**UNITED NATIONS** **E**

# Economic and Social Council

Distr.
GENERAL

ECE/EB.AIR/WG.5/2009/11
ECE/EB.AIR/GE.1/2009/5
3 July 2009

Original: ENGLISH

**ECONOMIC COMMISSION FOR EUROPE**

EXECUTIVE BODY FOR THE CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

Working Group on Strategies and Review

Forty-fifth session
Geneva, 31 August–4 September 2009
Item 4 of the provisional agenda*

Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)

Thirty-third session
Geneva, 7–9 September 2009
Item 6 (b) of the provisional agenda**

## WORKSHOP ON NON-BINDING ASPIRATIONAL TARGETS FOR AIR POLLUTION FOR THE YEAR 2050

Report by the Chair of the Task Force on Integrated Assessment Modelling***

* ECE/EB.AIR/WG.5/97.

** ECE/EB.AIR/GE.1/2009/1

*** This document was submitted late for document processing as clearances from relevant parties were received late.

# I. INTRODUCTION

1. This report describes the results of the workshop on non-binding aspirational targets for air pollution for the year 2050, held on 5 and 6 March 2009 in Utrecht, the Netherlands, in accordance with item 2.3 of the workplan approved by the Executive Body at its twenty-sixth session (ECE/EB.AIR/96/Add.2).

## A. Attendance

2. Fifty-four experts from the following Parties to the Convention attended the meeting of the Task Force: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Serbia, Slovakia, Spain, Sweden, the former Yugoslav Republic of Macedonia, United Kingdom of Great Britain and Northern Ireland, and the European Community. Also present were representatives from the Centre for Integrated Assessment Modelling (CIAM), the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), the Coordination Centre for Effects (CCE) of the International Cooperative Programme (ICP) on Modelling and Mapping, the Expert Group on Techno-economic Issues, ICP Materials, ICP Vegetation, the Task Force on Emission Inventories and Projections, the Task Force on Health, the Task Force on Reactive Nitrogen and the Working Group on Effects. Representatives of the European Environment Agency (EEA), the European Environmental Bureau (EEB), the Joint Research Centre (JRC) of the European Commission and the Oil Companies' European Organization for Environment, Health and Safety (CONCAWE) also participated. A member of the Convention secretariat attended.

## B. Organization of work

3. The workshop was organized by the Task Force on Integrated Assessment Modelling and the Atmospheric Composition Change European Network of Excellence (ACCENT). Mr. R. Maas (Netherlands) chaired the meeting.

## C. Welcome addresses

4. A representative of the Executive Body and Working Group on Strategies and Review welcomed participants and requested them to facilitate the policy process, which should define what we would like the environment and health status to look like in 2050. He suggested making full use of the linkages with climate and nitrogen policies.

# II. TARGET-SETTING FOR RELEVANT EFFECTS

5. The Chair of the Working Group on Effects presented the Working Group's contributions to target-setting. The workshop welcomed the availability of information on levels of no-effects

and dose-response functions, available for all main receptors, as well as the monitoring data for verification.

6. The Head of CCE presented the possibilities to focus on existing nature conservation areas or their importance for human well-being, on air pollution effects and related biogeochemical processes, and on the robustness and integrated nature of the impacts of different policies. The workshop recommended choosing aspirational effects targets as the starting point to derive required reductions of exposure, deposition, emissions and related abatement measures. It noted that effects targets should protect biodiversity and ecosystem services for human well-being. They could be based on critical or target loads, the latter aiming at ecosystem recovery in a target year defined with dynamic modelling. The workshop also took note that a full recovery in 2050 would require much more reduction in emissions than meeting the critical loads in 2050.

7. The Head of the Programme Centre for ICP Vegetation presented recent results on assessing ozone ($O_3$) effects. The workshop recommended generic flux methods be used for crops and forest trees in integrated assessment modelling. Reductions in $O_3$ flux of 75 per cent would be required across large areas of Europe to avoid significant damage. Non-exceedance of the health-related indicator SOMO35 (sum of mean 8-hour $O_3$ concentrations above 35 parts per billion (ppb)) would not be sufficient to protect vegetation in all of Europe. In Northern and Western Europe further reductions of $O_3$ concentrations would be required.

8. The representative of the Task Force on Health presented work on health impacts. The workshop recommended using the World Health Organization *Air Quality Guidelines* as aspirational targets. Policy emphasis should not be based only on fine particulate matter ($PM_{2.5}$) mass to increase the robustness. Other additional aspects should be considered, which might show to be important in future with possible emerging new evidence from science. For example, the reduction of black carbon emissions could become important as they have toxicological effects and contribute to climate change. Ultrafine particles could become more important for local air quality policy. The workshop noted that alternative approaches could be taken, inter alia, the level of no effects, practical risk management and targets with cost-effective abatement.

9. The Co-Chair of ICP Materials presented results on tolerable levels of corrosion and soiling, and use of indicator materials for infrastructure, cultural heritage and its visual appearance of material. The workshop concluded that tolerable levels for the protection of cultural heritage and infrastructure would require more reduction of sulphur than needed for the protection of ecosystems and health. Additional reductions of up to 80 per cent would be needed in urban areas.

10. The workshop concluded that targets for impact indicators should be as specific as possible and linked to a date, e.g. not more than a specified number of months of loss in life expectancy by 2050. It also noted the need for an overarching vision to realize the choice of ambitions for different effects indicators. A long-term vision could either be based on the current

aims of the 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone (Gothenburg Protocol), aiming at no adverse effects for the environment and health, but could also be combined with a vision for society, e.g. a post-fossil fuel era or an emission-free energy and transport system.

## III. EMISSION REDUCTION REQUIREMENTS TO MEET TARGETS

11. The representative of CCE illustrated the ranges of emission reductions needed in Europe to attain critical and target loads, using the latest critical load data and ecosystem-specific deposition rates. Significant additional reductions in emission and deposition levels would be required: 40–60 per cent for sulphur in Central and Northern Europe and 70–90 per cent for nitrogen across most of Europe. The linear source-receptor relationships used contained uncertainty for reductions of this range. Remaining acidification problems would be local, for which other cost-effective measures might exist, such as liming. Eutrophication and $O_3$ probably would remain Europe-wide problems and would require both end-of-pipe measures and structural and behavioural changes. Without technological innovations, the costs of such extreme control measures might be excessive.

12. The representative of the European Commission presented current long-term objectives to have no exceedance of AOT40 (accumulated $O_3$ concentration over the threshold of 40 ppb during daylight hours) and critical loads for acidification and eutrophication. The aims for 2050 were no significant damage on vegetation and forests by $O_3$ and recovery of almost all ecosystems vulnerable for acidification and eutrophication.

## IV. CO-BENEFITS FROM CLIMATE CHANGE MITIGATION

13. The representative of the European Commission presented the long-term climate targets, in particular the politically endorsed 2º C rise target of the European Union (EU), which would be possible with existing technology. The workshop took note that they would require 80–95 per cent reduction of carbon dioxide ($CO_2$) emissions in the EU by 2050, including use of external credits. Quick action was required, as risks and impacts were accumulating and later remedies would be much more costly. The non-binding interim target of a 40–55 per cent $CO_2$ reduction by 2030 could be partly implemented with emission credits outside the EU.

14. The representative of CIAM concluded that, based on scenarios developed for the Intergovernmental Panel on Climate Change (IPCC), there was a strong relation between emission reductions of $CO_2$ and air pollutants. This was clear for sulphur dioxide ($SO_2$) and partly so for nitrogen oxides (NOx). The use of biomass and the application of carbon capture and storage (CSS) would not reduce but rather increase NOx emissions. The workshop noted that detailed information on air pollutants and data from the GAINS model could be included in climate policy analysis.

15. Another representative of CIAM presented long-term energy scenarios, which predicted declining emissions of air pollutants in spite of even increasing greenhouse gas (GHG) emissions. The workshop noted that energy intensity improvements had been the major driver for both historic (1970–2010) and future (baseline 2010–2050) emission changes. Control technologies had been important for air pollutants, especially for NOx. Climate policy would not alter this trend. $CO_2$ mitigation would further decrease $SO_2$, especially in the power sector. Potential trade-offs existed for NOx and PM.

16. The representative of Netherlands presented technologies that were available to implement the lowest possible emission scenario in reports of IPCC. The workshop noted that choices of technological options in the power sector (e.g. nuclear, renewable sources, CSS) depended on the development of future coal prices and the ambition level to mitigate climate change. The most ambitious climate policy scenario could reduce $SO_2$ emissions by 80 per cent for the period 2010–2050. Reductions of NOx emissions would be 60 per cent, which was less than needed to attain critical or target loads for eutrophication by 2050. The workshop took note of the very ambitious emission reductions required to stabilize the warming to 2º C, which was theoretically feasible with known techniques and likely to require substantial use of CCS.

17. The representative of JRC gave a presentation that indicated that a cut in $CO_2$ emissions would lead to a significant improvement in health impacts in all continents, which would provide an incentive for developing countries. As emissions of $CO_2$ and $SO_2$ were related, climate policy would lead to a temporary net increase in radiative forcing in the next decades. Emissions reductions of black carbon and $O_3$ precursors could partly offset this effect. The workshop concluded that a combined climate and air pollution strategy promised the best results for both health impacts and radiative forcing, although there were trade-offs in both policies.

18. The representative of Netherlands presented a study on attaining local health benefits, which might trigger measures that were also beneficial to mitigate climate change. He noted that air pollution policy alone would not be sufficient to meet climate targets and vice versa. The workshop concluded that air pollution and climate change should not be considered in isolation, as either one of them would make it easier and significantly cheaper to reach the goals of the other.

19. The Co-Chair of the Task Force on Reactive Nitrogen presented that an emission reduction of 35 per cent for ammonia ($NH_3$) was technically feasible. The workshop noted that some measures could lead to increased nitrate and nitrous oxide ($N_2O$) emissions. An approach without pollutant swapping would result in a 20–30 per cent reduction of $NH_3$ and $N_2O$ emissions. These were modest compared to the required 70–90 per cent reduction to attain critical or target loads for eutrophication. Behavioural changes, such as human diets with less meat, were not yet included in these maximum feasible reductions.

## V. NATIONAL REDUCTION POSSIBILITIES

20. The representative of United Kingdom illustrated the implementation of reducing $CO_2$ emissions by 80 per cent for the period 1990–2050 in the United Kingdom. The results indicated that emissions in and near urban areas would decrease more than the total emission reduction. Aviation and international shipping emissions could hardly be reduced. The workshop noted that aspirational targets would help to prevent unsustainable action in energy use that might later hinder further development. An integrated view over a period of years showed that later action required larger reductions in the future.

21. The workshop received information on a long-term energy scenario for Spain. The workshop noted that only modest emission reductions could be realized before 2020 even with an ambitious climate policy, due to the turnover rate of the capital stock, as in other national scenarios. In this scenario, the sharpest fall in emissions occurred for the period 2020–2040.

22. The representative of France presented national plans to reduce $CO_2$ emissions by 75 per cent in 2050. For $PM_{2.5}$, the reduction target was 30 per cent in 2015. Another representative of France illustrated the necessity of implementing plans for behavioural changes for the transport sector. The workshop noted that long-term social support, spatial planning and investment in public transport would be crucial for the success.

23. The representative of Netherlands showed the interdependence of actions needed to change towards a zero-emissions transport system. The workshop took note that, as many actors are involved, it was important to invest in a shared long-term vision to enable short-term action and investment in a meaningful and coherent manner. A long-term vision would not mean that action could be delayed.

24. The workshop emphasized that national presentations confirmed the findings of the international scenario analyses.

## VI. CONCLUSIONS AND RECOMMENDATIONS

25. The workshop concluded that a long-term policy should start from a vision, e.g. no detrimental effects of air pollution to the environment and health. The consequent well-defined long-term policy objectives would then set the direction, e.g. sustainability, recovery and a combustion-free economy. These should be effects-based with a high ambition level, but taking into account technological and economic possibilities. Long-term quantitative aspirational targets could be based on principles of risk management, no effects or cost-effective attainment. These targets should have an attainment date. This would create a path towards the long-term target and maintain enough flexibility to tackle unpredicted developments. Interim targets for 2020 should fit this path and not lead to action and investment that would not be sustainable in the long term.

26. The workshop recommended that both climate policy and air pollution policy be developed without negative effects for other environmental issues, and that they take into account all relevant reactions in the atmosphere. Air pollution policy could profit from an ambitious climate policy. However, climate policy would not be sufficient or quick enough to solve local air pollution problems, e.g. issues related to agriculture and urban health. The use of biomass and carbon capture and storage would require clear objectives with respect to air quality to avoid solutions with negative side-effects. A combined strategy for climate and air pollution policy could create significant reductions of sulphur emissions, which could result in warming in the next decades. Emission reductions of black carbon and $O_3$ precursors could be important in terms of avoiding negative short-term climate effects.

27. The workshop took note that problems related to reactive nitrogen would remain a significant challenge for air pollution policy, as these would not be addressed by climate policy. It noted the benefits in assessing nitrogen in a scientific and coherent manner.

28. The workshop drew attention to a number of details that would require attention and decisions:

(a) The priority and need for quantitative aspirational targets for the whole United Nations Economic Commission for Europe region, for Europe, for Parties to the Convention and its protocols, or for countries;

(b) The need for intermediate non-binding targets for 2030, as significant developments, e.g. investments and technological innovations, could be possible between 2020 and 2030;

(c) The definition of the recovery of ecosystems and target ecosystems, including most sensitive ones, with a possible focus on relatively small but high-valued areas;

(d) The need to protect ecosystems from other drivers than air pollution, inter alia, climate change, land use and forestry;

(e) The coherence of abatement measures for $N_2O$ and methane, the latter being a greenhouse gas and a precursor of $O_3$.

29. The workshop agreed that the meeting had been inspiring and productive for the participants and for the development of long-term targets. It recommended that other Convention bodies develop ideas for long-term visions and for aspirational and interim targets. It further suggested that the Working Group on Strategies and Review consider ways to include a long-term vision as well as objectives and non-binding targets in the protocols.

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