

# Calculating the Natura 2000 network area in Europe:

## The GIS approach



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# 1. INTRODUCTION

A precise area calculation is needed to check verify to what extent Member States have designated Natura 2000 sites across the territories. To check the ‘netto’ coverage of the Natura 2000 network by Member State, one can only apply geographic information to properly delimit and calculate the Natura 2000 surface. The following paragraphs will explain how this surface area is calculated and which shortcomings should be taken into account when interpreting these results.

The Natura 2000 data is delivered by the Member States (MS) through Reportnet (<http://www.eionet.europa.eu/reportnet>). The MS deliveries are aggregated into one single European dataset, consisting of a spatial part (in ESRI Shape format) and a tabular part (the ‘descriptive’ part – in MS Access format or XML format).

# 2. SURFACE AREA CALCULATION

The general methodology consists of five GIS processing steps and a final sixth step for the creation of the final Barometer table.

- Step1: Filtering the spatial data base on site type categories
- Step 2: Making a distinction between terrestrial and marine Natura 2000 area
- Step 3: Filter out sites with less than 5 % terrestrial or marine area
- Step 4: Dissolve marine and terrestrial geometrical features by field “MS” for the terrestrial and marine area calculations at country level
- Step 5: Creating an overview table with the area (km2) and number of sites.

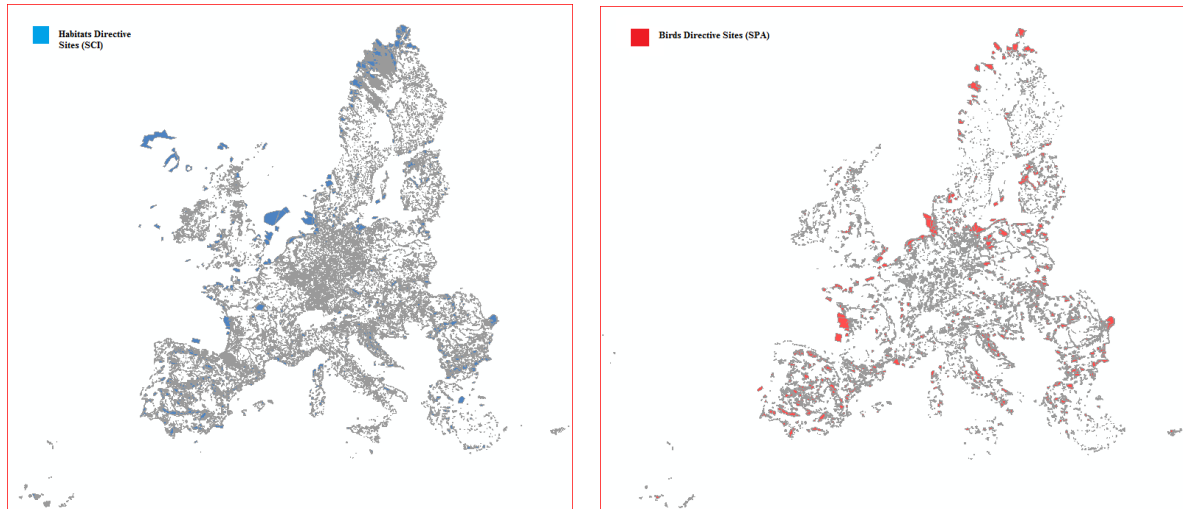
## Step1: Filtering spatial data base on site type categories

The extraction of the spatial data is done through selection criteria based on querying the descriptive data at the site type level. In the descriptive data, Member States deliver the site type category for each unique Natura 2000 site code.

First, the spatial data are filtered out from the European database using two main Natura 2000 categories: the A-types, SPAs (Special Protection Areas - Birds Directive) and the B-types, SCIs (Sites of Community Importance – Habitats Directive). The third category, the C-types, are Natura 2000 sites that are designated both as SCI and SPA.

The categorisation of the Natura 2000 sites stands as follows:

- Site type SPA: Site type A + C
- Site type SCI: Site type B + C



**Figure 1: Extracting the two main Natura 2000 site type categories, SPAs and SCIs**

	FID	Shape	SITECODE	MS	SITENAME	SITETYPE	RELEASE_DA	Shape_Leng	Shape_Area
▶	0	Polygon	AT1101112	AT	Nickelsdorfer Haidel	B	04/11/2013	2152.026245	120985.280884
	1	Polygon	AT1102112	AT	Zurndorfer Eichenwald und Hutweide	B	04/11/2013	7962.660562	1534213.34815
	2	Polygon	AT1103112	AT	Parndorfer Heide	B	04/11/2013	1679.184347	73776.756631
	3	Polygon	AT1104212	AT	Frauenwiesen und Johannesbach	B	04/11/2013	20552.434086	478840.035687
	4	Polygon	AT1106218	AT	Siegender Pußta und Heide	B	04/11/2013	5258.036098	278644.446206
	5	Polygon	AT1108813	AT	Landschaftsschutzgebiet Bernstein - Lockenhaus - Rechnitz	B	04/11/2013	224391.983258	246231963.882
	6	Polygon	AT1110137	AT	Neusiedler See - Nordöstliches Leithagebirge	C	04/11/2013	152897.879049	571225142.866
	7	Polygon	AT1114813	AT	Südburgenländisches Hügel- und Terrassenland	B	04/11/2013	166519.055785	139983481.409
	8	Polygon	AT1115415	AT	Naturwaldreservat Lange Leith, Neckenmarkt	B	04/11/2013	2429.896377	289451.670463
	10	Polygon	AT1122916	AT	Lafnitztal	B	04/11/2013	274626.702376	5905550.46166
	11	Polygon	AT1123323	AT	Mattersburger Hügelland	C	04/11/2013	129977.301451	30611774.5496
	15	Polygon	AT1201A00	AT	Waldviertler Teich-, Heide- und Moorlandschaft	B	04/11/2013	1099381.68212	137191391.348
	16	Polygon	AT1202000	AT	March-Thaya-Auen	B	04/11/2013	205786.12023	88794728.0442
	19	Polygon	AT1203A00	AT	Ötscher - Dürrenstein	B	04/11/2013	126482.101949	425874303.308
	20	Polygon	AT1204000	AT	Donau-Auen östlich von Wien	B	04/11/2013	148286.443004	95159143.5195
	23	Polygon	AT1205A00	AT	Wachau	B	04/11/2013	471218.625589	180612456.63
	24	Polygon	AT1206A00	AT	Weinviertel Klippenzone	B	04/11/2013	124063.722168	31449266.845
	26	Polygon	AT1207A00	AT	Kamp- und Kremstal	B	04/11/2013	510174.147829	144939333.919
	27	Polygon	AT1208A00	AT	Thayatal bei Hardegg	B	04/11/2013	67889.528936	44284330.7436
	29	Polygon	AT1209A00	AT	Westliches Weinviertel	B	04/11/2013	165909.835442	29822213.1488
	31	Polygon	AT1210A00	AT	Steinfeld	B	04/11/2013	65628.305145	30183010.8323
	33	Polygon	AT1211A00	AT	Wienerwald - Thermenregion	B	04/11/2013	282372.621036	521678247.411
	35	Polygon	AT1212A00	AT	Nordöstliche Randalpen: Hohe Wand - Schneeberg - Rax	B	04/11/2013	656752.071516	640824382.047
	36	Polygon	AT1213000	AT	Pannonische Sanddünen	B	04/11/2013	46716.335961	25235376.3709
	38	Polygon	AT1214000	AT	Hundsheimer Berge	B	04/11/2013	49517.226073	21349553.8624

**Figure 2: Table extraction with a filter on site type for the SCI sites**

After the finalisation of step 1, three datasets are available for the further calculations: the complete Natura 2000 sites data set (“total Natura 2000 sites”), the Birds Directive Natura 2000 sites data set (“SPA sites”), and the Habitats Directive Natura 2000 sites data set (“SCI sites”).

### *Data used for the process:*

The input dataset used for the filtering is the Natura 2000 data set; it can be downloaded from EEA Data and maps: <http://www.eea.europa.eu/data-and-maps/data/natura-5> (this url points to the 2013 version).

## Step 2: Making a distinction between terrestrial and marine Natura 2000 area

This step creates terrestrial and marine Natura 2000 data sets.

### *Step 2.1: Extraction of terrestrial areas for the total Natura 2000 sites, for SPA sites and for SCI sites: Intersection of geometric features*

For the extraction of terrestrial sites, **intersection** is the GIS process used. The intersection computes the geometric area intersected between Natura 2000 dataset and the EEA coastline polygon. The areas which overlap/intersect from the input spatial data will be written to an output dataset.

### *Step 2.2: Extraction of marine areas for the total Natura 2000 sites, for SPA sites and for SCI sites: Erase of geometric features*

For the extraction of marine sites, **disjoint/erase** is the GIS process used. The erase computes the geometric area that is falling outside EEA coastline polygon. The areas will be written to an output dataset.

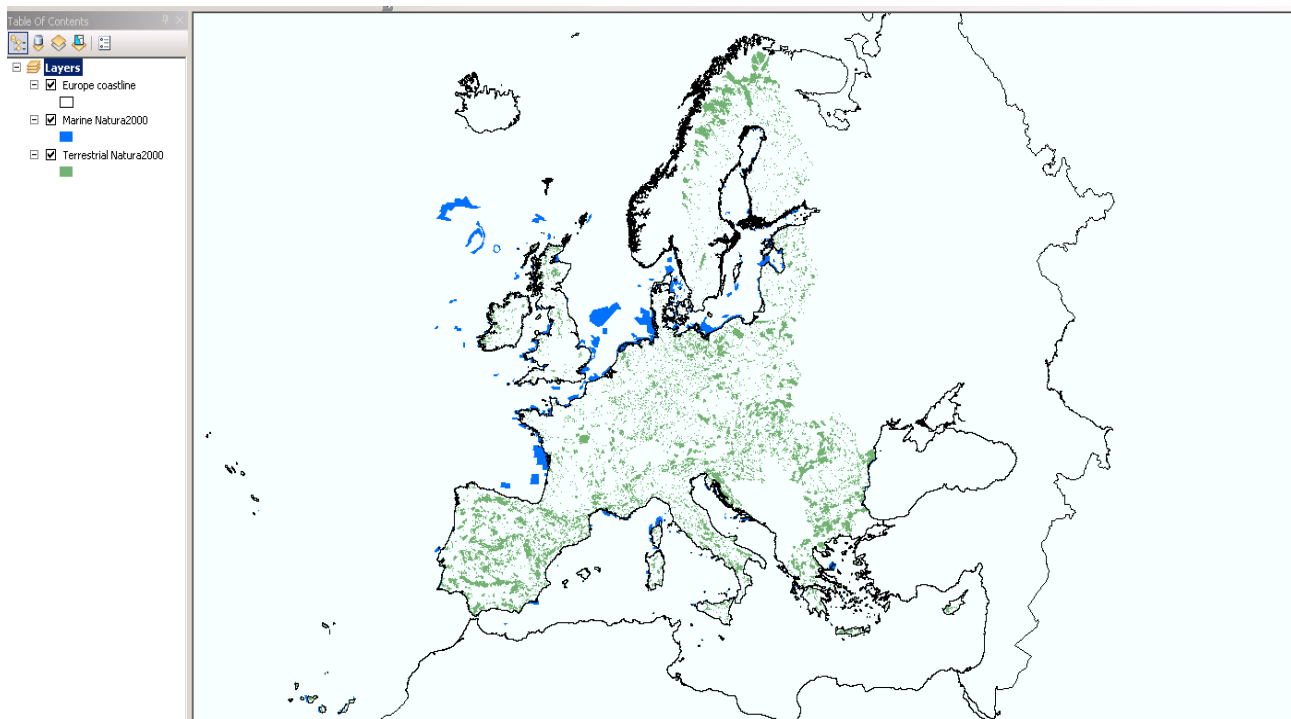


Figure 3: View of the coastline polygon data with the Natura 2000 sites dataset. The terrestrial sites

are shown in green and the marine sites in blue.

***Data used for these GIS calculations (get terrestrial and marine area):***

The input datasets are:

- Total Natura 2000, SCI and SPA spatial data as output from step 1.
- EEA Coastline for analysis (2012), polygon layer. The EEA coastline for analysis is created for highly detailed analysis, e.g. 1:100,000, for geographical Europe. The criteria for defining the coastline are the line separating water from land. The EEA coastline is a product derived from two sources: EU-Hydro and GSHHG. The dataset is available at <http://www.eea.europa.eu/data-and-maps/data/eea-coastline-for-analysis>

Both datasets use the ETRS89 LAEA as the spatial reference system that guarantees that area calculations will be consistent for all European latitudes.

**Step 3: Filter out sites with less than 5 % terrestrial or marine area**

This step provides an estimate of the number of marine and terrestrial sites for the total Natura 2000, the number of marine and terrestrial SPA sites and the number of marine and terrestrial SCI sites.

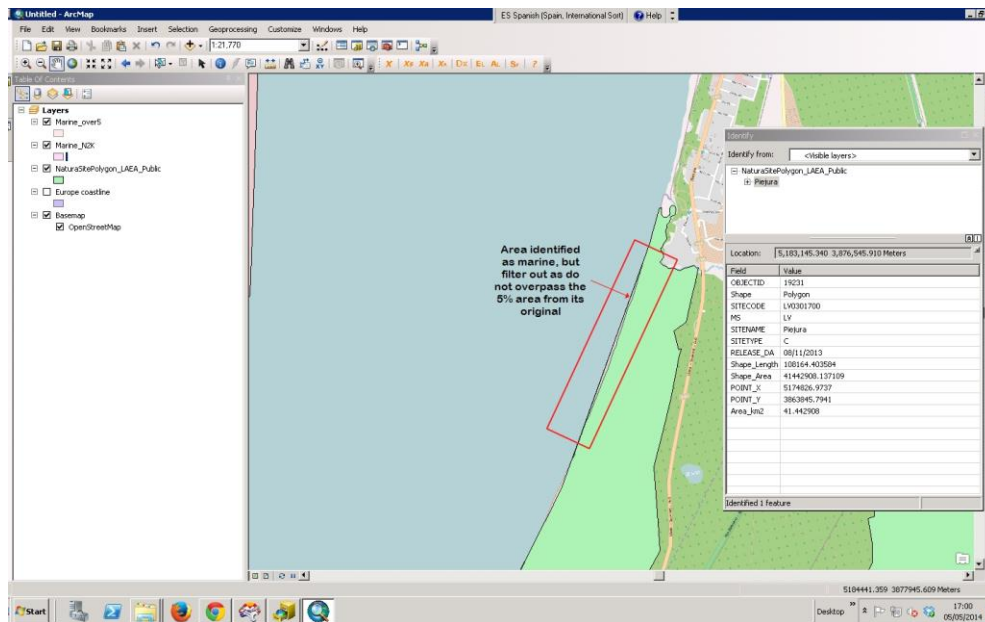
The spatial features extracted into a terrestrial and marine data set in step 2 are joined against the original Natura 2000 sites by the unique sitecode field. A percentage calculation takes place between the terrestrial and marine area and their respective original site area. The calculation is:

$$\text{Area percentage} = (\text{terrestrial or marine area/original site area}) \times 100$$

The 5 % rule is then applied as follows:

- Sites having a terrestrial component covering more than 5% of their total area are counted as terrestrial sites.
- Sites having a marine component covering more than 5% of their total area are counted as marine sites.

In practise, there is double counting of sites attributed to both terrestrial and marine categories, e.g. when a site is 50 % terrestrial and 50 % marine area (or 6 % terrestrial and 94 % marine area).



**Figure 4: Illustration of a Natura 2000 site (light green) having a minor marine extent (inside the red box). The site is not taken into account as a marine site as its marine area is less than or equal to 5% of the total area of the site.**

#### ***Data used for these calculations:***

The input datasets are:

- Terrestrial and marine data sets for total Natura 2000 sites, SCI sites and SPA sites from step 2.

#### **Step 4: Dissolve marine and terrestrial geometrical features by field “MS” for the terrestrial and marine area calculations at country level**

Once the intersection in steps 2.1 and 2.2 has taken place a **dissolve** operation is used to summarise features based on a specified attribute. In this calculation, the terrestrial and marine data sets for total Natura 2000 and SCI and SPA sites are dissolved by country. Polygons with the same country code are aggregated (dissolved) into a single, either terrestrial or marine, feature. The dissolved features summarise the shape area and the number of site records. After applying this operation we know for each type of category (total terrestrial and marine Natura 2000 sites, terrestrial and marine SCI sites and terrestrial and marine SPA sites) the number of sites and the area by Member State.

#### ***Data used for these GIS calculations:***

The input datasets are:

- Terrestrial and marine for total Natura 2000, SCI and SPA spatial data from the steps 2.1 and 2.2.

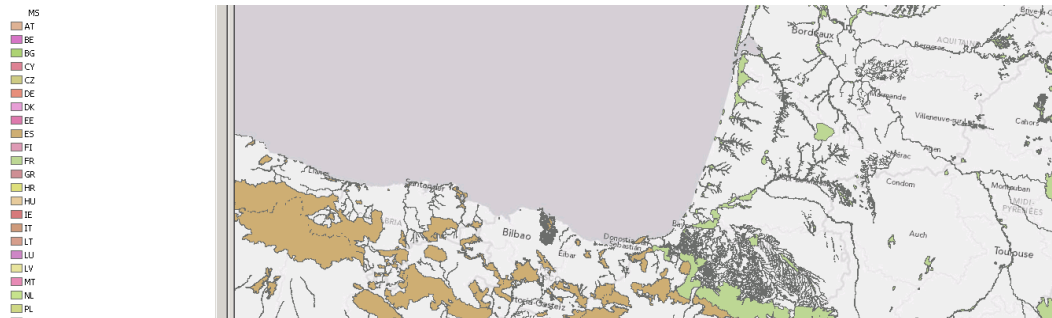


Figure 6: After the dissolve operation, it is obtained 28 multipolygons one per country, see Spain (brown) and France (green).

### Step 5: Creating an overview table with the area (km<sup>2</sup>) and number of sites.

All the output is consolidated in three final summary tables showing the resulting area calculations by country:

- Total Natura 2000 sites including (Table 1):
  - Terrestrial:
    - Natura 2000 terrestrial area (km<sup>2</sup>) – **obtained through step 2 and 4**
    - Natura 2000 / National terrestrial area (%) – **obtained through step 2 and 4**
    - Number of Terrestrial Natura 2000 sites – **obtained through step 3**
  - Marine:
    - Natura 2000 Marine area (km<sup>2</sup>) – **obtained through step 2 and 4**
    - Natura 2000 Marine / Total Natura 2000 area – **obtained through step 2 and 4**
    - Number of Marine Natura 2000 sites – **obtained through step 3**
  - All:
    - Number of sites – **obtained through step 3**
    - Total Natura 2000 area km<sup>2</sup> – **obtained through step 2 and 4**
- Total SCI sites including (Table 2):
  - Terrestrial:
    - Natura 2000 SCI terrestrial area (km<sup>2</sup>) - **obtained through step 2 and 4**
    - Natura 2000 SCI area/ National terrestrial area (%) - **obtained through step 2 and 4**
    - Number of SCI sites – **obtained through step 3**
  - Marine:
    - Natura 2000 SCI Marine area (km<sup>2</sup>) - **obtained through step 2 and 4**
    - Natura 2000 Marine / Total SCI Natura 2000 area - **obtained through step 2 and 4**
    - Number of SCI sites – **obtained through step 3**

- All:
  - Number of SCI sites – **obtained through step 3**
  - Total Natura 2000 SCI area (km<sup>2</sup>) **obtained through step 2 and 4**
- Total SPA sites including (Table 2):
  - Terrestrial:
    - Natura 2000 SPA terrestrial area (km<sup>2</sup>) - **obtained through step 2 and 4**
    - Natura 2000 SPA area/ National terrestrial area (%) - **obtained through step 2 and 4**
    - Number of SPA sites – **obtained through step 3**
  - Marine:
    - Natura 2000 SPA Marine area (km<sup>2</sup>) - **obtained through step 2 and 4**
    - Natura 2000 Marine / Total SPA Natura 2000 area - **obtained through step 2 and 4**
    - Number of SPA sites – **obtained through step 3**
  - All:
    - Number of SPA sites – **obtained through step 3**
    - Total Natura 2000 SPA area (km<sup>2</sup>) - **obtained through step 2 and 4**

All the figures above are given in km<sup>2</sup>. The unit of the spatial datasets is given in m<sup>2</sup> as ETRS 89 LAEA is the spatial reference. A conversion from m<sup>2</sup> to km<sup>2</sup> is required for the final figures provided in the summary table.



### 3. SUMMARY OF SURFACE AREA CALCULATION PROCESS

The graph below summarises the overall process followed for the surface area calculation process for Natura 2000 (presented in three pages).

