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Item 5 (a) of the provisional agenda

**Revision of the annexes to the 1999 Gothenburg Protocol
to Abate Acidification, Eutrophication and Ground-level
Ozone: Draft revised annex I**

Draft revised annex I

Note by the secretariat

Summary

This document presents proposals for amendments to annex I to the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone for consideration by the Executive Body at its thirtieth session. It is based on document ECE/EB.AIR/WG.5/2011/8/Rev.1, as further revised during the twenty-ninth session of the Executive Body for the Convention on Long-range Transboundary Air Pollution in December 2011. Proposed new text is indicated in bold.

Critical loads and levels

I. Critical loads of acidity

A. For Parties within the geographical scope of EMEP

1. Critical loads (as defined in article 1) of acidity for ecosystems are determined in accordance with the Convention's *Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads and Levels and Air Pollution Effects, Risks and Trends* (available online at www.icpmapping.org). They are the maximum amount of acidifying deposition an ecosystem can tolerate in the long term without being damaged. Critical loads of acidity in terms of nitrogen take account of within-ecosystem nitrogen removal processes (e.g. uptake by plants). Critical loads of acidity in terms of sulphur **are loads that — in the long term — will not cause adverse effects to the structure and functions of ecosystems**. A combined sulphur and nitrogen critical load of acidity considers nitrogen only when the nitrogen deposition is greater than ecosystem nitrogen removal processes, **such as uptake by vegetation**. All critical loads reported by Parties, **and approved by the Executive Body to the Convention**, are summarized for use in the integrated assessment modelling employed to provide guidance for setting the emission ceilings in annex II.

B. For Parties in North America

2. In Canada, critical acid deposition loads and geographical areas where they are exceeded are determined and mapped for lakes and upland forest ecosystems using scientific methodologies and criteria similar to those in the Convention's *Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads and Levels and Air Pollution Effects, Risks and Trends*. Critical load values for total sulphur plus nitrogen and exceedance levels have been mapped across Canada (south of 60° N latitude) and are expressed in acid equivalents per hectare per year (eq/ha/yr) (2004 Canadian Acid Deposition Science Assessment; 2008 Canadian Council of Ministers of the Environment). The province of Alberta has also adapted the generic critical load classification systems used for soils in Europe for potential acidity to define soils as highly sensitive, moderately sensitive and not sensitive to acidic deposition. Critical, target and monitoring loads are defined for each soil class and management actions are prescribed as per the Alberta Acid Deposition Management Framework, as appropriate.

3. For the United States of America, the effects of acidification are evaluated through an assessment of the sensitivity **and response** of ecosystems to the loading of acidifying compounds, **using peer-reviewed scientific methodologies and criteria**, and **accounting for the uncertainties** associated with nitrogen **cycling processes** within ecosystems.

4. These loads and effects are used in integrated assessment **activities, including providing data for international efforts to assess ecosystem response to loading of acidifying compounds**, and provide guidance for setting the emission ceilings and/or reductions for Canada and the United States of America in annex II.

II. Critical loads of nutrient nitrogen

A. For Parties within the geographical scope of EMEP

5. Critical loads (as defined in article 1) of nutrient nitrogen (eutrophication) for ecosystems are determined in accordance with the Convention's *Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads and Levels and Air Pollution Effects, Risks and Trends*. They are the maximum amount of eutrophying nitrogen deposition that — in the long term — will not cause adverse effects to the structure and functions of ecosystems. All critical loads reported by Parties are summarized for use in the integrated assessment modelling employed to provide guidance for setting the emission ceilings in annex II.

B. For Parties in North America

5 bis. For the United States of America, the effects of nutrient nitrogen (eutrophication) for ecosystems are evaluated through an assessment of the sensitivity and response of ecosystems to the loading of nitrogen compounds, using peer-reviewed scientific methodologies and criteria, and accounting for uncertainties associated with nitrogen cycling within ecosystems.

III. Critical levels of ozone

A. For Parties within the geographical scope of EMEP

6. Critical levels (as defined in article 1) of ozone are determined to protect plants in accordance with the Convention's *Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads and Levels and Air Pollution Effects, Risks and Trends*. They are expressed in terms of the cumulative value of either stomatal fluxes or concentrations at the top of the canopy. Critical levels are preferably based on stomatal fluxes, as these are considered more biologically relevant since they take into account the modifying effect of climate, soil and plant factors on the uptake of ozone by vegetation.

7. Critical levels of ozone have been derived for a number of species of crops, (semi-)natural vegetation and forest trees. The critical levels selected are related to the most important environmental effects, e.g., loss of security of food supplies, loss of carbon storage in the living biomass of trees and adverse effects on forest and (semi-)natural ecosystems.

8. The critical level of ozone for human health is determined in accordance with the World Health Organization (WHO) air quality guidelines to protect human health from a wide range of health effects, including increased risk of premature death and morbidity.

B. For Parties in North America

9. For Canada, it is understood that there is no lower threshold for human health effects from ozone. That is, adverse effects have been observed at all ozone concentrations experienced in Canada. The Canadian standard for ozone was set to

aid management efforts nationally, and by jurisdictions, to significantly reduce the effects on human health and the environment.

10. For the United States of America, critical levels are established in the form of national ambient air quality standards for ozone in order to protect public health with an adequate margin of safety and to protect public welfare, including vegetation, from any known or expected adverse effects. Integrated assessment modelling and the air quality standards are used in providing guidance for setting the emission ceilings and/or reductions for the United States of America in annex II.

IV. Critical levels of particulate matter

A. For Parties in the geographical scope of EMEP

11. The critical level of particulate matter (PM) for human health is determined in accordance with the WHO air quality guidelines as the mass concentration of PM_{2.5} (particles with aerodynamic diameter less than 2.5 µm). Attainment of the guideline level is expected to effectively reduce health risks. The long-term PM_{2.5} concentration, expressed as an annual average, is proportional to the risk to health, including reduction of life expectancy. This indicator is used in integrated modelling to provide guidance for emission reduction. In addition to the annual guideline level, a short-term (24-hour mean) guideline level is defined to protect against peaks of pollution which have significant impact on morbidity or mortality.

B. For Parties in North America

12. For the United States of America, critical levels are established in the form of national ambient air quality standards for PM in order to protect public health with an adequate margin of safety, and to protect public welfare (including visibility and man-made materials) from any known or expected adverse effects. Integrated assessment modelling and the air quality standards are used in providing guidance for setting the emission ceilings and/or reductions for the United States of America in annex II.

13. For Canada, it is understood that there is no lower threshold for human health effects from PM. That is, adverse effects have been observed at all concentrations of PM experienced in Canada. The Canadian national standard for PM was set to aid management efforts nationally, and by jurisdictions, to significantly reduce the effects on human health and the environment.

V. Critical levels of ammonia

14. Critical levels (as defined in article 1) of ammonia are determined to protect plants in accordance with the Convention's *Manual on Methodologies and Criteria for Modelling and Mapping Critical Loads and Levels and Air Pollution Effects, Risks and Trends*.

VI. Acceptable levels of air pollutants to protect materials

15. Acceptable levels of acidifying pollutants, ozone and PM are determined to protect materials and cultural heritage in accordance with the Convention's *Manual*

on Methodologies and Criteria for Modelling and Mapping Critical Loads and Levels and Air Pollution Effects, Risks and Trends. The acceptable levels of pollutants are the maximum exposure a material can tolerate in the long term without resulting in damage above specified target corrosion rates. This damage, which can be calculated by available dose-response functions, is the result of several pollutants acting together in different combinations depending on the material: acidity (sulphur dioxide (SO₂), nitric acid (HNO₃)), ozone and PM.
