

Für Mensch & Umwelt

Umwelt
Bundesamt

Joint thematic session: Air pollution effects on biodiversity

Empirical Critical Loads

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Coordination Center for Effects

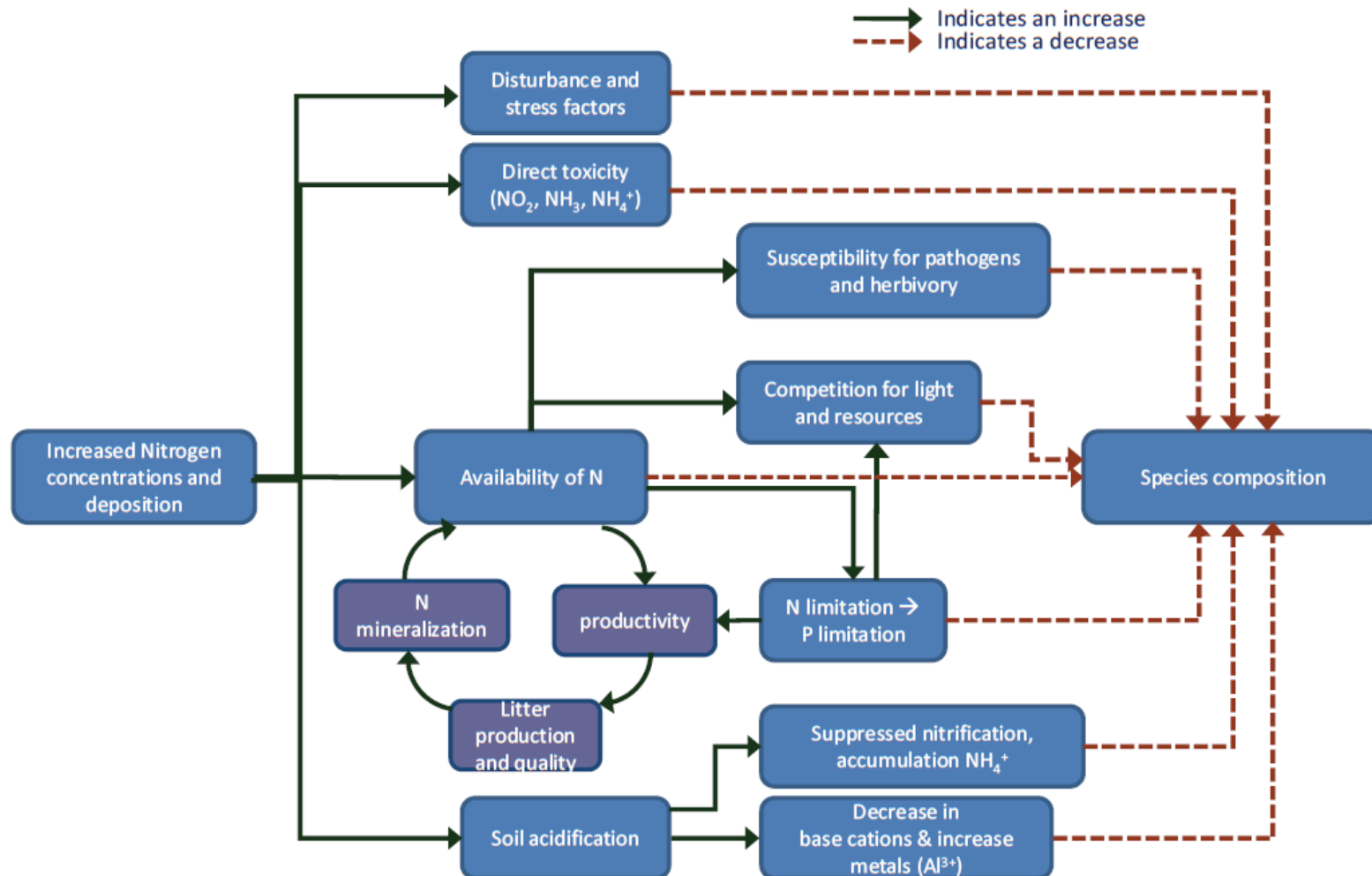
German Environment Agency

Section II 4.3

Air Quality and Terrestrial Ecosystems



N deposition impacts



- Direct toxicity of gases & aerosols (critical levels)
- Eutrophication
- Acidification
- Differential effects of reduced versus oxidized N
- Increased sensitivity to stresses and disturbances
- Impacts upon fauna

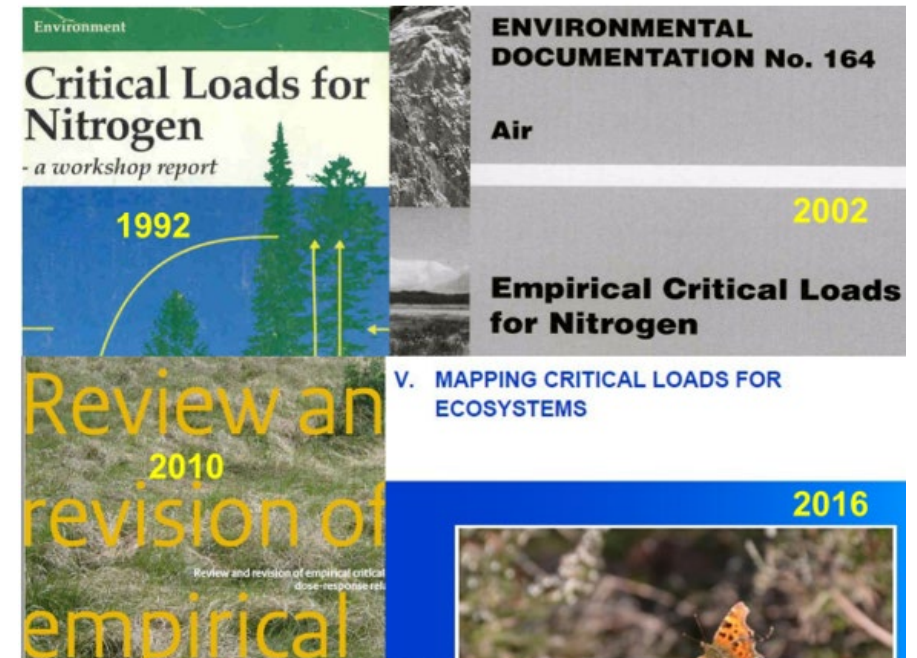
History of empirical Critical Loads for Nitrogen ($CL_{emp}N$)

$CL_{emp}N$ were first presented in a background document for a workshop in 1992 in Sweden (Grennfelt and Thörnelöf, 1992)

4 Updates:

- Bobbink et al. (1996)
- Achermann & Bobbink (2003)
- Bobbink & Hettelingh (2011)
- Bobbink et al. (2022)

Overview publication: Bobbink, R. et al. (2015). Effects and Empirical Critical Loads of Nitrogen for Europe. In: de Vries, W., Hettelingh, JP., Posch, M. (eds) Critical Loads and Dynamic Risk Assessments. Environmental Pollution, vol 25. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-9508-1_4



Current recommendations in Bobbink et al. (2022)

- ***Biodiversity is the term used to depict the variety of life on Earth. Life encompasses all organisms, species, and populations, the genetic variation among them and their complex assemblages of communities and ecosystems (UNEP, 2017)."***
- ***species within an ecosystem have their own niches and requirements. Changes in the ability to access these requirements – here **nitrogen availability** – affect the population size of a species resulting in changes to the composition of biological communities and ecosystems (CSS, 2020).***
- ***the present review demonstrates and confirms that excessive atmospheric nitrogen deposition negatively affects species assemblages, and thus poses a serious risk to biodiversity. "***

CSS - Center for Sustainable Systems, University of Michigan (2020). Biodiversity Factsheet.
Pub. No. CSS09-08. <https://css.umich.edu/factsheets/biodiversity-factsheet>

UNEP – UN Environment Programme (2017). Biodiversity Factsheet.
<https://www.unep.org/resources/factsheet/biodiversity-factsheet>



[Review and revision of empirical critical loads of nitrogen for Europe | Umweltbundesamt](#)

Current recommendations in Bobbink et al. (2022)

CL_{emp}N ranges recommended for in total 51 ecosystems, 9 new receptors could be added during the last update

Covers European Nature Information System (EUNIS) classes: marine habitats (MA), coastal habitats (N), inland surface waters (C), mires, bogs and fens (Q), grasslands and lands dominated by forbs, mosses or lichens (R), heathland, scrubland and tundra (S), woodland, forest and other wooded land (T)

Based on biologically significant outcomes of both field addition experiments and N gradient studies

Increased reliability for many recommended values



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Current recommendations in Bobbink et al. (2022)

$CL_{emp}N$ ranges recommended for in total 51 ecosystems

Recommended ecosystem specific $CL_{emp}N$ values are in the range between 2- 30 kg N ha⁻¹ a⁻¹

In nearly all of the ecosystems the indication of exceedance of the recommended $CL_{emp}N$ value is related to biodiversity:

- Change in plant species richness
- Change in plant species composition
- Decrease in oligotrophic species
- Increase in productivity species
- Decline of typical species
- Decline in diversity



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Current recommendations in Bobbink et al. (2022)

-acknowledging that $CL_{emp}N$ are used in the nature conservation practice in many European countries to assess the conservation status and the relevance of threat factors for endangered habitats....
-despite uncertainties laying e.g. in the fairly broad ecosystem specific ranges instead of explicit values, the patchy coverage of European ecosystem types and in the difficulties for large-scale (Europe-wide) accurate mapping for risk assessment....

“..... $CL_{emp}N$ are a suitable indicator to identify risks and damage to biodiversity at the ecosystem level, which can be linked to policy-relevant biodiversity targets (e.g. the EU Biodiversity Strategy for 2030 which aims to ensure no net loss of biodiversity and ecosystem services), and to the Convention on Biodiversity (CBD).”



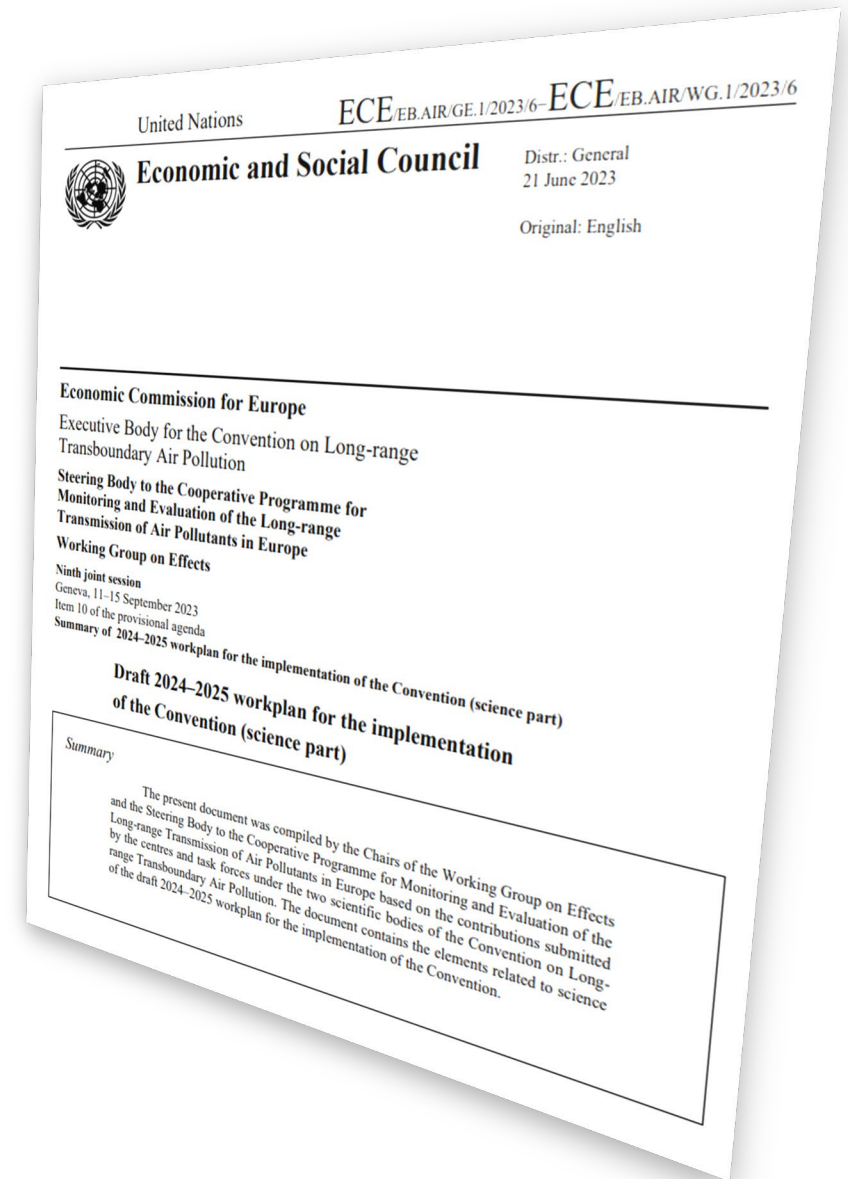
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Planned activities workplan 24/25

1.1.1.22 Empirical Critical Loads: map exceedance data, including CfD 23/24 outcome and updated 2023 receptor map

Europe-wide quantitative assessment for “risks for biodiversity” through air pollution

with beneficial information for the effects-assessment of CLRTAP and the Europe-related target assessment of CBD (Target 7) or EU Biodiversity Strategy (restoration plan 2.2.9)



Any questions?

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TARGET 7

Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution.