Modelling and Mapping the impacts of atmospheric deposition on plant species diversity in Europe

CCE Status Report 2014

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The Coordination Centre for Effects (CCE: www.wge-cce.org), located at RIVM, is the Programme Centre of the International Cooperative Programme on Modelling and Mapping (ICP M&M: www.icpmapping.org) of Critical Levels and Loads and Air Pollution Effects, Risks and Trends under the Working Group on Effects (WGE) of the Convention on Long-range Transboundary Air Pollution (LRTAP Convention: www.unece.org/env/lrtap/welcome.html).

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Summary

The focus of this report is on progress made, by the ICP M&M, with the modelling and mapping of critical thresholds and dose-response relationships of air pollution effects on the diversity of plant species in Europe. The idea is to extend and complete the existing European critical loads database with critical thresholds for biodiversity, to meet the new requirements of the LRTAP Convention and the European Union for the support of European air pollution abatement policies, taking into account synergies with other international policy issues.

Chapter 1 describes the results of an assessment of the impacts of the emission reduction scenarios that have been developed and used in the context of recent European air pollution abatement policies, using data from the current European critical loads database held at the CCE. The area at risk of acidification in Europe improves from 6% (8% in Natura 2000 areas) in 2005 to 2% (2% in Natura 2000 areas) in 2020. For eutrophication these percentages are 63% (78% in Natura 2000 areas) and 55% (65% in Natura 2000 areas), respectively.

The extension of ICP M&M work to include biodiversity endpoints more specifically was initiated in 2007 when the Executive Body agreed at its 25th session to encourage the Working Group on Effects 'to increase its work on quantifying effects indicators, in particular for biodiversity. These should also be linked to the integrated assessment modelling activities' (ECE/EB.AIR/91, para. 31). This was confirmed in the Long-term Strategy of the Convention till 2020, which 'set a vision for the next 10 years and beyond to address the remaining issues from existing activities and to meet emerging challenges with the aim of delivering a sustainable optimal long-term balance between the effects of air pollution, climate change and biodiversity' (ECE/EB.AIR/2010/4, para. 6a).

In 2012 the Working Group on Effects decided that a Call for Data on 'no net loss of biodiversity' indicators be issued by the CCE with a deadline of March 2014 in order to assess tentative methodologies and national data that had been reviewed by the CCE and National Focal Centres under the ICP Modelling and Mapping at various yearly CCE workshops and Task Force meetings since 2007. The Call for Data also aimed at addressing the EU 2020 headline target of 'halting the loss of biodiversity and the degradation of ecosystem services in the EU by 2010, and restoring them in so far as feasible, while stepping up the EU contribution to averting global biodiversity loss' (EU[1], 2011, p.12, Target 2, Action 7). *Chapter 2* describes the result of this Call for Data on biodiversity indicators and calculations, to which ten countries responded. Seven of them applied dynamic modelling. Respondents to the call suggested that further technical and conceptual work was needed to arrive at a harmonised indicator of no net loss of biodiversity.

Meanwhile, work continued on the identification of relationships between nitrogen-sulphur deposition and biodiversity response on a regional (EUNIS) scale with a focus on 'areas of special protection' such as Natura 2000 areas in the EU. An important goal is to derive a harmonised metric from the submitted variables and indicators with the objective of quantifying 'no net loss of biodiversity' on a regional scale. This harmonised metric would allow comparisons of the state of biodiversity between regions and countries. Finally, the indicator should be easily applicable to European policy support in the context of integrated assessment modelling and the GAINS system[2]. The progress made in the development of a new indicator, i.e. the Habitat Suitability (HS) index, includes the establishment of a link between modelled soil chemistry and the occurrence probability of plant species on a European scale. A description of the methodology and data for the implementation of the HS index on a European scale is provided in *Chapters 3 and 4*. A modelling methodology for the assessment of the HS index as a measure of the occurrence probability of plant species is introduced. Initial simulations with this model reveal the need to improve information on European natural vegetation and the list of desired species.

[1] COM(2011) 244 final: http://ec.europa.eu/environment/nature/biodiversity/comm2006/pdf/2020/1_EN_ACT_part1_v7[1].pdf; see also http://biodiversity.europa.eu/bise/policy/eu-biodiversity-strategy.

[2] The GAINS system consists of a combination of hard-linked (embedded in the GAINS computer code) and soft-linked assessment options. The latter are also known as 'ex-post' assessments under the LRTAP Convention. A component of the FP7 ECLAIRE project also contributes to this task.

These chapters include elements that form the basis of the Call for Data 2014/15, which was issued in November 2014 in response to the request of the Working Group on Effects at its 33rd session (Geneva, 17–19 September 2014).

This report concludes with submissions by National Focal Centres describing the methods and data used for their submission to the 2012–14 Call for Data on 'no net loss of biodiversity' indicators.

Publiekssamenvatting

Gemodelleerde effecten van de neerslag van stikstof op de natuur

Als stikstof vanuit de lucht op de bodem terechtkomt, werkt dat als een voedingsstof. Door te veel stikstof kunnen bepaalde plantensoorten verdwijnen of juist gaan overheersen. In internationale politieke gremia is daarom de vraag gesteld bij welke hoeveelheid stikstof (stikstofoxides en ammoniak) in de lucht natuurgebieden intact blijven. Het internationale Coordination Centre for Effects (CCE) helpt deze vraag te beantwoorden door een Europese database te beheren en te analyseren waarin de limieten ('kritische belastingsgrenzen') per type natuurgebied staan weergegeven. Landen uit het CCE-netwerk leveren hiervoor informatie.

In de afgelopen jaren hebben de landen nieuwe methoden getest om de kritische belastingsgrenzen te bepalen. Deze methode is gericht op de biodiversiteit: er wordt een relatie gelegd tussen de planten die typerend zijn voor een bepaald soort vegetatie en de omstandigheden in de bodem waaronder deze planten optimaal gedijen. In acht landen is vooruitgang geboekt met de toepassing en kwantificering van deze methode. Het blijkt essentieel om informatie te hebben over de typerende plantensoorten, maar dat is nog niet van alle vegetatiesoorten gelukt. Bossen zijn nog problematisch.

Momenteel zijn er twee methoden in gebruik om de kritische belastingsgrens te bepalen: bij de ene wordt de toegestane neerslag van stikstof begrensd door de stikstofconcentratie in het bodemvocht (in de laag van de bodem waar de wortels zitten), bij de ander gebeurt dat op basis van geobserveerde effecten van stikstof depositie op de natuur. De nieuwe methode - gebaseerd op de biodiversiteit - is hierop een aanvulling. Vanaf komend jaar worden aan de landen data over de belastingsgrenzen voor alle drie de methoden gevraagd.

Het CCE informeert beleidsmakers over de effecten van luchtverontreiniging op verschillende ecosystemen en wat het rendement van maatregelen is. De stikstofdepositie neemt al jaren af, maar op veel plekken in Europa verliezen ecosystemen nog steeds aan diversiteit.

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