.0.0	Inland marshes
Inland saline marshes	7.1.2.1	7.1.0.0	Inland marshes
Exploited peat bog	7.2.1.1	7.2.1.0	Exploited peat bog
Unexploited peat bog	7.2.1.2	7.2.2.0	Unexploited peat bog
Salt marshes	8.1.1.1	8.1.1.0	Coastal salt marshes
Salines	8.1.1.3	8.1.2.0	Salines
Intertidal flats	8.1.2.1	8.1.3.0	Intertidal flats
Coastal lagoons	8.2.1.1	8.2.1.0	Coastal lagoons
Estuaries	8.2.2.1	8.2.2.0	Estuaries
Permanent interconnected running water courses	9.1.1.1	9.1.1.0	Interconnected water courses
Intermittently running water courses	9.1.1.2	9.1.1.0	Interconnected water courses
Highly modified natural water courses and canals	9.1.1.3	9.1.2.0	Highly modified water courses and canals
Separated water bodies belonging to the river system	9.1.2.1	9.1.3.0	Separated water bodies: belonging to the river system
Natural water bodies	9.2.1.1	9.2.1.0	Natural water bodies
Ponds and lakes with completely man-made structure	9.2.1.3	9.2.2.0	Artificial standing water bodies
Intensively managed fish ponds	9.2.1.4	9.2.3.0	Intensively managed fish ponds
Standing water bodies of extractive industrial sites	9.2.1.5	9.2.4.0	Standing water bodies of extractive industrial sites
Marine (other)	10.1.1.1	10.0.0.0	Sea and ocean

8.1.5 COPERNICUS LC Natura 2000

N2k Level 1	N2k Level 2	N2k Level 3	N2k Level 4
1 Urban	1.1 Urban fabric, industrial, commercial, public, military and private units	1.1.1 Urban fabric (predominantly public and private units) & industrial, commercial and military units	1.1.1.1 Urban fabric (predominantly public and private units)
			1.1.1.3 Industrial, commercial and military units
	1.2 Transport infrastructure	1.2.1 Transport infrastructure	1.2.1.1 Road networks and associated land
			1.2.1.2 Railways and associated land
			1.2.1.3 Port areas
			1.2.1.4 Airports
	1.3 Mineral extraction, dump and construction sites, land without current use	1.3.1 Mineral extraction, dump and construction sites 1.3.2 Land without current use	1.3.1.1 Mineral extraction, dump and construction sites
			1.3.2.1 Land without current use
	1.4 Green urban, sports and leisure facilities	1.4.1 Green urban areas and leisure facilities	1.4.1.1 Green urban areas and leisure facilities
	2 Cropland	2.1 Arable land	2.1.1 Arable irrigated and non-irrigated land 2.1.2 Greenhouses
2.1.2.1 Greenhouses			
2.2 Permanent crops		2.2.1 Vineyards 2.2.2 Fruit trees and berry plantations 2.2.3 Olive groves	2.2.1.1 Vineyards
			2.2.2.1 Fruit trees and berry plantations
			2.2.3.1 Olive groves
2.3 Heterogeneous agricultural area		2.3.1 Annual crops associated with permanent crops 2.3.2 Complex cultivation patterns 2.3.3 Land principally occupied by agriculture with significant areas of natural vegetation 2.3.4 Agro-forestry	2.3.1.1 Annual crops associated with permanent crops
			2.3.2.1 Complex cultivation patterns
			2.3.3.1 Land principally occupied by agriculture with significant areas of natural vegetation
			2.3.4.1 Agro-forestry
3 Woodland and forest		3.1 Broadleaved forest	3.1.2 Broadleaved swamp forest 3.1.3 Other natural & semi-natural broadleaved forest 3.1.4 Broadleaved evergreen forest 3.1.5 Highly artificial broadleaved plantations
	3.1.3.1 Other natural & semi-natural broadleaved forest		
	3.1.4.1 Broadleaved evergreen forest		
	3.1.5.1 Highly artificial broadleaved plantations		
	3.2.2.1 Coniferous swamp forest		
	3.2 Coniferous forest	3.2.2 Coniferous swamp forest 3.2.3 Other natural & semi natural coniferous forest 3.2.4 Highly artificial coniferous plantations	3.2.3.1 Other natural & semi natural coniferous forest
			3.2.4.1 Highly artificial coniferous plantations
			3.3.2.1 Mixed swamp forest
	3.3 Mixed Forest	3.3.2 Mixed swamp forest	

N2k Level 1	N2k Level 2	N2k Level 3	N2k Level 4
		3.3.3 Other natural & semi natural mixed forest	3.3.3.1 Other natural & semi natural mixed forest
		3.3.4 Highly artificial mixed plantations	3.3.4.1 Highly artificial mixed plantations
	3.4 Transitional woodland scrub	3.4.1 Transitional woodland, scrub	3.4.1.1 Transitional woodland and scrub
			3.4.1.2 Lines of trees and scrub
3.5 Damaged forest	3.5.1 Damaged forest	3.5.1.1 Damaged forest	
4 Grassland	4.1 Managed grassland	4.1.1 Managed grassland	4.1.1.1 Managed grassland
	4.2 Natural & semi-natural grassland	4.2.1 Semi-natural grassland	4.2.1.1 Semi-natural grassland with trees (TCD \geq 30 %)
			4.2.1.2 Semi-natural grassland without trees (TCD < 30 %)
		4.2.2 Alpine and sub-alpine natural grassland	4.2.2.1 Alpine and sub-alpine natural grassland
5 Heathland and scrub	5.1 Moors and heathland	5.1.1 Moors and heathland	5.1.1.1 Heathland and Moorland
	5.2 Sclerophyllous vegetation		5.2.1 Sclerophyllous vegetation
6 Sparsely vegetated land	6.1 Sparsely vegetated areas	6.1.1 Sparsely vegetated areas	6.1.1.1 Sparsely vegetated areas
	6.2 Bare soil, rock, perennial snow & ice	6.2.1 Beaches, dunes, sands	6.2.1.1 Beaches
			6.2.1.2 Dunes
			6.2.1.3 River banks
		6.2.2 Bare rocks, burnt areas, glaciers and perpetual snow	6.2.2.1 Bare rocks and rock debris
			6.2.2.2 Burnt areas (except burnt forest)
			6.2.2.3 Glaciers and perpetual snow
7 Wetland	7.1 Inland marshes	7.1.1 Inland freshwater marshes	7.1.1.1 Inland freshwater marshes
		7.1.2 Inland saline marshes	7.1.2.1 Inland saline marshes
	7.2 Peat bogs	7.2.1 Peat bogs	7.2.1.1 Exploited peat bog
			7.2.1.2 Unexploited peat bog
8 Lagoons, coastal wetlands and estuaries	8.1 Maritime wetlands	8.1.1 Salt marshes & salines	8.1.1.1 Salt marshes
			8.1.1.3 Salines
	8.2 Marine waters	8.1.2 Intertidal flats	8.1.2.1 Intertidal flats
		8.2.1 Coastal lagoons	8.2.1.1 Coastal lagoons
9 Rivers and lakes	9.1 Water courses	9.1.1 Interconnected running water courses & highly modified natural water courses and canals	9.1.1.1 Interconnected running water courses
			9.1.1.3 Highly modified natural water courses and canals
		9.1.2 Separated water bodies belonging to the river system	9.1.2.1 Separated water bodies belonging to the river system (dead side-

N2k Level 1	N2k Level 2	N2k Level 3	N2k Level 4
			arms, flood ponds)
	9.2 Lakes and reservoirs	9.2.1 Lakes and reservoirs	9.2.1.1 Natural water bodies
			9.2.1.3 Ponds and lakes with completely man-made structure
			9.2.1.4 Intensively managed fish ponds
			9.2.1.5 Standing water bodies of extractive industrial sites
10 Marine (other)	10.1 Marine (other)	10.1.1 Marine (other)	10.1.1.1 Marine (other)

8.1.6 Correspondence between CORINE Land Cover classes and MAES Ecosystem Types

CLC Level 1	CLC Level 2	CLC Level 3	Ecosystem types level 2
1. Artificial surfaces	1.1. Urban fabric	1.1.1. Continuous urban fabric	Urban
		1.1.2. Discontinuous urban fabric	
	1.2. Industrial, commercial and transport units	1.2.1. Industrial or commercial units	
		1.2.2. Road and rail networks and associated land	
		1.2.3. Port areas	
		1.2.4. Airports	
	1.3. Mine, dump and construction sites	1.3.1. Mineral extraction sites	
		1.3.2. Dump sites	
		1.3.3. Construction sites	
	1.4. Artificial non-agricultural vegetated areas	1.4.1. Green urban areas	
1.4.2. Sport and leisure facilities			
2. Agricultural areas	2.1. Arable land	2.1.1. Non-irrigated arable land	Cropland
		2.1.2. Permanently irrigated land	
		2.1.3. Rice fields	
	2.2. Permanent crops	2.2.1. Vineyards	Grassland
		2.2.2. Fruit trees and berry plantations	
		2.2.3. Olive groves	
	2.3. Pastures	2.3.1. Pastures	Cropland
	2.4. Heterogeneous agricultural areas	2.4.1. Annual crops associated with permanent crops	Cropland
		2.4.2. Complex cultivation patterns	
		2.4.3. Land principally occupied by agriculture, with significant areas of natural vegetation	
2.4.4. Agro-forestry areas			
3. Forests and semi-natural areas	3.1. Forests	3.1.1. Broad-leaved forest	Woodland and forest
		3.1.2. Coniferous forest	
		3.1.3. Mixed forest	
	3.2. Shrub and/or herbaceous vegetation association	3.2.1. Natural grassland	Grassland
		3.2.2. Moors and heathland	Heathland and shrub
		3.2.3. Sclerophyllous vegetation	Woodland and forest
		3.2.4. Transitional woodland shrub	
	3.3. Open spaces with little or no vegetation	3.3.1. Beaches, dunes, and sand plains	Sparsely vegetated land
		3.3.2. Bare rock	
		3.3.3. Sparsely vegetated areas	
3.3.4. Burnt areas			
3.3.5. Glaciers and perpetual snow			
4. Wetlands	4.1. Inland wetlands	4.1.1. Inland marshes	Wetlands
		4.1.2. Peatbogs	
	4.2. Coastal wetlands	4.2.1. Salt marshes	Marine inlets and transitional waters
		4.2.2. Salines	
		4.2.3. Intertidal flats	
5. Water bodies	5.1. Inland waters	5.1.1. Water courses	Rivers and lakes
		5.1.2. Water bodies	
	5.2. Marine waters	5.2.1. Coastal lagoons	Marine inlets and transitional waters
		5.2.2. Estuaries	
		5.2.3. Sea and ocean	Marine

Code	MAES Level 2	Code	MAES Level 2
1	Urban	6	Sparsely vegetated land
2	Cropland	7	Wetlands
3	Grassland	8	Rivers and lakes
4	Woodland and Forest	9	Marine inlets and transitional waters
5	Heathland and shrub	10	Marine

8.2 Crosswalks Local Components

8.2.1 Crosswalk Urban Atlas/CLC/EUNIS

UA Code	Urban Atlas class name	CLC Code	CLC Class name	EUNIS Code	EUNIS Class name	Comment
11100	Continuous urban fabric (S.L. > 80%)	111	Continuous urban fabric	J1	Buildings of cities, towns and villages	
11210	Discontinuous dense urban fabric (S.L.: 50% - 80%)	111	Continuous urban fabric	J1	Buildings of cities, towns and villages	
11220	Discontinuous medium density urban fabric (S.L.: 30% - 50%)			J2	Low density buildings	
11230	Discontinuous low density urban fabric (S.L.: 10% - 30%)			J2	Low density buildings	
11240	Discontinuous very low density urban fabric (S.L. < 10%)			J2	Low density buildings	
11300	Isolated structures			J2	Low density buildings	
12100	Industrial, commercial, public, military and private units	121	Industrial or commercial units	J1+J2		differentiated into J1 and J2 depending on sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 121
12210	Fast transit roads and associated land	122	Road and rail networks and associated land	J4	Transport networks and other constructed hard-surfaced areas	
12220	Other roads and associated land	122	Road and rail networks and associated land	J4	Transport networks and other constructed hard-surfaced areas	
12230	Railways and associated land	122	Road and rail networks and associated land	J4	Transport networks and other constructed hard-surfaced areas	
12300	Port areas	123	Port areas	J4	Transport networks and other constructed hard-surfaced areas	
12400	Airports	124	Airports	J4	Transport networks and other constructed hard-surfaced areas	
13100	Mineral extraction and dump sites	131	Mineral extraction sites	J3	Extractive industrial sites	
13300	Construction sites	133	Construction sites	J2	Low density buildings	
13400	Land without current use	112	Discontinuous urban fabric	J1+J2		differentiated into J1 and J2 depending on sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 112
14100	Green urban areas	141	Green urban areas	I2	Cultivated areas of gardens and parks	
14200	Sports and leisure facilities	142	Sport and leisure facilities	I2	Cultivated areas of gardens and parks	
21000	Arable land (annual crops)	211	Non-irrigated arable land	I1	Arable land and market gardens	
22000	Permanent crops (vineyards, fruit trees, olive groves)	-		-		not selected: can only be linked to CLC-Level 2 (2.2 permanent crops) without thematic differentiation; in addition the MMU for rural areas is 1 ha compared to 0,25ha in the urban classes
23000	Pastures	231	Pastures	E4, B1, E7, E3 or E2		
24000	Complex and mixed cultivation patterns	242	Complex cultivation patterns	I1 or E2		
25000	Orchards at the fringe of urban classes	-		-		not selected: can only be linked to CLC-Level 2 (2.2 permanent crops) without thematic differentiation; in addition the MMU for rural areas is 1 ha compared to 0,25ha in the urban classes
31000	Forests	-		-		not selected: can only be linked to CLC-Level 2 (3.1 forests) without thematic differentiation; in addition the MMU for rural areas is 1 ha compared to 0,25ha in the urban classes
32000	Herbaceous vegetation associations	-		-		not selected: can only be linked to CLC-Level 2 (3.2 Shrub and/or herbaceous vegetation) without thematic differentiation; in addition the MMU for rural areas is 1 ha compared to 0,25ha in the urban classes
33000	Open spaces with little or no vegetation	-		-		not selected: can only be linked to CLC-Level 2 (3.3 open spaces with little or no vegetation) and this is differentiated into 2 EUNIS classes: H5 and H3 (in addition the MMU for rural areas is 1 ha compared to 0,25ha in the urban classes)
40000	Wetlands	-		-		not selected: can only be linked to CLC-Level 1 (Wetlands) without thematic differentiation; compensated by RZ data
50000	Water	-		-		not selected: can only be linked to CLC-Level 1 (Water bodies) without thematic differentiation; a differentiation of running and standing waters is achieved by the RZ dataset; all running waters down to Strahler level 2/3 are integrated there, therefore all other water areas are water bodies!

8.2.2 Crosswalk Riparian Zones/CLC/EUNIS

RZ Code	Riparian Zones (2017) Class name	CLC Code	CLC Class name	EUNIS Code	EUNIS Class name	Comment
1111	Continuous Urban fabric (IM.D ≥80%)	111	Continuous urban fabric	J1	Buildings of cities, towns and villages	
1112	Dense urban fabric (IM.D ≥30-80%)	111	Continuous urban fabric	J1	Buildings of cities, towns and villages	
1113	Low density fabric (IM.D <30%)	112	Discontinuous urban fabric	J1 or J2		differentiated into J1 and J2 depending on the sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 112
1120	Industrial or commercial units	121	Industrial or commercial units	J1 or J2		differentiated into J1 and J2 depending on sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 121
1210	Road networks and associated land	122	Road and rail networks and associated land	J4	Transport networks and other constructed hard-surfaced areas	
1220	Railways and associated land	122	Road and rail networks and associated land	J4	Transport networks and other constructed hard-surfaced areas	
1230	Port areas and associated land	123	Port areas	J4	Transport networks and other constructed hard-surfaced areas	
1240	Airports and associated land	124	Airports	J4	Transport networks and other constructed hard-surfaced areas	
1310	Mineral extraction, dump and construction sites	131	Mineral extraction sites	J3	Extractive industrial sites	includes CLC-Classes 131 (mineral extraction), 132 (dump sites) and 133 (construction sites). Priority is given to 131 as dominant landscape feature
1320	Land without current use	112	Discontinuous urban fabric	J1 or J2		differentiated into J1 and J2 depending on sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 112
1400	Green urban, sports and leisure facilities	141	Green urban areas	I2	Cultivated areas of gardens and parks	includes two CLC classes: 141 and 142, no dominant class available; according to CLC-EUNIS crosswalk both classes are mapped as I2
2110	Arable irrigated and non-irrigated land	211	Non-irrigated arable land	I1	Arable land and market gardens	includes also 212 irrigated arable land according to CLC-EUNIS Crosswalk both classes are mapped as I1
2120	Greenhouses	112	Discontinuous urban fabric	J1 or J2		differentiated into J1 and J2 depending on the sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 112
2210	Vineyards, fruit trees and berry plantations			FB	Shrub plantations	includes CLC-Classes 221 and 222; according to CLC-EUNIS Crosswalk both are mapped as FB
2220	Olive groves	223	Olive groves	G2	Broadleaved evergreen woodland	
2310	Annual crops associated with permanent crops	241	Annual crops associated with permanent crops	I1	Arable land and market gardens	
2320	Complex cultivation patterns	242	Complex cultivation patterns	I1 or E2		
2330	Land principally occupied by agriculture with significant areas of natural vegetation	243	Land principally occupied by agriculture, with significant areas of natural vegetation	E2 or I1		
2340	Agro-forestry	244	Agro-forestry areas	E7	Sparsely wooded grasslands	
3110	Natural & semi-natural broadleaved forest	311	Broad-leaved forest	G2 or G1		
3120	Highly artificial broadleaved plantations	311	Broad-leaved forest	G2 or G1		
3210	Natural & semi natural coniferous forest	312	Coniferous forest	G3	Coniferous woodland	
3220	Highly artificial coniferous plantations	312	Coniferous forest	G3	Coniferous woodland	
3310	Natural & semi natural mixed forest	313	Mixed forest	G4	Mixed deciduous and coniferous woodland	
3320	Highly artificial mixed plantations	313	Mixed forest	G4	Mixed deciduous and coniferous woodland	
3410	Transitional woodland and scrub	324	Transitional woodland-shrub	G5	Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice	
3420	Lines of trees and scrub			G5	Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice	
3500	Damaged forest	-		-		not selected: no information on type of forest; therefore this class is EXCLUDED
4100	Managed grassland	231	Pastures	E4, B1, E7, E3 or E2		
4210	Semi-natural grassland	321	Natural grasslands	E4, E3, E6 or E1		
4220	Alpine and sub-alpine natural grassland			E4	Alpine and subalpine grasslands	

RZ Code	Riparian Zones (2017) Class name	CLC Code	CLC Class name	EUNIS Code	EUNIS Class name	Comment
5110	Heathlands and Moorlands	322	Moors and heathland	F2, F9, F4, or F1		this class is treated like CLC-Class 322 BUT EXCLUSION of EUNIS-Class F3!!!
5120	Other scrub land	322	Moors and heathland	F2, F9, F3, F4 or F1		
5200	Sclerophyllous vegetation	323	Sclerophyllous vegetation	F8, F6, F7, F5, B1		
6100	Sparsely vegetated areas	333	Sparsely vegetated areas	F2, F1, H3, H5		
6210	Beaches and dunes	331	Beaches, dunes, sands	B1, B2, C3 or H2		
6220	River banks			H2	Screes	
6310	Bare rocks and rock debris	332	Bare rocks	B3 or H3		
6320	Burnt areas (except burnt forest)	334	Burnt areas	H5	Miscellaneous inland habitats with very sparse or no vegetation	
6330	Glaciers and perpetual snow	335	Glaciers and perpetual snow	H4	Snow or ice-dominated habitats	
7100	Inland marshes	411	Inland marshes	D5, D2, D4 or C3		
7210	Exploited peat bog	412	Peat bogs	D3 or D1		
7220	Unexploited peat bog	412	Peat bogs	D3 or D1		
8110	Coastal salt marshes	421	Salt marshes	D6	Inland saline and brackish marshes and reedbeds	
8120	Salines	422	Salines	J5	Highly artificial man-made waters and associated structures	
8130	Intertidal flats	423	Intertidal flats	-		not selected
8210	Coastal lagoons	521	Coastal lagoons	X2_3	Coastal lagoons	
8220	Estuaries	522	Estuaries	X1	Estuaries	
9110	Interconnected water courses			C2	Surface running waters	
9120	Highly modified water courses and canals			J5	Highly artificial man-made waters and associated structures	
9130	Separated water bodies belonging to the river system			C2	Surface running waters	are almost standing waters, but still dynamically linked to the river system; therefore mapped as water course
9210	Natural water bodies			C1	Surface standing waters	
9220	Artificial standing water bodies			J5	Highly artificial man-made waters and associated structures	
9230	Intensively managed fish ponds			J5	Highly artificial man-made waters and associated structures	
9240	Standing water bodies of extractive industrial sites			J5	Highly artificial man-made waters and associated structures	
10000	Sea and ocean	523	Sea and ocean	-		

8.2.3 Crosswalk Natura 2000/CLC/EUNIS

N2k Code	Natura 2000 Class name	CLC Code	CLC Class name	EUNIS Code	EUNIS Class name	Comment
1111	Urban fabric (predominantly public and private units)	112	Discontinuous urban fabric	J1 or J2		differentiated into J1 and J2 depending on the sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 112
1113	Industrial, commercial and military units	121	Industrial or commercial units	J1 or J2		differentiated into J1 and J2 depending on the sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 121
1211	Road networks and associated land	122	Road and rail networks and associated land	J4	Transport networks and other constructed hard-surfaced areas	
1212	Railways and associated land	122	Road and rail networks and associated land	J4	Transport networks and other constructed hard-surfaced areas	
1213	Port areas	123	Port areas	J4	Transport networks and other constructed hard-surfaced areas	
1214	Airports	124	Airports	J4	Transport networks and other constructed hard-surfaced areas	
1311	Mineral extraction, dump and construction sites	131	Mineral extraction sites	J3	Extractive industrial sites	This N2k-Class includes CLC-Classes 131 (mineral extraction), 132 (dump sites) and 133 (construction sites). Priority is given to 131 as dominant landscape feature
1321	Land without current use	112	Discontinuous urban fabric	J1 or J2		differentiated into J1 and J2 depending on sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 112
1411	Green urban areas and leisure facilities	141	Green urban areas	I2	Cultivated areas of gardens and parks	includes two CLC classes: 141 and 142, no dominant class available; both classes are mapped as I2 according to CLC-EUNIS crosswalk
2111	Arable irrigated and non-irrigated land	211	Non-irrigated arable land	I1	Arable land and market gardens	
2121	Greenhouses	112	Discontinuous urban fabric	J1 or J2		differentiated into J1 and J2 depending on the sealing degree (HRL Imperviousness) according to CLC-EUNIS Crosswalk for CLC-Class 112
2211	Vineyards	221	Vineyards	FB	Shrub plantations	
2221	Fruit trees and berry plantations	222	Fruit trees and berry plantations	FB	Shrub plantations	
2231	Olive groves	223	Olive groves	G2	Broadleaved evergreen woodland	
2311	Annual crops associated with permanent crops	241	Annual crops associated with permanent crops	I1	Arable land and market gardens	
2321	Complex cultivation patterns	242	Complex cultivation patterns	I1 or E2		
2331	Land principally occupied by agriculture with significant areas of natural vegetation	243	Land principally occupied by agriculture, with significant areas of natural vegetation	E2 or I1		
2341	Agro-forestry	244	Agro-forestry areas	E7	Sparsely wooded grasslands	
3121	Broadleaved swamp forest	311	Broad-leaved forest	G1 or G2		could be assigned to EUNIS L3 class
3131	Other natural and semi natural broadleaved forest			G1	Broadleaved deciduous woodland	could be assigned to EUNIS L3 class
3141	Broadleaved evergreen forest			G2	Broadleaved evergreen woodland	could be assigned to EUNIS L3 class
3151	Highly artificial broadleaved plantations	311	Broad-leaved forest	G1 or G2		could be assigned to EUNIS L3 class: G1.C
3221	Coniferous swamp forest	312	Coniferous forest	G3	Coniferous woodland	could be assigned to EUNIS L3 class
3231	Other natural and semi natural coniferous forest	312	Coniferous forest	G3	Coniferous woodland	could be assigned to EUNIS L3 class
3241	Highly artificial coniferous plantations	312	Coniferous forest	G3	Coniferous woodland	could be assigned to EUNIS L3 class: G3.F
3321	Mixed swamp forest	313	Mixed forest	G4	Mixed deciduous and coniferous woodland	could be assigned to EUNIS L3 class
3331	Other natural and semi natural mixed forest	313	Mixed forest	G4	Mixed deciduous and coniferous woodland	could be assigned to EUNIS L3 class
3341	Highly artificial mixed plantations	313	Mixed forest	G4	Mixed deciduous and coniferous woodland	could be assigned to EUNIS L3 class: G4.F
3411	Transitional woodland and scrub	324	Transitional woodland-shrub	G5	Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice	
3412	Lines of trees and scrub			G5	Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice	
3511	Damaged forest	-		-		not selected: no information on type of forest; therefore this class is EXCLUDED

N2k Code	Natura 2000 Class name	CLC Code	CLC Class name	EUNIS Code	EUNIS Class name	Comment
4111	Managed grassland	231	Pastures	E4, B1, E7, E3 or E2		
4211	Semi-natural grassland with trees (T.C.D. >= 30%)	321	Natural grasslands	E4, E3, E6 or E1		
4212	Semi-natural grassland without trees (T.C.D. < 30%)	321	Natural grasslands	E4, E3, E6 or E1		
4221	Alpine and sub-alpine natural grassland			E4	Alpine and subalpine grasslands	
5111	Heathlands and Moorlands	322	Moors and heathland	F2, F9, F4, or F1		this class is treated like CLC-Class 322 BUT EXCLUSION of EUNIS-Class F3!!!
5112	Other scrub land	322	Moors and heathland	F2, F9, F3, F4 or F1		
5211	Sclerophyllous vegetation	323	Sclerophyllous vegetation	F8, F6, F7, F5, B1		
6111	Sparsely vegetated areas	333	Sparsely vegetated areas	F2, F1, H3, H5		
6211	Beaches	331	Beaches, dunes, sands	B1, B2, C3 or H2		
6212	Dunes	331	Beaches, dunes, sands	B1, B2, C3 or H2		
6213	River banks			H2	Screes	
6221	Bare rocks and rock debris	332	Bare rocks	B3 or H3		
6222	Burnt areas (except burnt forest)	334	Burnt areas	H5	Miscellaneous inland habitats with very sparse or no vegetation	
6223	Glaciers and perpetual snow	335	Glaciers and perpetual snow	H4	Snow or ice-dominated habitats	
7111	Inland freshwater marshes	411	Inland marshes	D5, D2, D4 or C3		
7121	Inland saline marshes			D6	Inland saline and brackish marshes and reedbeds	
7211	Exploited peat bog	412	Peat bogs	D3 or D1		
7212	Unexploited peat bog	412	Peat bogs	D3 or D1		
8111	Salt marshes	421	Salt marshes	D6	Inland saline and brackish marshes and reedbeds	
8113	Salines	422	Salines	J5	Highly artificial man-made waters and associated structures	
8121	Intertidal flats	423	Intertidal flats			not selected
8211	Coastal lagoons	521	Coastal lagoons	X2_3	Coastal lagoons	
8221	Estuaries	522	Estuaries	X1	Estuaries	
9111	Interconnected running water courses			C2	Surface running waters	
9113	Highly modified natural water courses and canals			J5	Highly artificial man-made waters and associated structures	
9121	Separated water bodies belonging to the river system (dead side-arms, flood ponds)			C2	Surface running waters	
9211	Natural water bodies			C1	Surface standing waters	
9213	Ponds and lakes with completely man-made structure			J5	Highly artificial man-made waters and associated structures	
9214	Intensively managed fish ponds			J5	Highly artificial man-made waters and associated structures	
9215	Standing water bodies of industrial sites			J5	Highly artificial man-made waters and associated structures	
10111	Marine (other)	523	Sea and ocean	-		

8.3.4 Detailed distribution of UA classes within EUNIS

The table below shows in percentage how UA-classes are mapped into EUNIS classes according to the UA/CLC/EUNIS crosswalk and mapping rules

Class	B1	E2	E3	E4	E7	I1	I2	J1	J2	J3	J4	Total
11100								100				100
11210								100				100
11220									100			100
11230									100			100
11240									100			100
11300									100			100
12100								70.8	29.2			100
12210											100	100
12220											100	100
12230											100	100
12300											100	100
12400											100	100
13100										100		100
13300									100			100
13400								37.6	62.4			100
14100							100					100
14200							100					100
21000						100						100
23000	0.03	87.7	11.4	0.18	0.71							100
24000		90.5				9.53						100
Total	0.01	27.8	3.61	0.06	0.22	48.2	2.21	8.78	7.55	0.57	1.04	100

8.3.5 Detailed distribution of HRL & OSM classes within EUNIS

The table below shows in percentage how HRL-classes and OSM-classes are mapped into EUNIS classes according to the HRL&OSM/CLC/EUNIS crosswalk and mapping rules

Source	mapped as	Code	Class	CLC/EUNIS	C1	E1	E3	E4	E6	G1	G2	G3	G4	I2	J1	J2	J4	J5	Total
HRL Forest (Broadleaved)	CLC	23	311	Broad-leaved forest						98.9	1.1								100.0
HRL Forest (Coniferous)	CLC	24	312	Coniferous forest								100.0							100.0
HRL Forest (Mixed)	CLC	25	313	Mixed forest									100.0						100.0
HRL Grassland	CLC	26	321	Natural grassland		54.7	5.0	39.9	0.3										100.0
HRL Permanent waterbodies	CLC	41	512	Water bodies	99.2													0.8	100.0
HRL Imperviousness & OSM	EUNIS	53	I2	Cultivated areas of gardens and parks										100.0					100.0
HRL Imperviousness & OSM	EUNIS	54	J1	Buildings of cities, towns and villages											100.0				100.0
HRL Imperviousness & OSM	EUNIS	55	J2	Low density buildings												100.0			100.0
HRL Imperviousness & OSM	EUNIS	57	J4	Transport networks and other constructed hard-surfaced areas													100.0		100.0
HRL Imperviousness & OSM	EUNIS	58	J5	Highly artificial man-made waters and associated structures														100.0	100.0
Total					3.1	3.6	0.3	2.6	0.0	38.4	0.4	37.2	12.4	0.0	0.6	0.7	0.6	0.0	100.0

8.4 Distribution of Level 2 EUNIS habitats per country - Area in km²

EUNIS L2	AL	AT	BA	BE	BG	CH	CY	CZ	DE	DK	EE	ES	FI	FR
A1	48.9			26.5			19.8		3,315.2	890.1	3.6	370.6	149.2	2,937.5
X1	2.6			14.5					371.3			86.9	0.0	500.6
X2_3	127.4				7.0				1,133.3	504.5	15.5	81.2		651.7
B1	17.0		3.8	3.8	10.5		71.0		42.6	60.4	27.5	200.1	1.3	186.8
B2									0.0		2.4	0.7	0.0	2.8
B3					0.4		5.5					80.3	61.8	10.2
C1	476.4	518.7	155.9	106.2	614.0	1,401.7	20.4	584.5	3,418.7	448.1	2,055.6	2,720.1	32,671.6	2,257.1
C2	54.3	241.1	114.6	90.7	301.3	83.1	0.3	111.6	922.0	3.8	32.0	436.5	782.6	1,199.3
C3	6.5	1.4	25.0	0.1	13.4	10.2		1.0	14.9	7.4	8.7	31.1	0.8	18.0
D1		6.1	9.3	36.3				12.7	570.6	114.2	1,006.7	6.6	694.5	23.2
D2		11.6		17.5	0.3	0.1		33.4	195.2	66.3	347.2	2.7	490.4	43.0
D3											29.4		15,728.4	
D4		8.1		1.0	2.2	1.5		1.0	24.8	36.5	55.0	0.3	0.1	33.4
D5	23.5	131.3	19.1	6.5	74.1	13.4	4.3	6.2	267.7	51.4	167.5	45.3	3.6	404.4
D6	5.9			0.2					4.3	0.4	0.2	314.5	1.3	162.0
E1	2,541.8	1,095.7	3,056.8	88.7	4,702.2	1,352.2	221.7	322.3	1,382.7	359.2	278.4	29,858.7	261.5	9,208.0
E2	2,098.5	9,587.5	7,107.7	8,138.8	9,997.6	3,569.4	451.1	11,938.6	57,686.5	2,671.4	3,466.5	19,725.4	916.4	123,436.6
E3	355.3	153.9	188.0	125.7	3,047.9	413.7	100.1	94.2	9,578.1	664.7	1,513.3	1,720.7	357.4	2,696.4
E4	355.7	5,830.6	161.2		568.2	4,105.7		46.3	244.4			2,023.3	569.2	4,028.5
E6		7.1			153.4			0.3				2,795.4		36.2
E7	5.1				10.7							9,197.7		192.6
F1													2,017.1	
F2	213.9	3,122.9	144.7		257.1	1,733.8	0.1	19.2	123.9			1,739.7	2,445.1	1,873.3
F3	78.3	286.9	60.9	85.7	50.5	168.8			334.6	339.2	59.9	10,614.8	914.4	2,086.7
F4			0.3	0.3	66.3	0.8			10.0	48.6	0.4	1,719.8	10.0	99.7
F5	1,337.8		754.7		29.6		1,048.8					19,681.1		2,458.0
F6												9,708.6		12.1
F7	3.5											9,654.8		516.3
F8												954.0		
F9		0.0		0.2	2.2				1.1			8.2	31.4	3.3
FB	149.4	431.1	62.1	78.4	1,405.2	111.5	216.5	391.5	1,687.0	16.5	9.8	16,252.6	0.4	10,525.2
G1	10,967.7	10,854.8	23,804.2	3,498.7	31,442.2	4,070.9	149.3	8,445.8	45,783.5	2,052.8	10,433.3	94,218.1	16,206.1	116,835.5
G2	434.1				0.2	0.2	55.4					22,512.4		2,694.2
G3	636.4	18,288.5	3,829.9	2,094.3	6,871.5	6,667.4	1,955.6	13,386.2	45,104.2	1,831.3	8,401.7	64,608.1	182,293.4	25,547.5
G4	1,327.4	10,505.2	3,502.3	1,620.3	3,657.0	3,014.0	170.7	7,059.2	23,625.2	1,134.7	6,812.5	8,266.9	39,536.7	22,768.5
G5	1,666.6	299.9	1,894.2	144.5	3,245.4	108.6	202.2	567.9	1,302.2	426.5	1,415.5	9,851.3	10,634.2	7,791.2
H2	180.1	10.1	8.8	8.2	31.2	20.2	25.3	0.4	112.6	18.8	2.5	214.1	16.8	175.0
H3	459.8	2,658.6	187.1	0.1	151.5	3,864.2	9.1	1.4	113.6	0.3		3,342.1	967.1	4,591.1
H4		351.9	0.5			1,185.5			0.4			3.5		248.2
H5	674.2	38.4	436.0	1.6	160.6	34.5	118.3	1.4	31.6	0.7	4.9	6,094.1	99.6	871.1
I1	3,696.9	14,666.7	4,484.9	8,084.5	38,793.1	6,389.7	3,554.4	29,535.0	123,818.9	28,148.9	8,114.6	138,269.8	24,783.6	166,124.0
I2	5.4	350.4	11.2	308.5	201.1	135.2	82.7	464.9	3,660.9	644.7	60.6	850.6	300.1	2,189.6
J1	276.7	1,679.6	499.9	2,360.2	2,436.7	1,208.8	337.2	3,366.1	21,134.3	1,665.1	310.5	7,553.7	1,127.7	15,834.0
J2	465.8	2,299.5	535.2	3,111.9	2,100.0	1,313.8	320.6	1,865.7	11,679.7	1,578.2	572.2	6,004.3	3,233.3	16,560.7
J3	45.9	111.0	82.2	90.8	313.9	37.0	33.3	239.1	1,164.2	57.9	91.1	1,034.6	245.6	786.2
J4	40.1	380.1	34.5	518.7	229.0	271.3	74.1	331.1	2,955.4	307.6	57.3	2,907.9	285.2	2,880.0
J5	11.0	14.5	20.1	16.7	29.0	1.3	0.0	21.2	248.3	0.8	9.4	251.8	100.0	401.1
J6	0.3	0.7	5.9	3.5	18.5		0.6	25.6	44.7	2.1	13.9	52.1	47.1	18.5
Total	28,790.0	83,943.9	51,200.8	30,683.5	110,994.9	41,288.3	9,248.1	78,873.9	362,108.6	44,152.8	45,379.5	506,066.9	337,984.8	551,919.2

EU-NIS L2	GB	GR	HR	HU	IE	IS	IT	KS	LI	LT	LU	LV	ME	MK
A1	3,130.9	326.7	6.0		538.5	642.9	442.1					0.7	1.0	
X1	1,087.3	10.1			257.4	28.5	0.8						0.0	
X2_3	8.2	211.1	1.0		18.3	240.2	906.7			382.8				
B1	215.4	974.0	154.5		110.1	0.3	242.8			9.8		24.9	13.1	
B2	15.8	0.0			1.0		5.8							
B3	17.0	27.9	5.2		17.3	75.7	15.9						0.4	
C1	2,586.3	863.8	212.4	1,141.3	1,184.2	1,529.4	1,841.8	21.6	0.1	1,058.1	5.7	1,040.4	264.8	523.3
C2	237.5	138.9	185.9	383.5	98.4	1,106.3	452.0	5.4	1.1	134.9	4.7	164.7	11.2	14.4
C3	3.7	0.1	57.3	65.4	4.8	62.2	13.4			16.6		9.8	57.9	3.9
D1	21,782.8			52.5	9,831.5	6,351.9	0.5	0.1		286.1		950.2		
D2	47.8	0.6		3.5	33.5		0.9			44.7		63.6		0.0
D3												8.3		
D4	21.9	0.3	4.4	124.8	48.8		6.0			11.2	0.0	4.9		
D5	134.9	127.0	124.2	558.8	218.2	207.3	105.4	0.7	0.1	99.7	0.2	115.4	11.8	12.8
D6	18.9	62.9		96.8	1.4	0.1	42.0							
E1	7,163.4	9,386.5	3,148.7	809.7	554.5	3,749.8	10,928.4	601.6	4.0	374.6	0.1	170.0	1,136.1	1,731.1
E2	60,178.2	7,211.4	8,372.8	10,560.3	33,331.6	2,077.0	17,909.9	1,610.5	18.5	12,445.7	450.1	9,527.4	539.3	3,473.4
E3	17,806.4	782.4	5.2	1,408.4	6,963.0	768.7	204.0	63.5		553.6	236.1	1,691.1	6.2	60.6
E4	1,465.8	544.0	0.6				7,021.0	203.0	17.4				295.5	504.0
E6		34.2		1,559.2			81.3							
E7		50.9	22.3	60.1			1,383.9						3.2	
F1						32,992.7								
F2	5,106.5	547.9				1,617.1	2,337.2	12.8	4.3				83.9	40.0
F3	12,972.9	225.4	43.1	0.4	800.1	10,707.6	269.2	11.8		13.1		0.2	3.6	58.6
F4	1,146.4		27.1	0.5	106.1	564.7	48.7							
F5		10,352.2	938.5	0.7			5,186.9	4.8					23.5	223.0
F6		129.0					557.8							
F7		6,221.7					1,376.4							
F8														
F9	7.7	0.5		0.0			2.7					0.2		
FB	52.4	1,676.0	291.5	1,471.6	2.6		8,512.4	59.6	0.1	61.5	12.6	34.4	28.6	318.3
G1	11,766.7	28,660.8	21,881.1	17,656.4	1,462.2	325.8	81,219.5	4,701.6	16.4	10,366.8	661.3	15,914.0	6,279.7	10,319.3
G2		6,865.2	186.9				16,199.3						12.6	
G3	11,701.8	9,278.7	2,732.0	898.4	3,639.3	47.9	15,232.9	224.0	36.5	7,297.6	111.7	11,576.4	1,288.9	440.4
G4	3,150.4	4,049.2	1,882.8	1,018.0	1,263.3	62.4	5,625.4	147.2	25.1	5,545.1	186.0	7,704.6	810.0	427.5
G5	2,775.8	5,972.5	2,469.1	2,031.0	1,208.3	279.6	3,896.3	498.6	0.3	947.1	2.6	2,646.5	1,273.0	2,472.9
H2	241.4	150.3	5.5	2.5	50.4	3,092.4	451.8	3.2	0.2	7.9		1.8	10.8	5.1
H3	430.5	892.4	219.4	0.1	259.3	23,760.3	4,548.3	14.9	0.9				241.1	19.2
H4						10,591.9	388.5							
H5	893.1	1,411.3	422.0	12.9	414.7	1,974.3	855.8	107.6	0.0	8.0		24.2	359.7	78.0
I1	59,572.5	29,879.5	10,421.0	46,388.3	5,523.8	203.9	90,970.3	2,171.0	14.8	22,845.2	651.7	11,356.7	847.5	4,112.3
I2	4,006.4	192.0	104.5	377.1	344.2	121.7	844.0	1.4	0.4	158.3	21.5	168.5	10.0	8.9
J1	8,932.5	2,072.1	1,165.6	3,789.0	882.3	40.8	10,448.3	163.6	12.7	1,150.1	143.4	488.3	110.7	283.1
J2	8,311.1	1,816.2	1,019.7	2,004.7	1,188.7	206.2	8,252.5	236.0	6.9	1,263.8	70.9	764.9	114.4	215.0
J3	709.8	357.9	62.8	119.4	111.8	17.2	604.0	19.8	0.3	40.5	6.1	47.4	18.8	37.3
J4	1,448.3	487.6	235.8	307.0	202.8	45.4	1,720.5	18.3	0.1	136.9	30.0	69.3	7.8	42.7
J5	26.9	93.7	45.3	91.4	0.6		209.5	0.6		22.6	0.0	19.0	13.0	0.9
J6	25.4	3.7	0.6	18.9	2.4	0.2	6.6	4.1		7.0	0.7	2.6	3.9	9.3
Total	249,200.3	132,088.3	56,454.6	93,012.5	70,675.1	103,492.2	301,369.0	10,907.1	160.0	65,289.0	2,595.4	64,590.2	13,881.6	25,435.3

EU-NIS L2	MT	NL	NO	PL	PT	RO	RS	SE	SI	SK	TR	ZZ/ disputed	Total area [km ²]
A1		2,379.2	447.3		211.7	67.2		17.8	2.2		293.6	0.4	16,269.5
X1		300.2	0.1	0.2	424.8			317.6			0.9		3,403.9
X2_3				899.6	76.0	680.5		55.0			157.0	53.2	6,210.1
B1	8.4	81.6	0.1	24.3	95.5	5.1		60.4			264.7	0.9	2,910.7
B2				0.3	0.5	13.7		13.7			0.5		57.3
B3			230.8		18.8			69.6			2.1		638.7
C1	0.1	2,476.8	15,532.2	3,773.1	675.5	1,530.8	233.5	36,845.2	30.3	185.0	11,711.5	275.4	132,991.2
C2		547.7	955.3	762.4	198.3	1,230.0	562.0	1,755.1	48.5	159.9	444.6	187.7	14,163.3
C3		45.9	1.8	75.5	1.2	1,610.6	26.2	5.2	0.4	0.6	375.4	14.0	2,590.5
D1		62.1	2,762.6	68.7	49.7	0.0		1,471.1		1.8	0.0	16.8	46,168.5
D2		27.7	2.1	141.6	0.5			570.7	0.0	1.1		9.0	2,154.8
D3			13,507.3					22,000.0				37.0	51,310.4
D4		0.8	0.1	96.5		1.4	0.0	0.5	0.1	2.1		0.7	488.1
D5		157.9	55.8	869.3	11.8	1,222.6	188.9	13.5	8.1	31.3	2,250.4	70.0	7,814.4
D6		0.4	0.1	15.4	14.1	0.7		0.5			1,332.2		2,074.2
E1	0.1	446.3	7,785.7	2,111.8	3,343.9	6,350.1	2,665.8	2,126.6	174.0	336.5	72,432.0	89.0	192,349.7
E2	27.5	9,265.9	3,215.3	34,995.7	7,807.2	29,547.4	9,591.3	6,924.3	2,832.8	4,415.3	62,411.6	483.5	600,015.4
E3		3,960.8	270.4	7,839.0	674.0	3,109.1	170.9	523.8	57.1	0.5	10,456.3	36.1	78,656.2
E4			7,874.4	30.3	2.9	1,572.9	4.1	2,247.1	45.7	100.1	46,932.3	129.4	86,923.6
E6	6.0				92.5	110.7	6.4			16.3	2.6		4,901.6
E7	2.3			0.1	4,137.3	25.2	1.0	8.5			42.8		15,143.6
F1			25,903.7	0.3				17,183.3		8.5		0.5	78,106.1
F2			29,854.6	10.7	17.9	447.4		8,015.2	109.2	28.1	25,504.1	98.6	85,508.8
F3		239.7	8,568.7	6.7	2,774.0	97.4	13.7	2,046.0	35.8	7.9	494.1	15.8	54,486.2
F4		2.4	172.2	4.5	12.4	68.8	2.5	4.0	0.0		1.1	0.1	4,117.7
F5	3.8				1,758.2	0.1	1.0		1.2		6,159.8	1.1	49,964.7
F6					293.1								10,700.6
F7	19.0				119.1								17,910.8
F8													954.0
F9		0.8	0.2		1.6			46.9			0.0		106.9
FB	0.1	164.1	0.1	1,461.7	2,705.0	6,051.8	324.6	18.2	125.6	275.8	8,684.8	39.6	63,710.0
G1	2.7	1,644.6	42,433.3	34,003.1	16,553.1	57,893.8	27,517.7	31,809.7	7,419.9	15,225.4	73,889.0	664.4	899,050.8
G2					3,686.5		0.1				3,976.4	3.1	56,626.4
G3	4.2	1,099.9	61,569.6	47,955.2	6,590.2	13,024.1	1,038.9	210,203.7	2,755.2	4,687.3	73,861.5	1,007.8	869,819.8
G4	0.9	929.5	22,070.9	23,319.9	4,053.0	7,539.1	1,063.4	41,573.1	2,897.6	3,381.9	23,959.4	568.7	296,254.8
G5		49.0	2,460.6	2,428.1	11,191.2	2,721.9	2,319.9	20,698.1	134.5	766.6	51,264.2	422.0	160,479.6
H2		60.3	59.9	44.0	19.9	341.5	11.0	27.9	4.2	1.9	898.0	16.5	6,332.4
H3		0.0	26,542.7	21.2	151.4	87.4	21.8	4,107.2	173.8	68.6	25,199.2	68.4	103,173.8
H4			2,905.2					267.6	0.3		5.9	0.8	15,950.0
H5	6.1	1.9	35,074.1	61.7	869.2	110.7	121.2	2,773.4	1.8	8.0	38,662.8	43.3	92,862.5
I1	136.8	8,850.3	10,292.0	131,690.8	18,264.8	90,250.7	28,244.3	28,461.6	2,438.3	16,218.7	221,178.0	770.5	1,440,220.0
I2	4.2	869.5	471.0	1,035.0	203.5	128.6	94.0	924.0	31.5	143.7	464.4	1.8	19,996.1
J1	54.5	3,428.2	610.8	9,466.3	2,300.6	4,910.2	1,673.9	1,267.3	372.6	1,726.8	7,064.4	115.3	122,463.9
J2	27.4	1,827.2	1,857.0	8,029.3	2,139.0	6,945.8	1,321.1	4,725.1	408.6	1,033.2	6,797.4	10.6	112,233.3
J3	4.3	77.9	113.6	589.1	172.3	336.3	111.3	221.6	18.3	46.3	1,230.7	2.4	9,409.6
J4	7.4	754.9	165.4	707.8	602.8	256.9	133.7	577.5	131.4	129.5	874.6	3.3	20,370.0
J5	0.1	153.8	0.8	117.9	52.8	108.2	13.2	3.7	7.2	11.8	178.5	0.8	2,297.6
J6	0.0	5.6	2.1	25.7	8.8	7.7	7.6	66.0	1.1	5.7	32.4		481.2
Total	315.6	39,912.8	323,769.8	312,682.9	92,376.4	238,406.3	77,484.4	450,047.0	20,267.2	49,025.8	779,491.0	5,258.4	5,860,823.3

8.5 Distribution of substrate per sea region

Arctic		Substrate [km ²]						Total
MAES	EUNIS	rock and biogenic	coarse sediment	mixed sediment	sand	mud	undetermined substrate	
Coastal	Littoral	238.2	197.7	1.4	1,542.7	370.9	13,090.4	15,441.2
	Infralittoral	4,270.2	2,925.3	272.5	28,175.4	10,461.9	62,849.8	108,955.2
	Circalittoral	5,527.3	27,895.7	1,842.9	50,693.4	20,588.7	65,433.6	171,981.6
Shelf	Offshore circalittoral	17,584.6	50,766.8	21,292.6	90,536.6	194,125.4	193,086.6	567,392.6
Open Ocean	Upper bathyal	10,262.4	93,006.9	37,478.4	33,164.5	802,190.7	695,591.3	1,671,694.2
	Lower bathyal	1,215.5	8,230.5	4,364.6	961.6	313,787.8	628,536.2	957,096.2
	Abyssal	48.5		128.8	216.8	56,458.2	1,235,050.6	1,291,903.0
Total		39,146.8	183,022.8	65,381.2	205,291.0	1,397,983.7	2,893,638.4	4,784,463.9

Atlantic		Substrate [km ²]						Total
MAES	EUNIS	rock and biogenic	coarse sediment	mixed sediment	sand	mud	undetermined substrate	
Coastal	Littoral	484.5	119.1	215.7	4,075.7	1,250.9	7,302.3	13,448.2
	Infralittoral	8,838.8	5,997.1	2,682.0	20,076.7	4,402.0	10,932.1	52,928.7
	Circalittoral	24,395.3	56,177.8	12,132.1	98,849.8	16,424.6	8,435.6	216,415.2
Shelf	Offshore circalittoral	29,505.9	219,957.8	24,246.5	442,351.3	187,563.5	29,340.7	932,965.7
Open Ocean	Upper bathyal	6,988.8	27,866.4	58,236.4	38,364.8	310,491.9	201,533.1	643,481.3
	Lower bathyal	4,230.4	3,145.3	15,202.3	14,775.3	178,505.9	602,177.3	818,036.5
	Abyssal	4,634.7		7,836.3	23,694.7	252,727.6	6,994,442.3	7,283,335.5
Total		79,078.2	313,263.4	120,551.3	642,188.3	951,366.4	7,854,163.3	9,960,610.9

Baltic		Substrate [km ²]						Total
MAES	EUNIS	rock and biogenic	coarse sediment	mixed sediment	sand	mud	undetermined substrate	
Coastal	Littoral	15.7	1.2	36.0	94.6	27.1	527.8	702.4
	Infralittoral	4,865.1	5,228.5	24,515.6	14,370.9	12,248.4	225.7	61,454.1
	Circalittoral	8,607.6	14,859.0	109,695.5	36,885.6	79,703.7	11.7	249,763.0
Shelf	Offshore circalittoral	0.2	362.1	20,650.4	1,243.7	55,842.1	0.3	78,098.7
Open Ocean	Upper bathyal							
	Lower bathyal							
	Abyssal							
Total		13,488.5	20,450.8	154,897.5	52,594.7	147,821.2	765.5	390,018.2

Black Sea		Substrate [km ²]						Total
MAES	EUNIS	rock and biogenic	coarse sediment	mixed sediment	sand	mud	undetermined substrate	
Coastal	Littoral	14.3	340.7	1,016.0	341.4	527.4	562.0	2,801.7
	Infralittoral	183.1	9,446.0	20,452.6	5,223.5	3,035.2	17,045.0	55,385.3
	Circalittoral	9,003.5	654.9	1,115.3	1,274.7	42,964.2	104.8	55,117.4
Shelf	Offshore circalittoral		17.1	30,209.3	1,015.0	13,645.4	49.1	44,935.9
Open Ocean	Upper bathyal		9.9	1,667.8	1,621.4	213,376.5	1.0	216,676.7
	Lower bathyal							
	Abyssal			53.8	90.7	98,681.7		98,826.2
Total		9,200.9	10,468.5	54,514.8	9,566.7	372,230.4	17,761.9	473,743.2

Mediterranean		Substrate [km ²]						Total
MAES	EUNIS	rock and biogenic	coarse sediment	mixed sediment	sand	mud	undetermined substrate	
Coastal	Littoral	0.6	2.2	21.1	427.9	441.4	1,757.8	2,650.8
	Infralittoral	1,327.0	3,449.5	56.2	56,681.5	15,541.5	6,255.2	83,311.0
	Circalittoral	2,230.8	7,195.1	8,529.4	71,261.7	317,169.2	12,333.9	418,720.1
Shelf	Offshore circalittoral							
Open Ocean	Upper bathyal	5,387.6	3,306.2	9,497.0	44,032.3	1,625,046.5	5,563.1	1,692,832.7
	Lower bathyal							
	Abyssal	97.4				317,987.6	0.1	318,085.0
Total		9,043.4	13,952.9	18,103.7	172,403.4	2,276,186.1	25,910.1	2,515,599.5

8.6 Workflow chart

