Working Group on Effects' Activities on Nitrogen

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T.Spranger, ICP Modelling and Mappping
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Working Group on Effects' Activities on Nitrogen

WGE activities comprise

- monitoring
- modelling
- assessments and literature reviews, on:

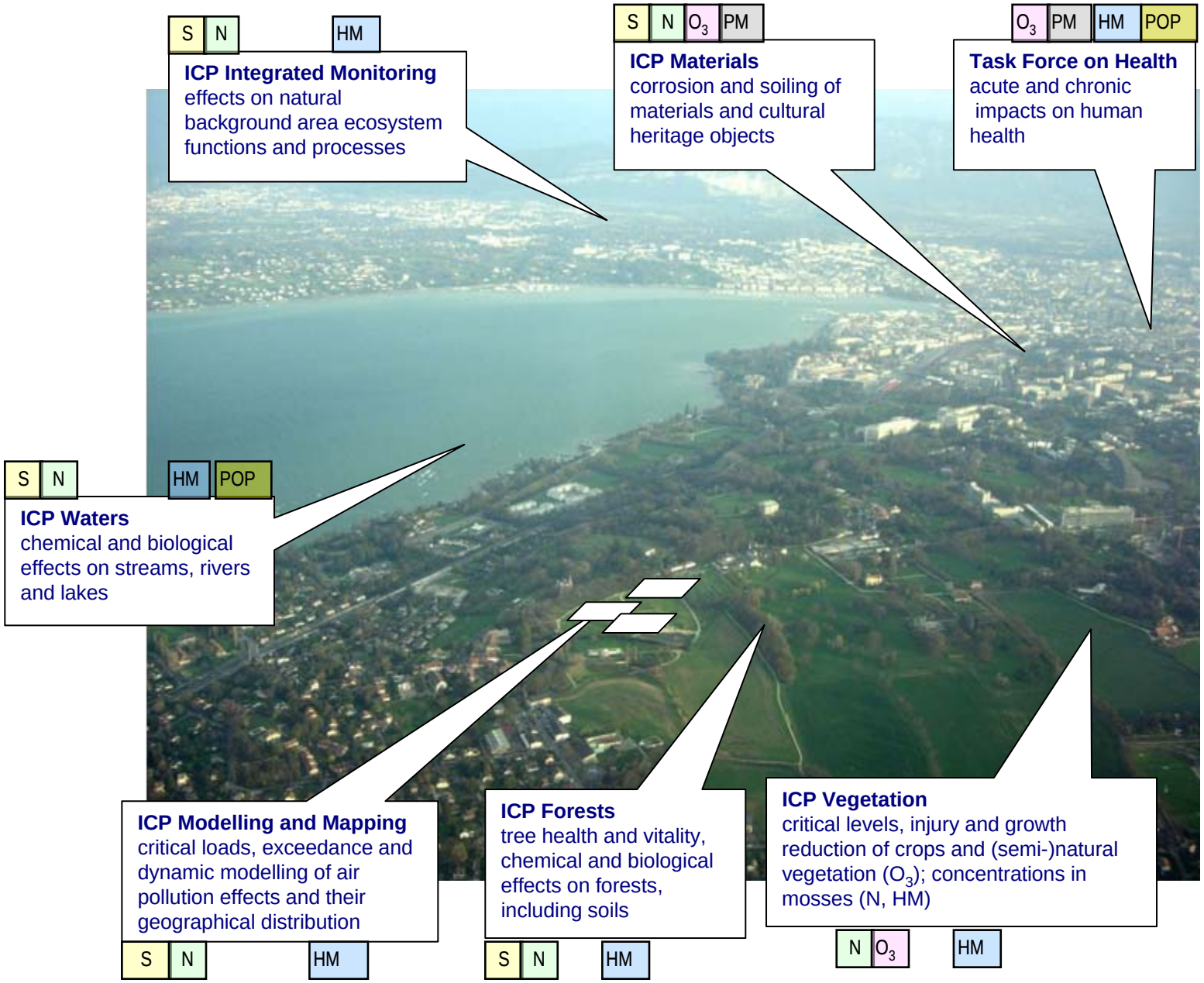
- acidification,
- eutrophication,
- ozone,
- particulate matter,
- heavy metals, POPs

Working Group on Effects' Activities on Nitrogen

WGE covers

- surface waters (rivers and lakes)
- forests and forest soils
- catchment studies
- (semi-)natural vegetation and crops
- materials (buildings, monuments)
- mapping and modelling (critical loads)
- dynamic modelling
- health

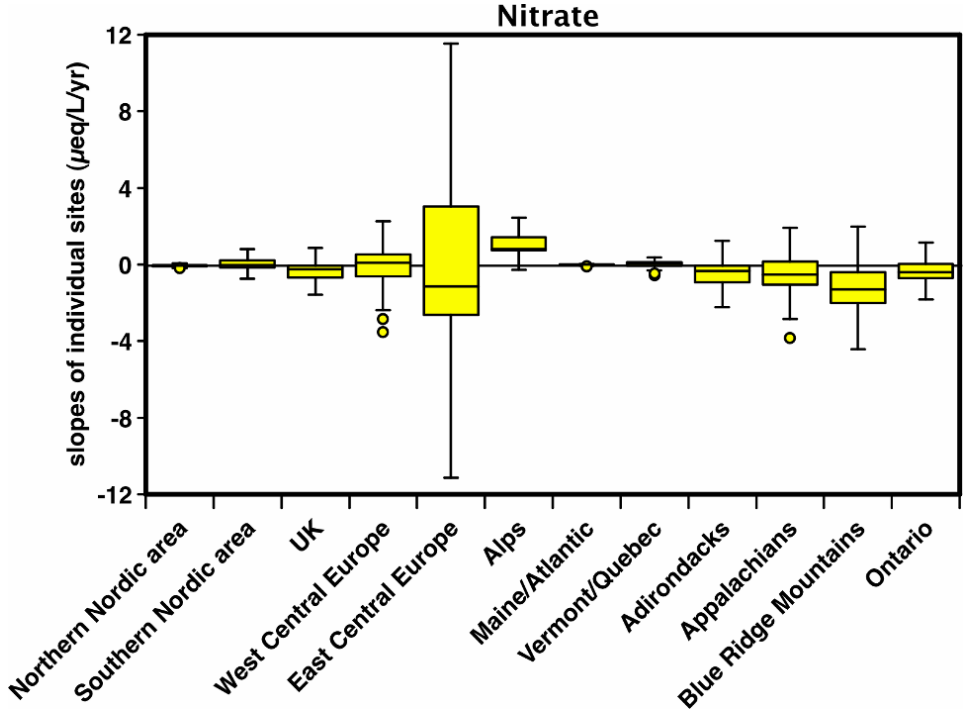
Schematic description of the main work topics of the effects-oriented programmes of WGE



Working Group on Effects' Activities on Nitrogen

- **Executive Body**
  - Implementation Committee
  - **Working Group on Effects**
    - ICP Forests Task Force — Programme Coordinating Centre
    - ICP Waters Task Force — Programme Centre
    - ICP Materials Task Force — Main Research Centre
    - ICP Vegetation Task Force — Programme Coordinating Centre
    - ICP Integrated Monitoring Task Force — Programme Centre
    - ICP Modelling and Mapping Task Force — Coordinating Centre for Effects
    - Task Force on Health — WHO Bonn
  - **Steering Body of EMEP**
    - Task Force on Emission Inventories and Projections
    - Task Force on Measurements and Modelling
    - Chemical Coordinating Centre
    - Meteorological Synthesizing Cenre - West
    - Meteorological Synthesizing Cenre - East
    - Task Force on Integrated Assessment Modelling
    - Centre for Integrated Assessment Modelling
    - Task Force on Hemispheric Transport of Air Pollution
  - **Working Group on Strategies and Review**
    - Task Force on POPs
    - Network of Experts on Benefits and Economic Instruments
    - Expert Group on Techno-economic Issues
    - Task Force on Heavy Metals
    - Expert Group on Particulate Matter
    - Task Force on Reactive Nitrogen

Long-term trends in nitrate in surface waters are poorly understood (ICP W)



- Unclear trends:

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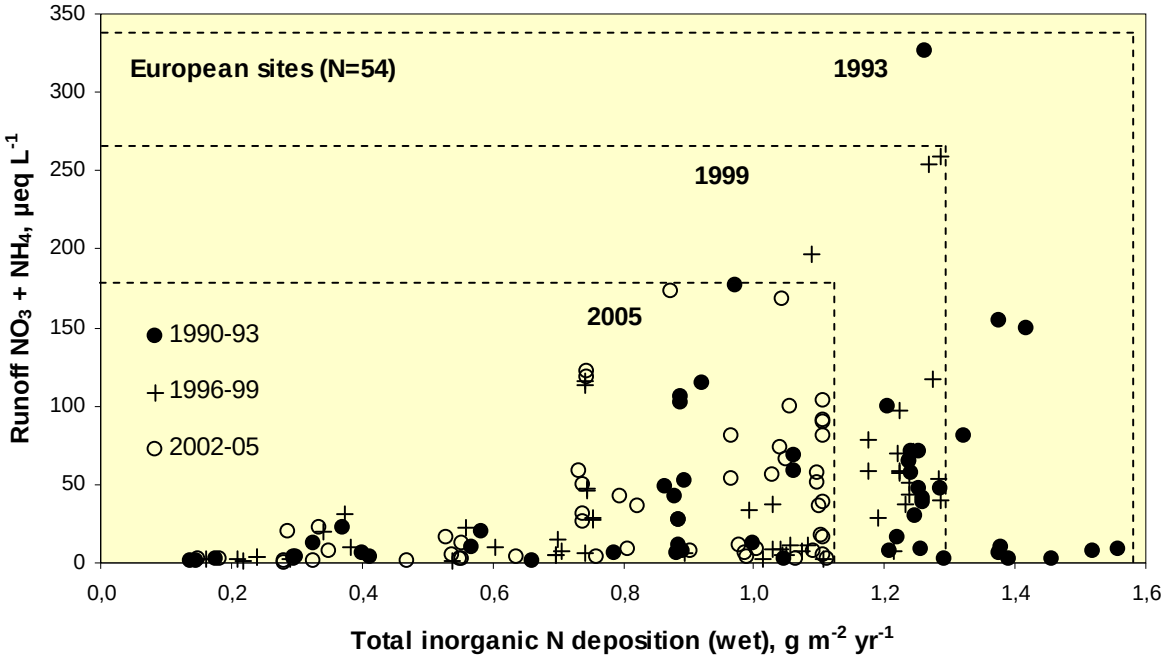
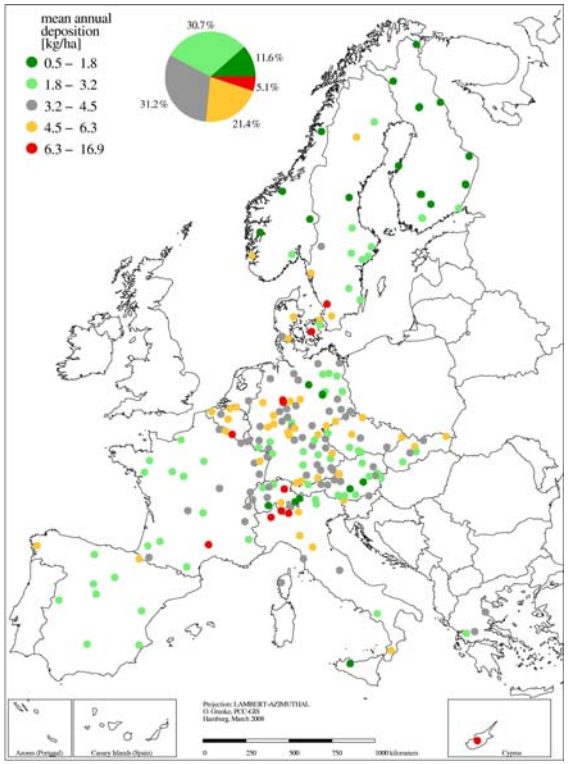
N deposition vs. run-off over time (ICP W)

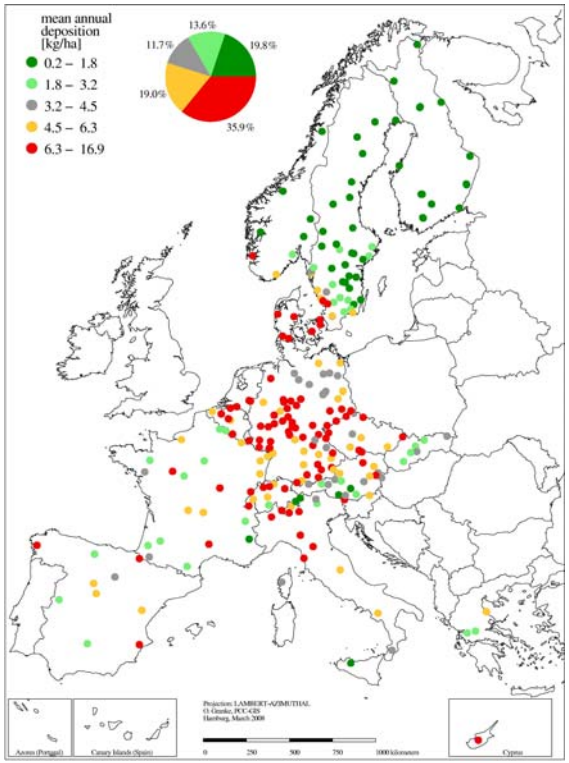


- evidence of reduced concentrations
- most N still retained in soil, but N enrichment continues
- trends relate to climate, forest growt, N saturation

The dotted lines indicate the successive decrease in N deposition and N runoff with time (’93, ’99, ’05)

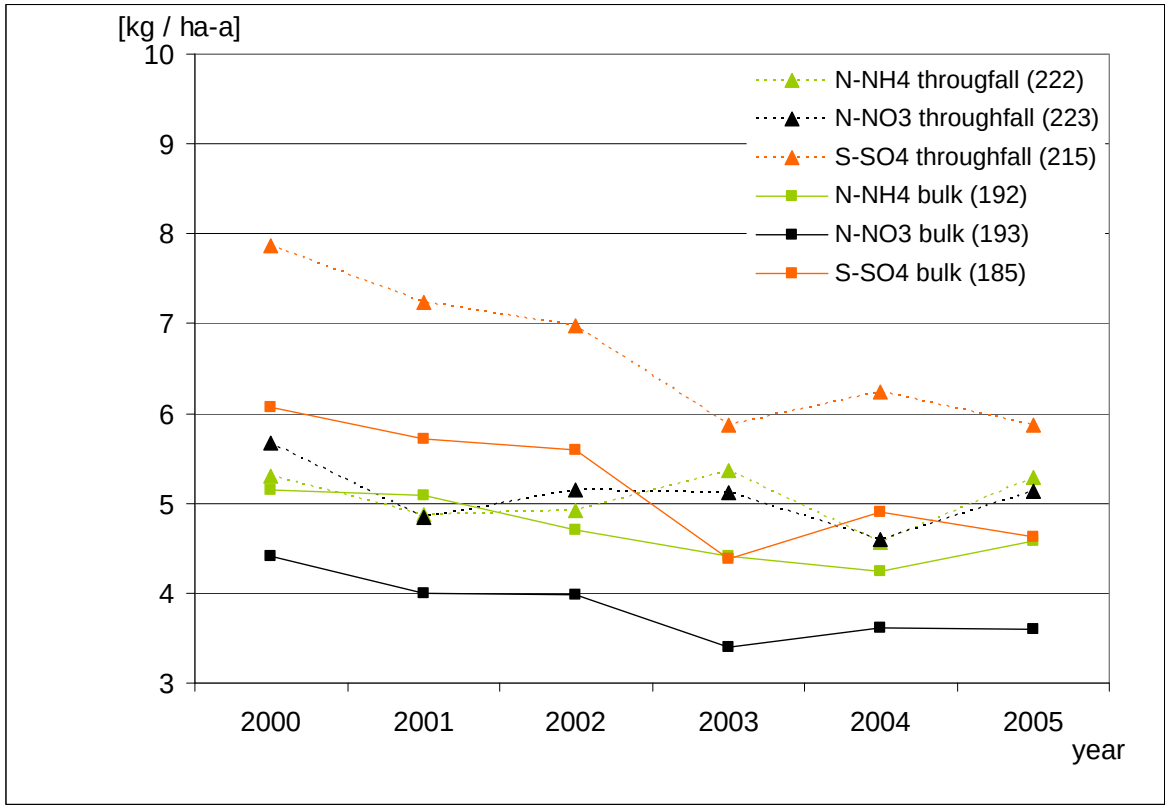
N deposition, bulk vs. throughfall (ICP F)





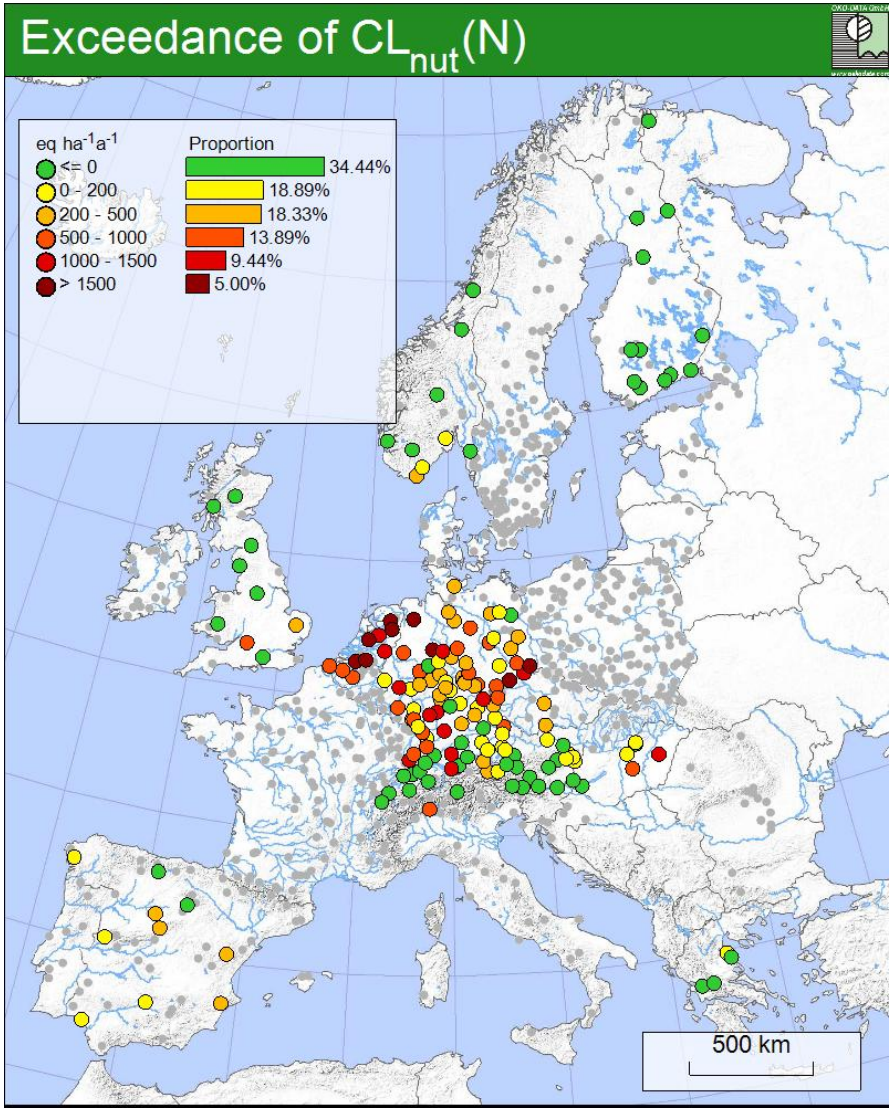
- spatial pattern of N throughfall deposition varies over Europe
- throughfall deposition > bulk deposition

Temporal changes in bulk and throughfall deposition 2000 to 2005 (ICP F)



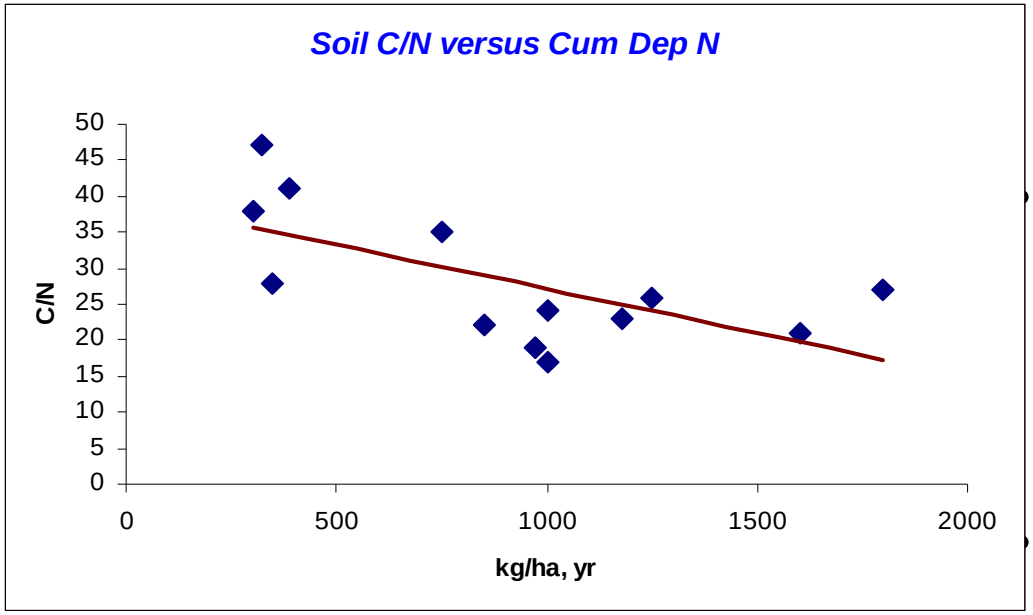
- There is a slight tendency to lower deposition of N in 2005 than in 2000

Exceedances of critical loads for N (ICP F)



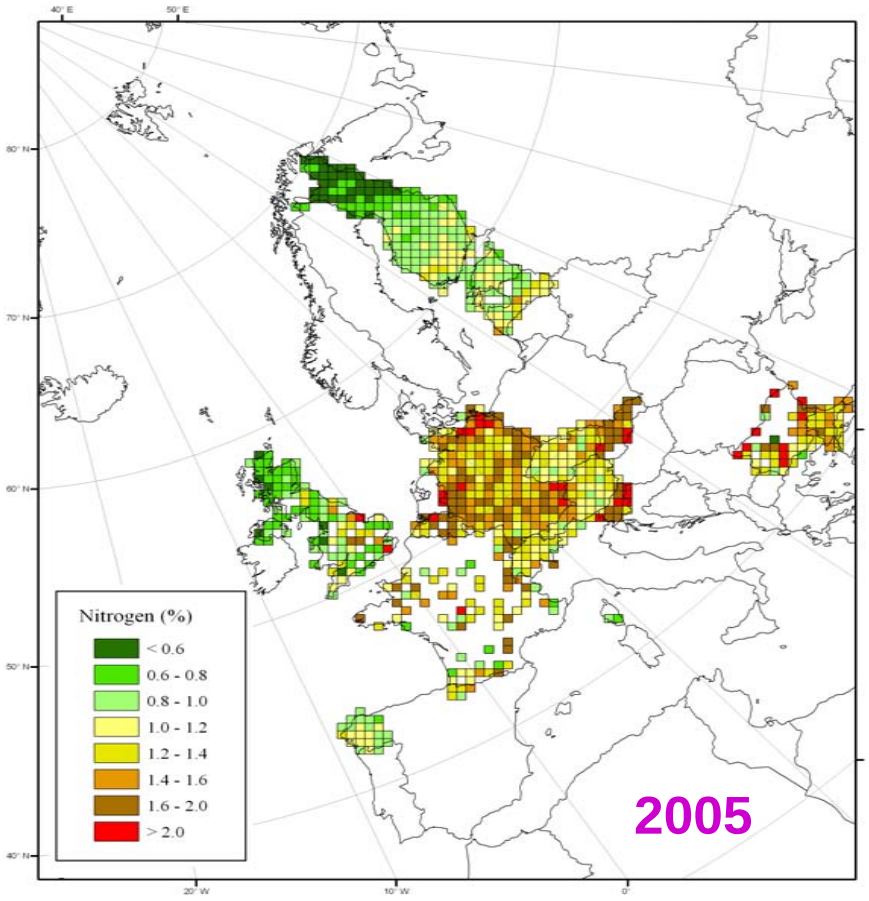
- Critical loads for N are exceeded on a large number of plots (2004); mainly in NL, BE and DE

Catchment studies (ICP IM)



- 90% of N-deposition is retained in the catchment.
- Accumulated N deposition now reaches over 2000 kg N/ha and total deposition is related to soil CN-ratio.
- N leaching from catchments are enhanced at organic soil layer CN-ratios below 25

N deposition, indicated by mosses (ICP V)



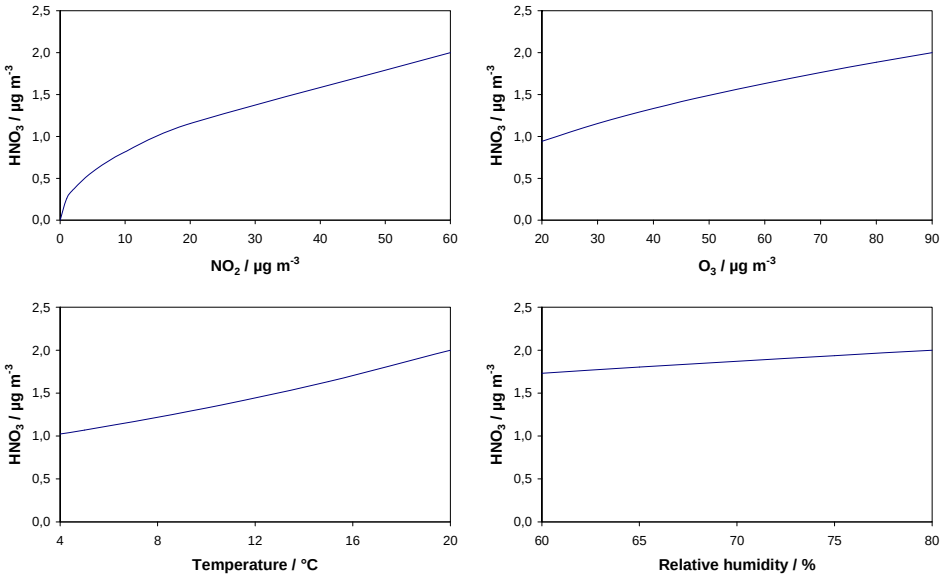
- Highest levels of N in mosses are found in Central and Eastern Europe, lowest in FI and UK

Impacts of N on vegetation (ICP V)

- For ‘Grasslands’ and ‘Heathland’ a high proportion of ‘likely’ or ‘definite’ exceedance of empirical critical load occurs in a small number of sensitive habitats for which the critical load range extends below 10 kg N ha-1 yr-1

- A meta-database was developed to describe field surveys on N impacts on vegetation; N impacts such as changes in species composition or loss of sensitive species are often difficult to separate from other factors

Nitric acid affects materials (ICP M)

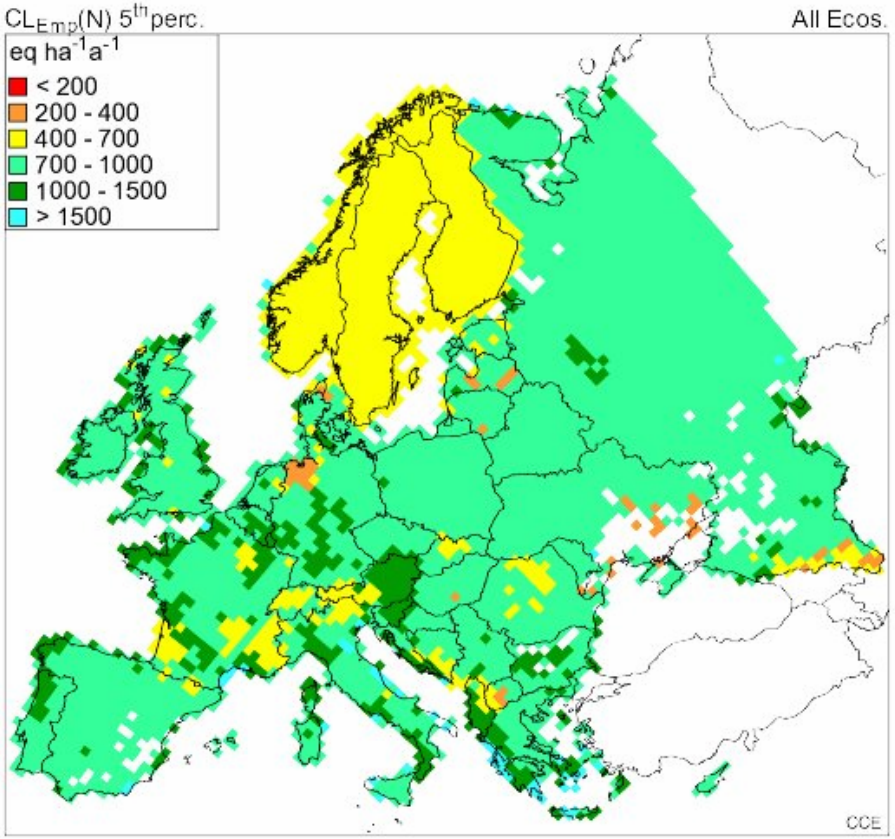


- Nitric acid is, for some materials, more corrosive than SO_2
- HNO_3 included in dose-response functions for 2 indicator materials
- Empirical function developed to calculate HNO_3 in lack of measurement

Supporting function for calculation of HNO_3

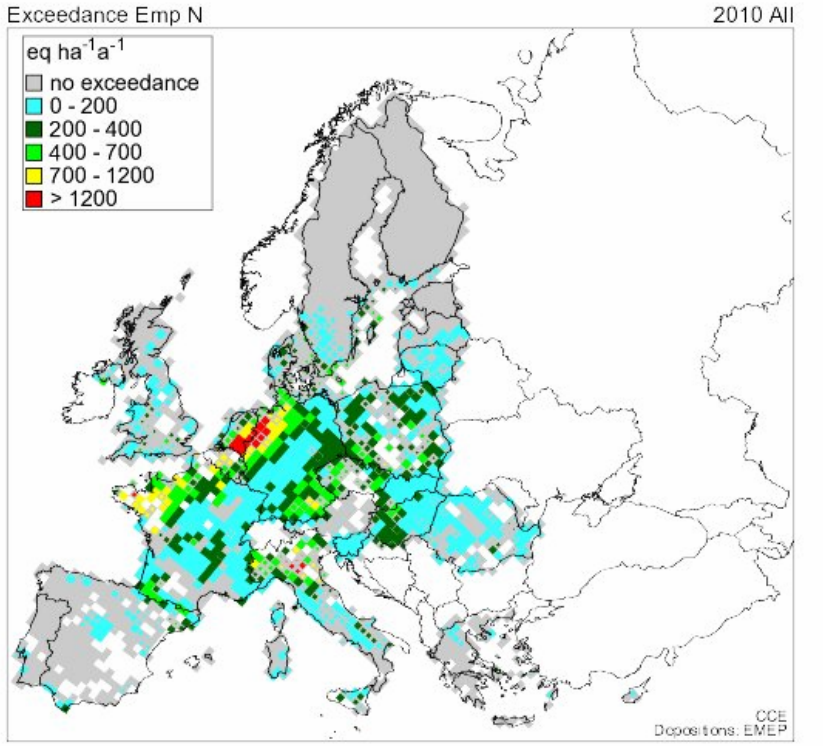
$HNO_3 = 516 \times e^{-3400/(T+273)} ([NO2] \times [O3] \times Rh)^{0.5}$

Critical loads of N (ICP M&M)



- Critical loads of nitrogen (eutrophication and acdification) have been successfully used as environmental quality objectives / indicators / targets for sustainable Nr fluxes from the atmosphere to ecosystems. This includes their use in Integrated Assessment Modelling.
- Critical load exceedances indicate environmental risk of nitrogen deposition, e.g. to the biodiversity of ecosystems.

Critical loads of N (ICP M&M)



Future and ongoing work priorities include:

- Assessment using dynamic modelling of nitrogen effects, including on biodiversity, and feedbacks to climate change, C biogeochemistry and management;
- Use of critical loads, dynamic modelling results and other data for European environmental policies, including the development of a (set of) indicator(s) for multimedia, multiscale nitrogen management

Dynamic modelling (JEG)

- Dynamic modelling (C & N cycle) describe air pollution impacts
- DM; linking atmospheric deposition, land management, and climate change impacts on aquatic and terrestrial biodiversity
- DM outputs show that GP beyond 2010, ecosystems will continue to become N enriched
- Rates of recovery varies; many sites recovered to acceptable levels, while other places may take decades under GP deposition, some irreversible

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Working Group on Effects

Twenty-sixth session
Geneva, 29–30 August 2007
Item 5 of the provisional agenda

REVIEW OF THE 1999 GOTHENBURG PROTOCOL

REVIEW REPORT OF THE WORKING GROUP ON EFFECTS

Report by the Extended Bureau of the Working Group on Effects

2008 Draft Consolidated Report on Air Pollution Effects