Project Number 282910

ÉCLAIRE

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

Seventh Framework Programme

Theme: Environment

D16.3 Map of critical N loads based on a steady-state VSD+PROPS approach at European scale

Due date of deliverable: **01/08/2014** Actual submission date: **03/11/2014**

Start Date of Project: **01/10/2011** Duration: **48 months**

Organisation name of lead contractor for this deliverable : **RIVM**

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Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	☐
RE	Restricted to a group specified by the consortium (including the Commission Services)	☐
CO	Confidential, only for members of the consortium (including the Commission Services)	☐

1. Executive Summary

Methods have been developed to assess critical N and S loads based on an index (the so-called Habitat-Suitability Index, HSI) with which to quantify (changes in) plant diversity. This index has been agreed-upon at the meeting of the ICP M&M Task Force meeting in Rome (April 2014) to be used in future European assessments under the LRTAP Convention and the EU ("no net loss of biodiversity"). The link between the HSI and N- and S-depositions is established by applying the steady-state VSD+ model.

Critical (better: optimal) loads of N- and S-deposition can then be derived, once a threshold value of the HSI is agreed upon. The methodology has been applied on a newly created European data base, obtained from combining the existing 'European background data base' for computing 'classical' critical loads with a 'European Vegetation Map'.

2. Objectives:

To derive critical loads (CLs) of N and S based on criteria derived to safeguard plant species diversity ("no net loss of biodiversity") that can be used for assessments on a European scale.

3. Activities:

In order to assess CLs of N and S, a criterion and a threshold value is needed for a defined plant species diversity index. In this context, the so-called Habitat Suitability Index (HIS) has been introduced and agreed upon in discussions at various meetings. This index summarizes plant occurrence probabilities as one diversity measure. Next, databases have been used to assign plant species probabilities to European vegetation units by overlaying them with soil/climate/etc. maps ('European background database'), using the vegetation model (PROPS), predicting plant occurrence as a function of climate, soil pH and NO_3 concentration (see WP15). Finally, on the basis of this overlay critical loads were computed for (almost) every soil-vegetation unit with the stead-state soil chemistry model (VSD+).

4. Results:

As an example, isolines of the Habitat-Suitability (HS) index for a European vegetation unit ('Frisian-Danish coastal heaths') is shown in Figure 1 as a function of the soil NO_3 concentration and the soil solution pH (left) and as function of N and S deposition (right). From the isolines in Figure 1 (right) one can derive critical loads of N- and S-deposition, once a threshold value of the HSI is agreed upon. This is graphically illustrated in Figure 2 (the methodology is described in Slootweg et al., 2014).

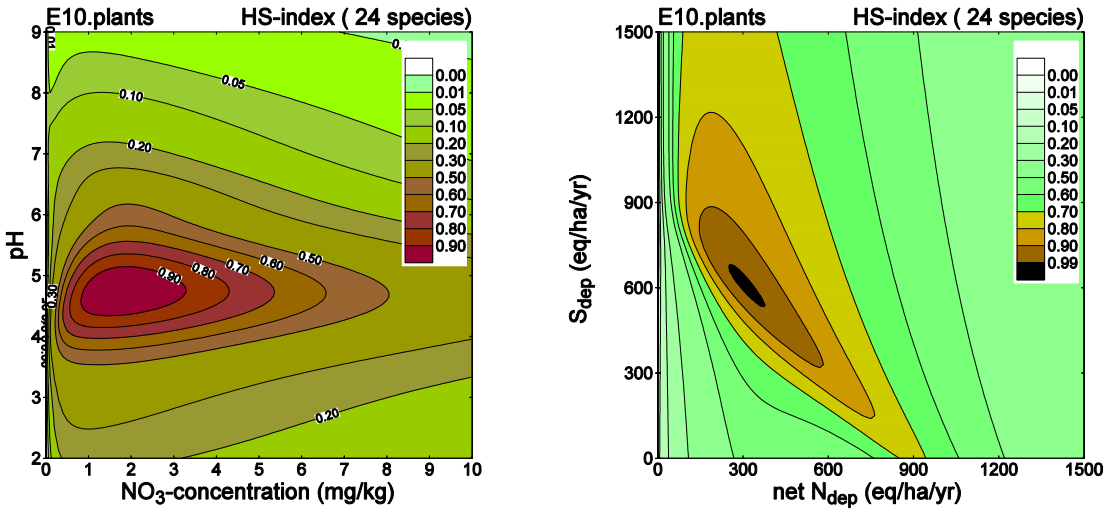

Figure 1: Left: Isolines of the HSI as function of soil NO_3 concentration and soil solution pH for 24 plants in vegetation unit E10 ('Frisian-Danish coastal heaths'). Right: Same isolines in the N_{dep}-S_{dep} plane computed with the steady-state soil model.

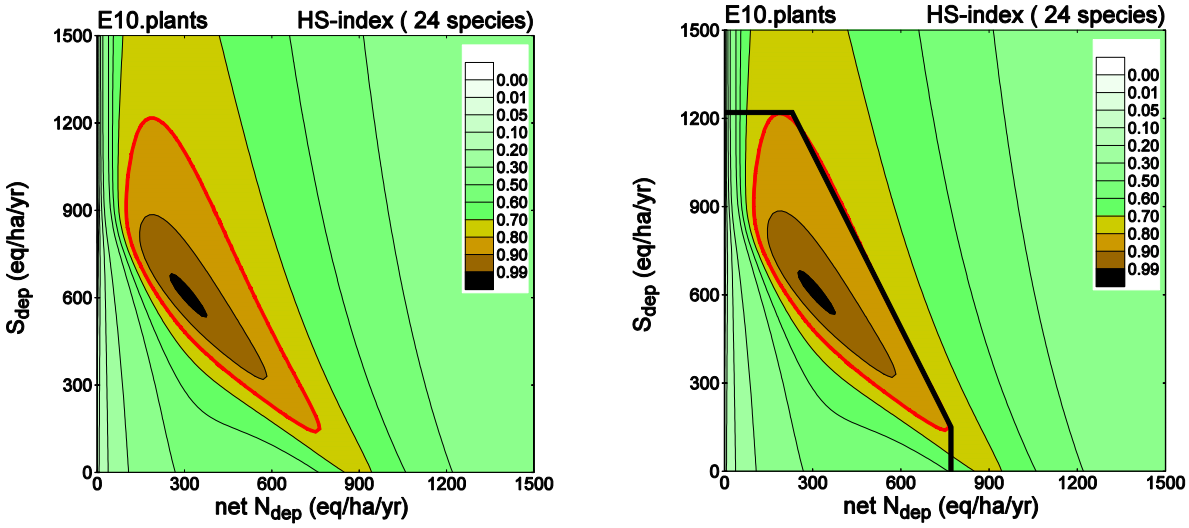

Figure 2: Left: As Figure 1 right, but with an HSI limit value chosen (red line). Right: A N-S critical load function derived from the chosen HS-index limit value (black line).

The methodology has been applied on a newly created European data base, obtained from combining the existing 'European background data base' with a 'European Vegetation Map', and preliminary results are shown in Figure 3.

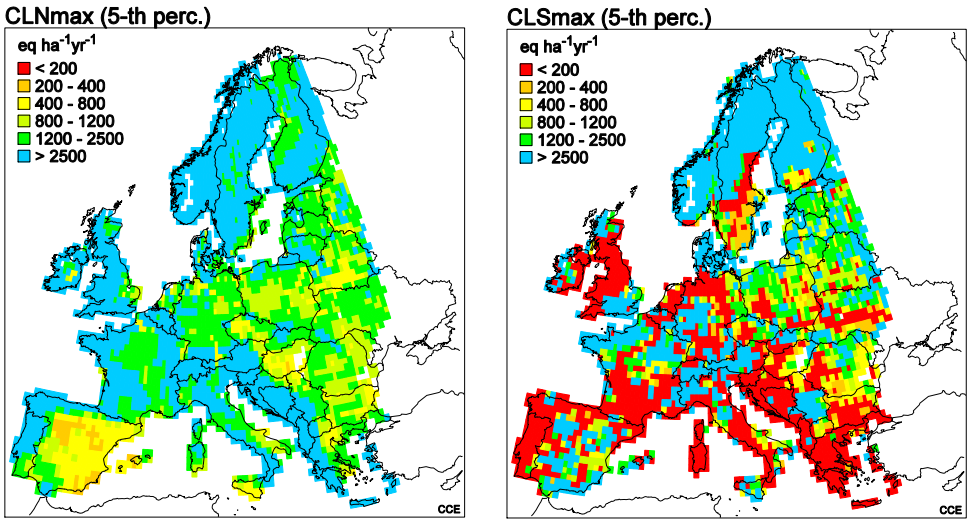

Figure 3: Provisional European maps of the 5-th percentile critical loads of CLN_{max} (left) and CLS_{max} (right), derived from the HS-index computed with the PROPS vegetation model and steady-state soil model.

5. Milestones achieved:

The deliverable is related to milestone MS68 (Inverse updated model approaches available) and MS69 (An updated dataset of European soil and vegetation data).

6. Deviations and reasons:

The deliverable was delayed by 3 months. The main reason for the delay was that the European databases on parameters for the PROPS vegetation model (replacing EUMOVE) were not yet finalised. The advantage of the delay was that the data/approach could also be discussed in more detail at the ECLAIRE General Assembly (Budapest, 29.09-02.10.2014).

7. Publications:

Slootweg J, Posch M, Hettelingh J-P, Mathijssen L (eds), 2014. Modelling and mapping of atmospherically-induced plant diversity impacts in Europe: CCE Status Report 2014. RIVM, Bilthoven, Netherlands (*in prep.)*

8. Meetings:

- Numerous meetings between WP16 and WP15 (at Alterra, Wageningen) to link the PROPS model to the European database.
- CCE Workshop and ICP Modelling & Mapping Task Force (LRTAP Convention) meeting in Rome (7-10 April 2014);
- ECLAIRE General Assembly in Budapest (29.09-02.10.2014);
- Joint Expert Group (JEG) on Dynamic Modelling (LRTAP Convention) in Sitges (Spain, 29-31 Oct 2014).

9. List of Documents/Annexes:

None.