

Methodology used in the GLOBIO₃ model

Mapping Nitrogen Deposition Effects on Biodiversity

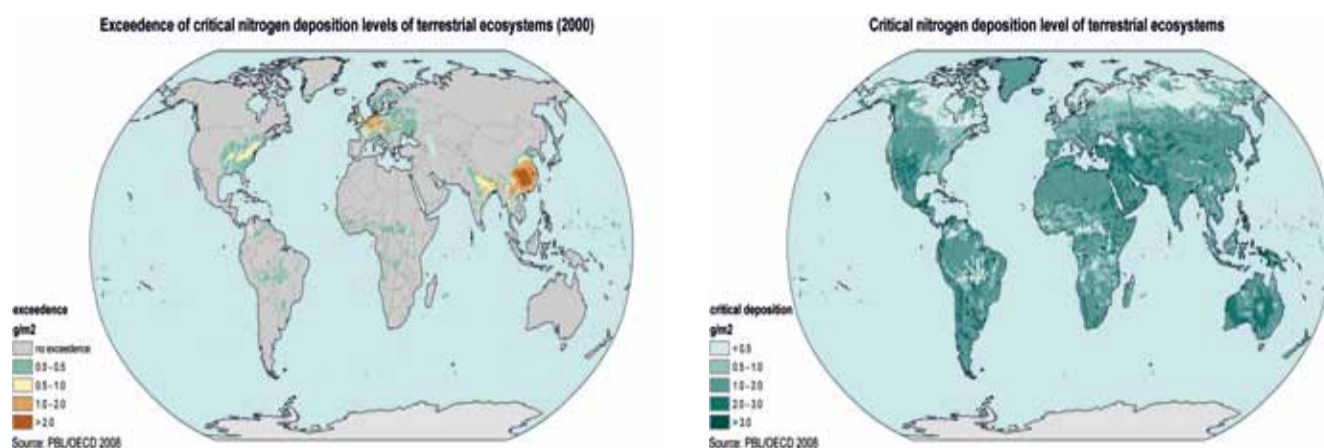


Figure 1 Global deposition of reactive nitrogen

Figure 2 Critical load of ecosystems

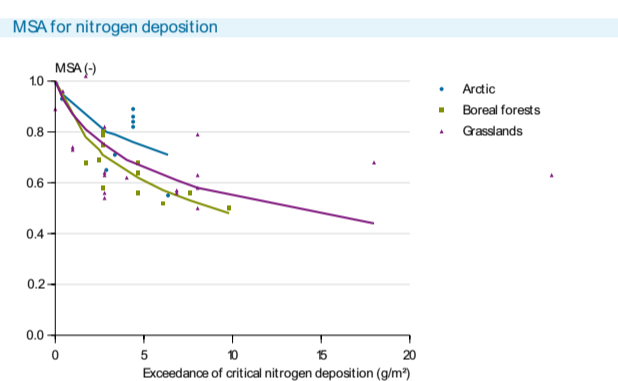


Figure 3 Relation between Critical load exceedance and MSA-values.

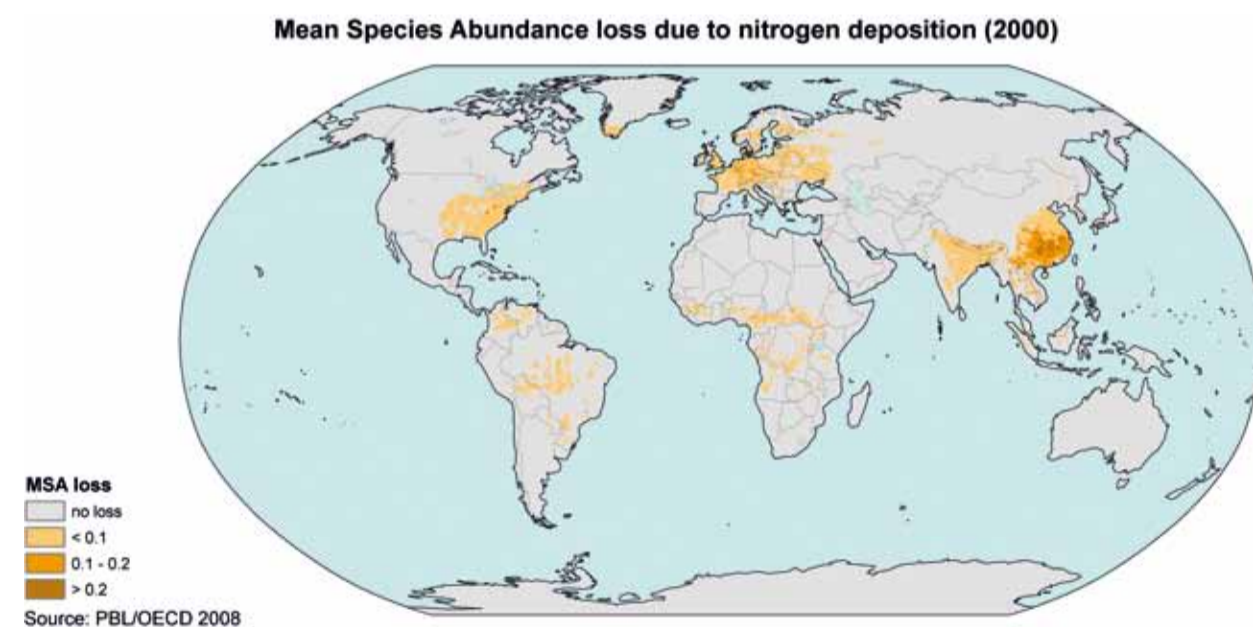


Figure 4: Biodiversity Loss

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Introduction

The UNEP World Conservation Monitoring Centre (WCMC), UNEP-GRID Arendal and the Netherlands Environmental Assessment Agency (PBL) have developed the GLOBIO₃ model to assess human-induced changes in biodiversity, in the past, present and future at regional and global scales (Alkemada et al., 2009). GLOBIO₃ uses quantitative relationships between environmental drivers and biodiversity intactness, based on state-of-the-art knowledge from literature. Drivers comprise changes in land use (agriculture, forestry and settlements), climate change, infrastructure, fragmentation and nitrogen deposition.

By combining results related to individual drivers, the overall change in biodiversity is calculated in terms of mean species abundance (MSA). This measure of mean species abundance (MSA) is similar to, but not equal to, the Biodiversity Integrity Index (Majer and Beeston, 1996) and the Biodiversity Intactness Index (Scholes and Biggs, 2005) and can be considered as a proxy for policy relevant CBD indicators (UNEP, 2004).

Effects of Nitrogen deposition on Biodiversity

Effects of nitrogen deposition were calculated by combining a global deposition map (figure 1), a map of critical loads (figure 2) and dose response relationships between critical load exceedance and species loss (figure 3).

The deposition maps are derived from IMAGE which simulates global atmospheric Nitrogen deposition, based on data on agricultural and live stock production (MNP 2006). A critical-load map for major ecosystems was derived from the soil map of the world and from the sensitivity of ecosystems to N inputs (Bouwman et al., 2002). Cause-effect relationships were derived from 22 papers on the experimental addition of nitrogen to natural systems and its effects on mean species abundance (CCE, 2008; Bobbink et al. in press).

Southern China and Western Europe are the most affected, followed by parts of the United States of America and India (figure 4). Weak but probably increasing effects are emergent in Brazil and some parts of Southern Africa. Effects on protected Red List-species are probably higher (CCE, 2008).

