The Working Group on Effects is a unique and well structured international network of scientists with a wide range of expertise. It is established as a key part of the Convention on Long-range Transboundary Air Pollution. Its databases describe nitrogen effects and their trends over the years and over large geographical areas. Databases and expertise are available for further science and policy development.

Grasslands

More information

- Convention on Long-range Transboundary Air Pollution (http://www.unece.org/env/lrtap)
  - Working Group on Effects
  - Task Force on Reactive Nitrogen
- International Nitrogen Initiative (http://www.initrogen.org)
- Cost 729 (http://cost729.ceh.ac.uk)
- Nitrogen in Europe (http://www.nine-esf.org)

This brochure has been prepared by:

Human activities introduce excess nitrogen in the environment

Human activities have doubled the nitrogen that is available to ecosystems since the beginning of the 20th century. The main sources are:

- Agriculture, in particular the use of fertilisers (ca. 75% of the nitrogen introduced in the environment by man)
- Energy production
- Transport

The challenge is to make these essential human activities more nitrogen efficient and sustainable in the future.

Nitrogen deposition is a threat to the environment and human health

- Many of the most sensitive ecosystems are normally starved of nitrogen. Any enhanced nitrogen input modifies natural equilibria.
- Nitrogen reacts in the air to form ozone and small particulates. These pollutants damage the environment and human health.

Excess nitrogen weakens our environment and health

Effects of excessive nitrogen concentration include:

- Loss of biodiversity amongst ground vegetation in forests, grasslands and aquatic species
- Increased ozone concentrations in lower atmosphere
- Lower resistance against droughts and pest attacks
- Corrosion of materials
- Negative impacts on human health
- Contribution to global warming via N_2O emissions and potential lowering of methane uptake by soils

Overall, nitrogen contributes significantly to global change.

United Nations Economic Commission for Europe
Convention on Long-range Transboundary Air Pollution

Atmospheric nitrogen deposition: a threat to the environment and human health

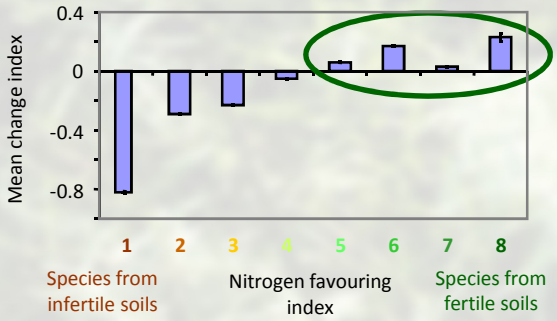
Evidence gathered by the Working Group on Effects

Average nitrogen deposition in Europe is currently 10 – 15 kg/ha/year
whereas background pre-industrial deposition was less than 5 kg/ha/year

Ecosystems receive unsustainable depositions of nitrogen

Acute effects are observed close to sources.

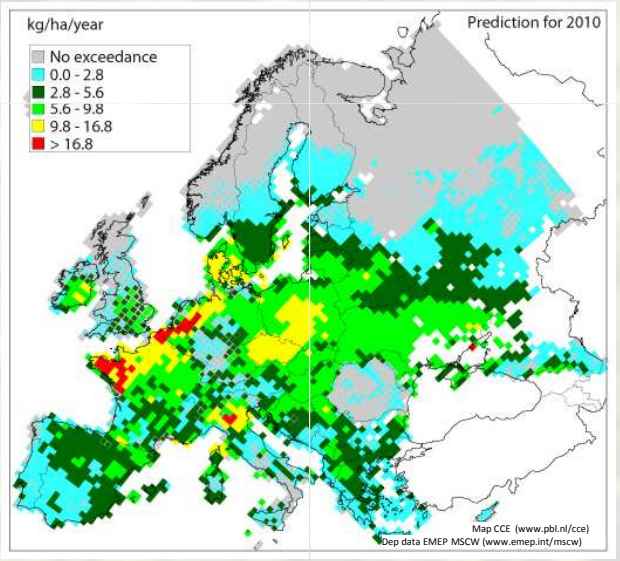
Experiments and long-term observations show that the composition of plant communities has changed when nitrogen was added but that recovery is possible if nitrogen additions are reduced.



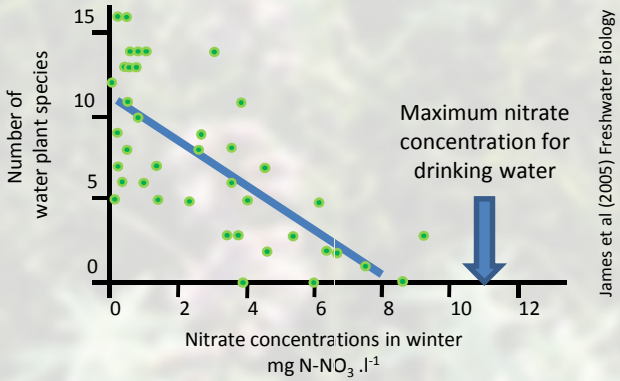
Preston et al (2002) New Atlas of British and Irish Flora

For example, occurrence of nitrogen-loving species (as indicated by high nitrogen favouring indices) has increased in the UK between the first and the second half of the 20th century while nitrogen use increased. Nitrogen is one of the main driving forces of plant community changes.

Chronic nitrogen deposition will impact ecosystems in most of Europe in 2010 as shown by the map of predicted critical load exceedance of nitrogen for eutrophication (below).



Concentration limits of nitrate in water set to protect human health are too high to protect natural ecosystems.



James et al (2005) Freshwater Biology

Nitrogen contributes to other pollutants: ozone and particulate matter

Ozone leads to decreased crop yields, damage to trees and (semi-)natural vegetation. Impact on crops has been estimated to cost ca. 6.7 billion euros to European agriculture in 2000.

Ozone damage on brown knapweed and lettuce

Nitrogen affects human health

Ozone and small particulate matter are linked with an increased risk of deaths due to lung and heart diseases. The World Health Organisation has estimated that this leads to 300,000 premature deaths per year. Nitrogen also affects human well-being through changes in ecosystems functions and services.

Effects drive environmental policies

The monitoring and modelling results of the Working Group on Effects are used to define effects-based environmental policies. Effects data are an essential input to integrated assessment models. These models inform on how (control techniques) and where (countries and activity sectors) to reduce emissions. This helps to reach good environmental and health status with minimised costs.