GERMANY

National Focal Centre

OEKO-DATA
Hans-Dieter Nagel
Hegermühlenstr. 58
D–15344 Strausberg
tel.: +49 3341 3901920
fax: +49 3341 3901926
hans.dieter.nagel@oekodata.com

Collaborating institutions

Federal Agricultural Research Centre (FAL)
Institute of Agroecology
Thomas Gauger
Bundesallee 50
D–38116 Braunschweig
tel.: +49 531 5962566
fax: +49 531 5962699
thomas.gauger@fal.de

Calculation of critical loads of acidity and nutrient nitrogen and dynamic modelling data

The German NFC provides an update of the national critical load data of sulphur and nitrogen (steady-state mass balance approach) and results of the dynamic model application (VSD).

Critical loads are calculated in accordance to the methods described in the Mapping Manual (UBA, 2004) and following the instructions of the CCE for data submission (CCE, 2006). The German critical load database consists of 101,098 records.

In comparison with the data submission of 2005 only very small changes are to be observed concerning the critical loads of sulphur, \( CL_{\text{maxS}} \), mostly due to some new deposition values of base cations (Figure DE-1). More important changes results for nitrogen critical loads (Figure DE-2). Applying the suggested update of critical concentrations in soil solution (CCE, 2006) a national approach was derived using the vegetation period for assignment of different concentration values in Northern and Western Europe (Fig. DE-3). As result in Figure DE-4 is shown a box plot of submitted nitrogen critical load data, the calculation of 2005 using the original critical N concentrations given by the Mapping Manual, the empirical critical load values and \( CL_{\text{nutN}} \) with the suggested (national modified) update of the 2007 call for data.

The dynamic model VSD was successful implemented. For the three given scenarios ‘Current Legislation’ (CLE), ‘Maximum Feasible Reduction’ (MFR) and a deposition scenario based on EMEP-MSC-W calculated background values (bkg) results are shown in Figures DE-5 to DE-7. As one of the most sensitive indicators the pH value was selected and the distribution trend over time was demonstrated in a box plot.
Figure DE-1. Critical load of sulphur, $\text{CL}_{\text{maxS}}$.

Figure DE-2. Critical load of nutrient nitrogen, $\text{CL}_{\text{nutN}}$.

Figure DE-3. Critical (acceptable) $N$ concentrations in soil solution for calculating $\text{CL}_{\text{nutN}}$.

Figure DE-5. Trend of the distribution of pH values in Germany following the ‘current legislation’ deposition scenario (101098 plots calculated).

Figure DE-6. Trend of the distribution of pH values in Germany following the ‘maximal feasible reduction’ deposition scenario (101098 plots calculated).

Figure DE-7. Trend of the distribution of pH values in Germany following the ‘background’ deposition scenario (only natural sources from 2020) (101098 plots calculated).

Data sources

CORINE Land Cover, Federal Environmental Agency (DLR-DFD 2004)

Data on soil properties described for the reference profiles of the units of the General Soil Map of Germany (BUEK 1000; Hartwig et al., 1995).

**Empirical critical loads of nitrogen for terrestrial ecosystems**

In addition to the calculation of critical loads with the steady-state mass balance approach and the application of the dynamic model VSD, empirical critical loads of nitrogen were assessed for the complete national dataset and submitted by the German NFC.

Empirical critical loads were derived in accordance to the methods described in the Chapter 5.2 of the Mapping Manual (UBA, 2004) and following the recommendations of the workshop ‘Empirical Critical Loads for Nitrogen’ (Achermann and Bobbink, 2003). The German empirical critical load database consists of 102,561 records of 1×1 km² grids. A regional distribution of this dataset is shown in Figure DE-8.

![Empirical Critical Loads Nutrient Nitrogen](image)

**Figure DE-8.** Regional distribution of empirical critical loads of nitrogen for terrestrial ecosystems in Germany.

Critical load ranges given by Table 5.1 of the Mapping Manual were specified by applying the BERN model (Schlutow and Kraft 2006). A typical plant community with a unique empirical critical load value could be defined for each EUNIS code (Table DE-1).
Empirical critical loads of nitrogen for terrestrial ecosystems in Germany range between 5 and 38 kg N ha\(^{-1}\) a\(^{-1}\) with a mean of 15 kg N ha\(^{-1}\) a\(^{-1}\); the statistical distribution is given in Table DE-2.

### Table DE-2. Statistics of empirical critical loads of nitrogen for terrestrial ecosystems in Germany in kg N ha\(^{-1}\) a\(^{-1}\)

<table>
<thead>
<tr>
<th>Minimum</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 percentile</td>
<td>11</td>
</tr>
<tr>
<td>25 percentile</td>
<td>13</td>
</tr>
<tr>
<td>Mean</td>
<td>15</td>
</tr>
<tr>
<td>75 percentile</td>
<td>17.5</td>
</tr>
<tr>
<td>95 percentile</td>
<td>18.5</td>
</tr>
<tr>
<td>Maximum</td>
<td>38</td>
</tr>
</tbody>
</table>

As additional information the protection status of all grid cells with empirical critical loads of nitrogen was checked. The European Habitats Directive (FFH) applies at nearly 28 percent (28,806) of mapped grids, 10,532 of them are also Special Protection Areas (SPA) for which the Birds Directive applies. About 5% of the grid cells are SPA areas only (Table DE-3).

### Table DE-3. Protection status of grid cells with empirical critical loads of nitrogen.

<table>
<thead>
<tr>
<th>Protection</th>
<th>Area (km(^2))</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No specific nature protection applies</td>
<td>68,348</td>
<td>66.6</td>
</tr>
<tr>
<td>Special Protection Area (SPA), Birds Directive applies</td>
<td>5,407</td>
<td>5.3</td>
</tr>
<tr>
<td>Special Area of Conservation (SAC), Habitats Directive applies (FFH)</td>
<td>28,806 (10,532 SPA + FFH)</td>
<td>28.1</td>
</tr>
<tr>
<td>A national protection program applies</td>
<td>no information</td>
<td></td>
</tr>
</tbody>
</table>

As a note, the European Nature Conservation Act (CEN) applies to nearly 16 percent (16,231) of the mapped grids, 5,611 of them are also Special Protection Areas (SPA). About 1% of the grid cells are SPA areas only (Table DE-3).
References

Environmental Documentation 164, Swiss Agency for the Environment, Forests and Landscape