

Project Number 282910

ÉCLAIRE

**Effects of Climate Change on Air Pollution Impacts and Response
 Strategies for European Ecosystems**

Seventh Framework Programme

Theme: Environment

D17.1: Database of soil and vegetation data for the regional and landscape domains

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PU	Public	<input type="checkbox"/>
PP	Restricted to other programme participants (including the Commission Services)	<input checked="" type="checkbox"/>
RE	Restricted to a group specified by the consortium (including the Commission Services)	<input type="checkbox"/>
CO	Confidential, only for members of the consortium (including the Commission Services)	<input type="checkbox"/>

1. Executive Summary

- The objective of this deliverable was to compile datasets of soil and vegetation parameters at regional and landscape scales in order to derive input datasets for the model chain VSD+(Inverse)-PROPS.
- The first step to achieve this objective was the definition of the regional and landscape domains in the Netherlands and the United Kingdom, in conjunction with WP8 (Assessing local and regional variation).
- For each domain, the suitability of existing soil and vegetation datasets was assessed. It was concluded that existing soil and vegetation datasets for the regional and landscape domains are suitable, with the exception of habitat data for the Scottish landscape.
- A habitat map for the Scottish landscape was produced using a combination of existing land cover data and site visits to classify each land cover polygon into the most appropriate habitat category.

2. Objectives:

Within WP17, the model chain VSD+(Inverse)-PROPS will be used to calculate critical loads for nitrogen deposition at the regional and landscape scale. At the regional scale this will be done at a spatial resolution of $5 \times 5 \text{ km}^2$ for a domain covering both the United Kingdom and the Netherlands and at a spatial resolution of $1 \times 1 \text{ km}^2$ for Scotland and the Netherlands, separately. At the landscape scale the model chain will be applied to study landscapes in Scotland and the Netherlands at a resolution of $25 \times 25 \text{ m}^2$ and $50 \times 50 \text{ m}^2$, respectively. The objective of this deliverable was to compile datasets of soil and vegetation parameters at regional and landscape scales in order to derive input datasets for the model chain.

3. Activities:

3.1. Specification of modelling domains

The first step to achieve this objective was the definition of the regional and landscape domains, in conjunction with WP8 (Assessing local and regional variation). Domains were chosen to cover two contrasting European case-study areas; Scotland and the Netherlands. A nested domain was designed that consists of one European domain ($50 \times 50 \text{ km}^2$ horizontal resolution, used in WPs 7 and 16) a second domain ($5 \times 5 \text{ km}^2$ horizontal resolution) including both countries and two sub-domains ($1 \times 1 \text{ km}^2$ horizontal resolution) that covered each country separately (Figure 1). Within each sub-domain a study landscape was selected (with a spatial resolution of $50 \times 50 \text{ m}^2$ or $25 \times 25 \text{ m}^2$, depending on data availability). The landscape domains are referred to as the Burnsmuir landscape in Scotland and the Noordelijke Friese Wouden (NFW) in the Netherlands.

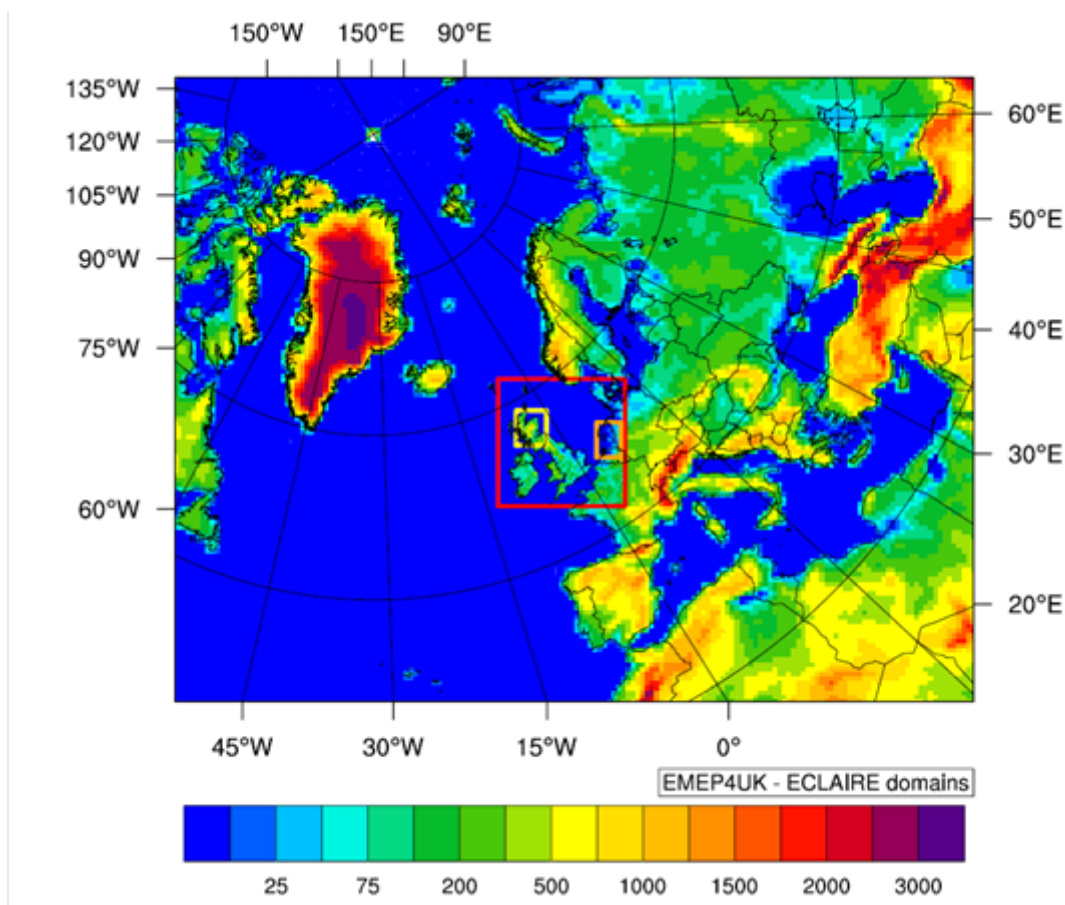


Figure 1: Elevation map showing the $5 \times 5 \text{ km}^2$ domain covering the UK and the Netherlands (red box) and the $1 \times 1 \text{ km}^2$ domains covering the Netherlands (orange box) and Scotland (yellow box) to be used for the critical load simulations.

3.2. Identification of existing soil and vegetation datasets

Regional soil datasets

For the Netherlands, the existing Dutch polygon soil map (scale 1:50 000) and soil database were used to derive VSD+ model input parameters at a spatial resolution of $250 \times 250 \text{ m}^2$. For the UK, input data derived from soil maps for running the VSD model at a national scale (from nationally-funded projects) were used at a spatial resolution of $1 \times 1 \text{ km}^2$. These inputs have been derived for specific soil classes (and in some cases soil \times vegetation classes) on the basis of class-specific surveys and analyses. The key extra input required to run the VSD+ model is the rate of litterfall. This will be estimated as a vegetation-class-specific proportion of net primary productivity (NPP). Values for NPP for use at both regional and landscape scale will be derived from outputs from the JULES model (see Figure 5).

Landscape soil datasets

For the Dutch landscape (NFW), the same soil map and database as used for the regional scale were used to derive VSD+ input parameters but at a higher spatial resolution ($50 \times 50 \text{ m}^2$). For the Scottish landscape, Burnsmuir, a digital soil map was obtained from the James Hutton Institute, which was complemented by existing soil sampling data from the NitroEurope IP. As with the regional analysis, inputs for the VSD+ model will be obtained using soil-class-specific values.

Regional vegetation datasets

For the Netherlands, the existing Dutch nature type map at a resolution of $25 \times 25 \text{ m}^2$ was used to derive model vegetation inputs at a spatial resolution of $50 \times 50 \text{ m}^2$ and for the UK, existing EUNIS habitat mapping data will be used derived from the CEH Land Cover Map 2000 and refined using ancillary datasets on species' distributions, vegetation classification data and 1 km soil maps.

Landscape vegetation datasets

For the Dutch landscape, the existing Dutch nature type map was also used to derive model vegetation inputs. For the Scottish landscape, there are no existing vegetation datasets with sufficiently high spatial resolution and so a new dataset had to be prepared. This was achieved by combining the existing agriculture-focused land cover dataset (high-resolution polygons) from the NitroEurope IP with local knowledge of semi-natural habitats, supplemented with vegetation surveys by CEH Edinburgh staff in some areas (summer 2013). A new EUNIS (Level 3) map of the landscape has been completed.

4. Results:

The result of this work has been the compilation of soil and vegetation datasets (existing and new) that have been used to derive input parameters for the model chain VSD+(Inverse)-PROPS for regional and landscape domains. These datasets include Dutch soil (Figure 2) and habitat (Figure 3) data, UK habitat maps (Figure 4) and estimates of net primary productivity (Figure 5) and soil and habitat data for the Dutch (Figures 6 and 7) and Scottish (Figure 8) landscapes.

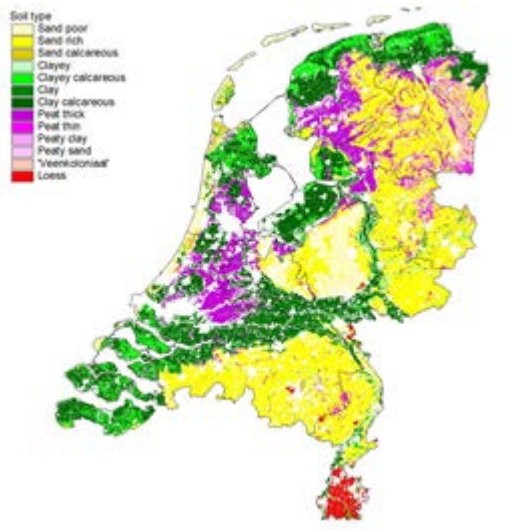


Figure 2: Example of Dutch soil data. Map is derived from the 1: 50 000 soil map of the Netherlands, where the original mapping units were aggregated to the soil categories that are used in VSD+ model.

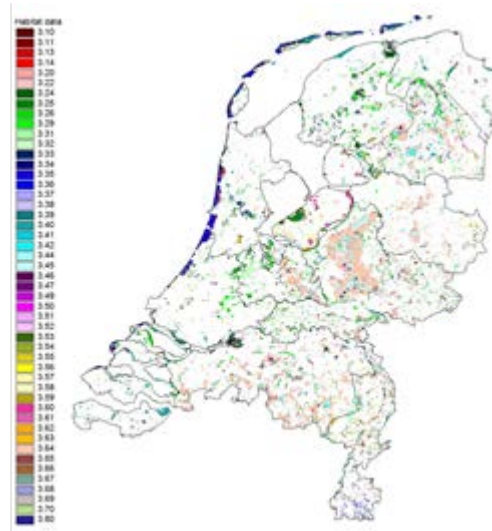


Figure 3: Example of Dutch habitat data. Categories shown are the so-called Nature type (a category used for national policy), which consists of one or more habitat types (Bal *et al.*, 2001). There are 92 types divided into three categories according to the scale of human interference. Shown are the categories for group 3, i.e. semi-natural ecosystems. E.g. 3.33 refers to dry nutrient poor grassland on well drained sandy soils.

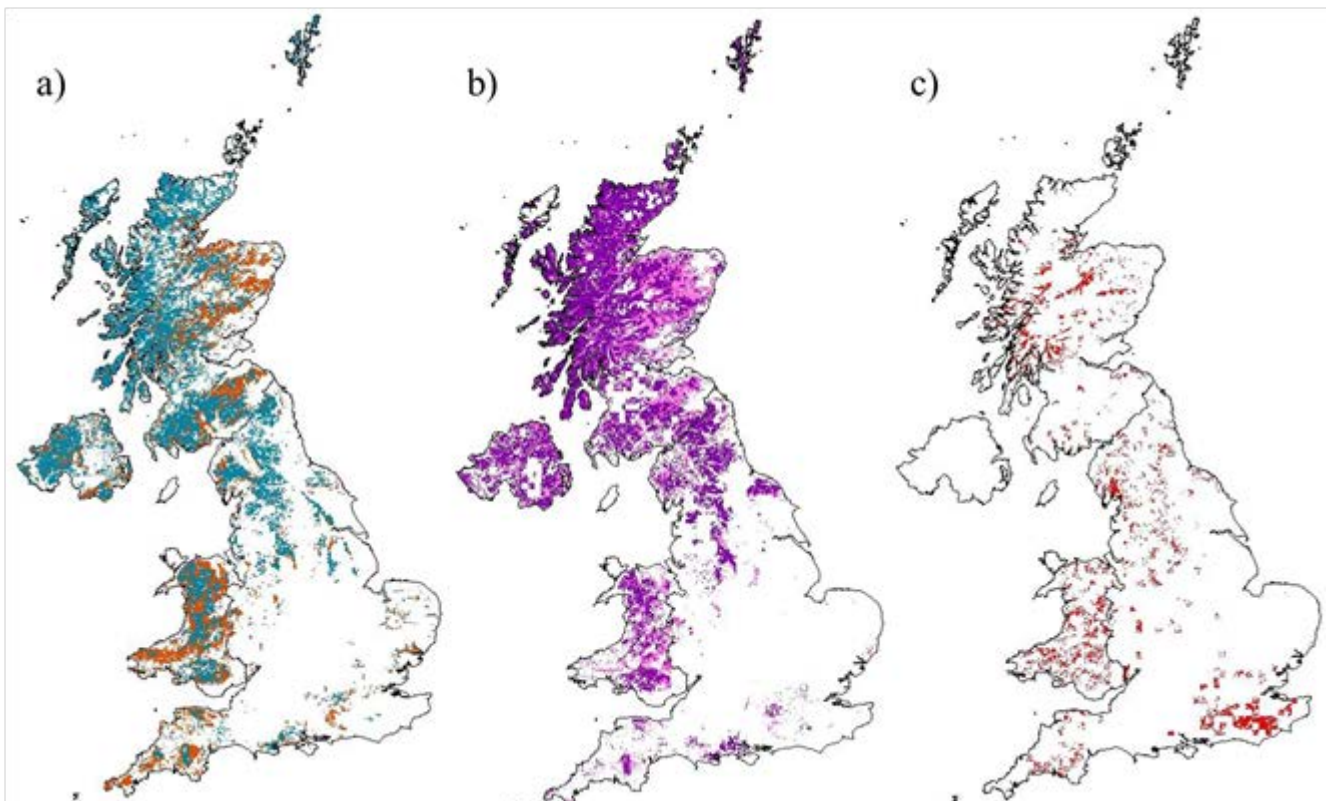


Figure 4: Examples of UK habitat data for a) EUNIS classes: E1.7 dry acid grassland (orange) and E3.52 wet acid grassland (blue), b) F4.11 wet dwarf shrub heath (purple) and F4.2 dry dwarf shrub heath (pink) and c) G1.8 Acidophilous oak (*Quercus*) dominated woodland. Maps taken from Hall *et al.* (2011).

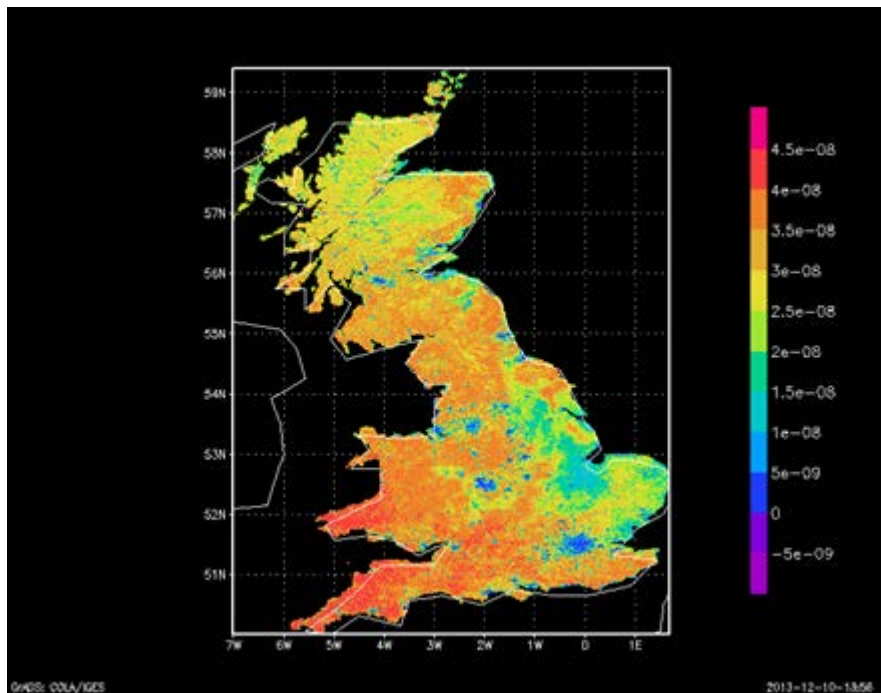


Figure 5: Net Primary Productivity ($\text{kg C m}^{-2} \text{s}^{-1}$) as predicted by the JULES model, from which litterfall inputs to soil organic matter will be derived as inputs for the VSD+ model.

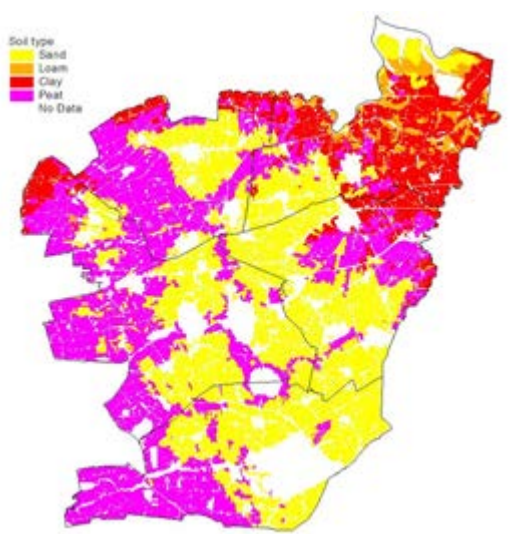


Figure 6: Example of soil data for the Dutch landscape. Map is derived from the 1: 50 000 soil map of the Netherlands, where the original mapping units were aggregated to the soil categories that are used in the Integrator model.

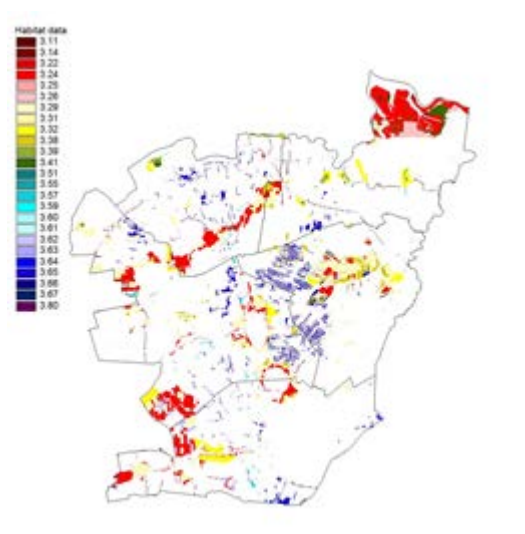


Figure 7: Example of habitat data for the Dutch landscape. Categories shown are the so-called Nature type (a category used for national policy), which consists of one or more habitat types (Bal *et al.*, 2001).

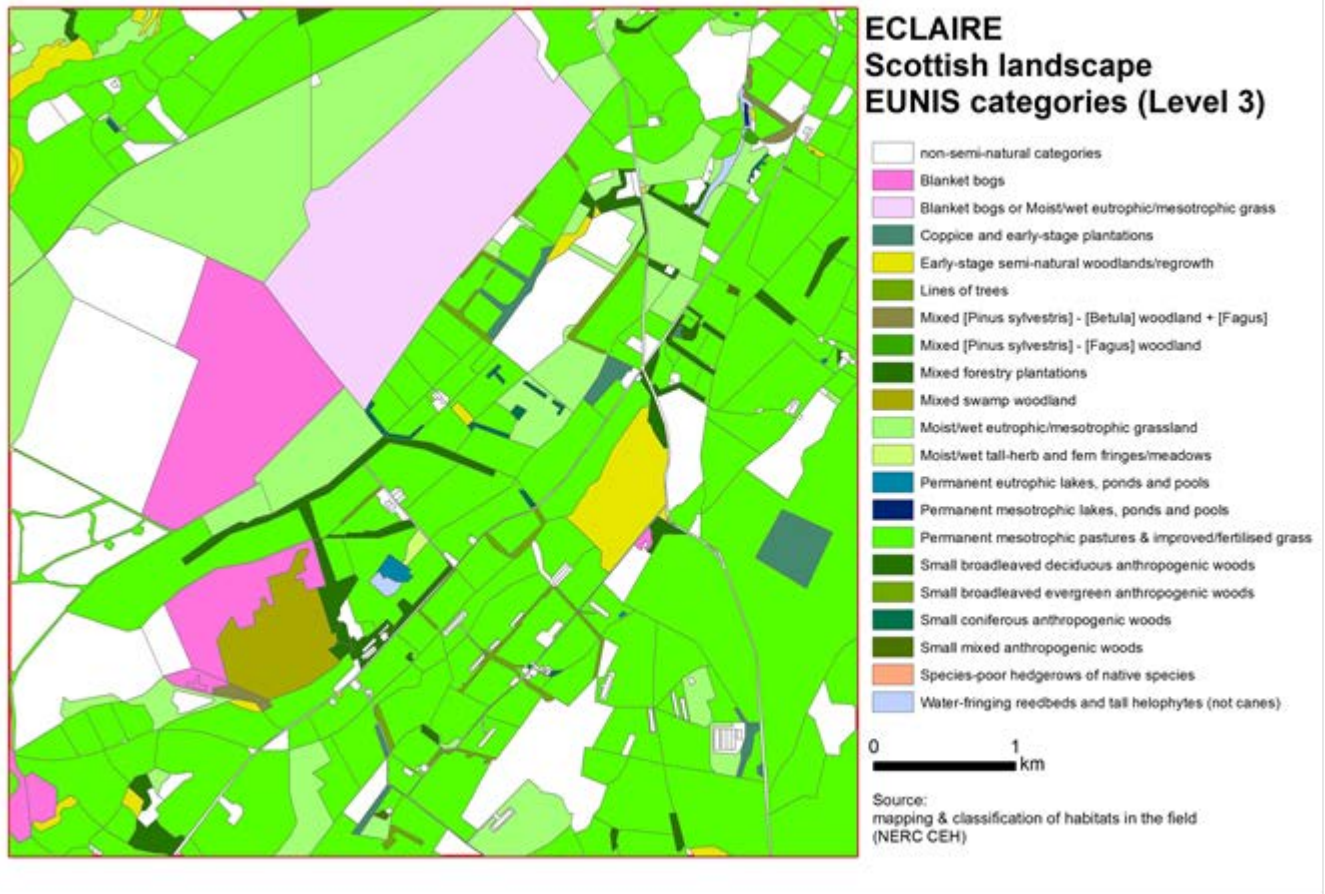


Figure 8: Map showing EUNIS categories (Level 3) for the Scottish landscape.

5. Milestones achieved:

- MS71 Assessment of existing soil and vegetation data resources and their availability
- MS72 All requests for external soil and vegetation data submitted (if necessary)
- MS73 Regional and landscape scale soil and vegetation databases complete

6. Deviations and reasons:

The completion of this deliverable has been delayed by more than a year as a result of ongoing discussions to decide on the best sources of data to use for this work package. These discussions also resulted in the delay to the acquisition of habitat data for the Scottish landscape, since it was necessary to wait until after the start of the vegetation period (summer 2013), to allow the identification of key species necessary for ascertaining the habitats present. However, these delays should not adversely affect the progress within WP17 since the modelling using these data is not planned to start until month 28.

7. Publications:

None

8. Meetings:

The work plan for completing this deliverable has been developed through teleconferences involving participants of WP8 and WP17 in June 2012 and July 2013 and during relevant sessions held at the annual project meetings.

9. List of Documents/Annexes:

None

10. References

- Bal, D., H.M. Beije, M. Fellingier, R. Haveman, A.J.F.M. van Opstal en F.J. van Zadelhoff, 2001. Handboek Natuurdoeltypen. Second revised edition. Publisher: Ministerie van Landbouw, Natuurbeheer en Visserij, Wageningen, the Netherlands.
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http://cldm.defra.gov.uk/PDFs/UK_status_report_2011_finalversion_July2011_v2.pdf