AIR & ECOSYSTEMS

In 2010, the area of ecosystems affected by eutrophication amounted to 1.1 million km² which represents 2/3 of EU ecosystems.

Two-thirds of EU ecosystems are currently exposed to higher nitrogen levels than they can cope with and one-tenth are over-exposed to acidifying air pollutants. Elevated concentrations of ground-level ozone also threaten biodiversity and the functioning of ecosystems. While the area of ecosystems in the EU at risk from excess acid deposition is expected to shrink further by the year 2020, the area at risk of eutrophication from excess nitrogen deposition is expected to come down only marginally, and will still exceed 1 million km². According to longer-term scenarios, up to 61% of EU ecosystems will remain at risk of eutrophication by 2050 [1].

EU legislation

- The Ambient Air Quality Directive 2008/50/EC sets an EU-wide target value for O_3 for the protection of vegetation. This target is three times higher than the long-term objective set already in 2002 (Directive 2002/3/EC) to protect vegetation from adverse effects. The Directive lacks critical levels for ammonia.
- The National Emissions Ceilings (NEC) Directive sets overall caps on pollutants in order to limit acidification, eutrophication and ground-level ozone pollution. The Directive is currently being revised.
- Significant additional emission reductions are required to achieve the long-term objective of the 6th and 7th Environmental Action Programmes of no exceedance of critical loads and levels.

Ozone changes the composition of species of sensitive plant communities such as acid grasslands. All the other parts of an ecosystem are also potentially impacted by ozone, including animals, fungi, bacteria and insects that live in close association with plants or in nearby soils.

FACTS AND FIGURES

LESS ACIDIFICATION

Following significant SO_2 emission reductions over the last 40 years, the area of sensitive ecosystems at risk of acidification in the EU is now less than 200,000 km².

TOO MUCH EUTROPHICATION

Excess levels of nitrogen lead to eutrophication (over-fertilisation) of ecosystems. Nitrogen-loving species, such as many grasses, out-compete sensitive lichens, mosses, forbs and dwarf shrubs in grasslands or on the forest floor.

DAMAGING AIR POLLUTANTS

The main air pollutants damaging the structure and function of grassland, forest, fresh water and other natural ecosystems in Europe today are reactive nitrogen compounds (especially NO_x and NH_3) and ozone (O_3).

The maximum level of nitrogen that can be supported without harming the most sensitive ecosystems (e.g. permanent nutrient poor lakes, tundra) is exceeded in most parts of Europe [2].

O_3 may worsen the effects of other stress factors such as high acid levels and drought.

1.1 MLN KM² = 2/3 OF EUROPEAN ECOSYSTEMS = 5xUK

In 2010, the area of ecosystems affected by eutrophication in the EU amounted to 1.1 million km², which is equal to more than two-thirds of the EU's ecosystems and corresponds to more than the size of Poland, the UK and Spain put together [3].

OZONE DAMAGES FOREST TREES

The current ambient ozone levels are dangerously high, as shown by the growth reductions in mature beech and Scots pine in Switzerland and Lithuania, respectively [4].

Reduced tree growth means reduced carbon storage in wood biomass. The estimated losses in forest carbon stocks average about 10% across ten northern European countries, with the highest losses predicted for the Czech Republic, Germany and Poland [5].

If additional measures to reduce emissions of ozone precursor pollutants (primarily NO_x and volatile organic compounds) are not taken by 2020, vegetation over large areas in Europe will remain at risk from ozone damage. Areas in parts of western, central and southern Europe will be at highest risk [1].

LICHEN DIVERSITY

In London, lichen diversity has increased by an order of magnitude since 1970. The current diversity of lichens on non-acidic tree bark is due to the ubiquitous distribution of nitrogen pollution tolerant species associated with eutrophication. In contrast to SO_2, NO_x concentration in the air in London has changed very little since 1970s and still exceeds the EU critical level of 30 µg/m^3 of NO_2 for sensitive vegetation and ecosystems [6].

Eutrophication due to excess nitrogen deposition is also apparent in rural areas in the vicinity of large poultry, pig and cattle farms.

For footnotes, please refer to separate reference sheet and to the EEB website.

RECOMMENDATIONS

Urgent action at EU level is required to minimise the effects of air pollutants on biodiversity and to ensure the ability of species and ecosystems to provide us with vital ecosystem services. In particular the EU should:

- Adopt ambitious emission reduction commitments in the revised National Emissions Ceilings Directive. Emission reduction commitments must go beyond the Gothenburg Protocol and aim to achieve the health and environmental objectives of the EU's 6th and 7th Environment Action Programmes by 2030.
- Control emissions from medium combustion installations by setting limits in line with current best available techniques, ensure their rapid entry into force and an adequate permitting and monitoring regime.
- Adopt sector legislation to cut emissions from all major sources of air pollution including e.g. NO_x emissions from international shipping and NH_3 emissions from agriculture.
- Extend the EU Air Quality Directive 2008/50/EC to include critical levels for NH_3 to protect lichens and bryophytes, heathlands, grasslands and forest ground flora.

More information

- Ozone Injury in European Forest Species: www.ozoneinjury.org
- CLRTAP Working Group on Effects: http://icpvegetation.ceh.ac.uk/publications/wge_documents.html
- Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads & Levels and Air Pollution Effects, UNECE, 2004
- NGO reports and briefings: www.eeb.org and www.airclim.org

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