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OPTIONS FOR REVISING THE GOTHENBURG PROTOCOL

REACTIVE NITROGEN

Report by the Co-Chairs of the Task Force on Reactive Nitrogen

INTRODUCTION

1. This report, prepared in cooperation with the secretariat, describes the results of the second meeting of the Task Force on Reactive Nitrogen, held on 28 and 29 April 2009 in Garmisch-Partenkirchen, Germany, in accordance with item 1.9 of the 2009 workplan for the implementation of the Convention (ECE/EB.AIR/96/Add.2) adopted by the Executive Body at its twenty-sixth session in December 2008. It also includes a description of the progress on the work to amend annex IX of the Gothenburg Protocol[1] (see annex). The presentations made during the meeting and the reports presented can be accessed at: www.clrtap-tfrn.org.

[1] 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone.

A. Attendance

2. Sixty-nine experts from the following Parties to the Convention attended the meeting of the Task Force: Austria, Belgium, Bulgaria, Canada, Czech Republic, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Norway, Poland, Russian Federation, Serbia, Spain, Switzerland and United Kingdom of Great Britain and Northern Ireland.

3. Also present were representatives from the International Cooperative Programme (ICP) on Vegetation, ICP Modelling and Mapping, Centre for Integrated Assessment Modelling (CIAM) at the International Institute for Applied Systems Analysis (IIASA) of the Steering Body to Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP), the European Community's Directorate-General Environment, the European Commission's Joint Research Centre (JRC), the European Environment Agency (EEA), and the European Fertilizers Manufacturers Association (EFMA). The Chair of the Working Group on Effects and a member of the Convention secretariat also attended.

B. Organization of work

4. Mr. O. Oenema (Netherlands) and Mr. M. Sutton (United Kingdom), Co-Chairs of the Task Force on Reactive Nitrogen, chaired the meeting. Specific work within the Task Force was chaired by Mr. S. Bittman (Canada) and Mr. W. Winiwarter (CIAM), who provided reports on the results from these topics. It was hosted by the German Ministry of the Environment, with support from the research networking programme "Nitrogen in Europe" (NinE) of the European Science Foundation (ESF) and the European Cooperation in the Field of Scientific and Technical research (COST) Action 729.

5. The Task Force mainly worked in plenary, with an emphasis of relating its work to activities within and outside the Convention linked to reactive nitrogen (Nr) and an integrated approach to the management of the nitrogen (N) cycle. It also divided into discussion groups to compile information for support to the revision of the Gothenburg Protocol. These groups reported their conclusions to the Task Force.

I. INTRODUCTORY REMARKS

6. The two Co-Chairs of the Task Force on Reactive Nitrogen and the representative of the Convention secretariat provided introductory information on the activities of the Task Force, the Convention and their workplans, including recent additional advice from the forty-fourth session of the Working Group on Strategies and Review in April 2009. The Task Force acknowledged that its priority task at this time was to update annex IX of the Gothenburg Protocol, which was also linked to work on evaluating the need to amend the Guidance document on control techniques for preventing and abating emissions of ammonia (NH_3) (EB.AIR/WG.5/2007/13; hereinafter the Guidance Document) and the Framework Code on Good Agricultural Practice for Reducing NH_3 (hereinafter the Framework Code). The Task Force agreed that the links to the

methodologies to improve emission inventories were important. It took note that its second priority at this time was the development of an integrated approach to inform the policymakers on the N cycle and links to air pollution policy.

7. Mr. Bittman presented a tentative proposal on possibilities to amend annex IX of the Gothenburg Protocol, in particular including in the text various NH_3 emissions abatement options, their effectiveness and applicability. The Task Force took note of the importance of ensuring that sufficient information was presented in appropriate documentation accompanying annex IX. It further noted that amended annex IX would be part of an official text, which the Parties would need to consider with respect to national implementation before ratification of a whole Protocol.

8. Mr. Oenema provided the Task Force the guidance received from the forty-fourth session of the Working Group on Strategies and Review in April. He noted that the Working Group had invited the Task Force to present a draft technical annex on NH_3 for discussion at the Working Group's next session. He drew attention to the sections in the Gothenburg Protocol that addressed NH_3: article 3, items a and b; annex II, table 3; annex IX; and the references for the Framework Code and Guidance Document. The Task Force took note of the limited possibilities to include description of an integrated approach on N in amendments to annex IX, though it would help in presenting the synergies and tradeoffs of various abatement options. It noted that the full N cycle should be taken into account in an appropriate section of the Protocol. It also emphasized the need to ensure that non-agricultural emissions of NH_3 were sufficiently addressed by the emission inventory work under the Convention.

9. Mr. Winiwarter reported on the work on N budgets at different spatial scales. He noted that experts on budgets were also involved in three chapters of the European Nitrogen Assessment (ENA), which provided useful input for the aims of the Task Force. The Task Force welcomed the links to work of the Task Force on Emission Inventories and Projections and encouraged to continue the collaboration.

10. The recently finalized integrated N strategy for Germany was presented by the representative of Germany and the representative of the Chair of ICP Modelling and Mapping. They stressed that an integrated approach to Nr management consisted of: (a) an effects assessment oriented to environmental quality; (b) a Nr budget encompassing all relevant emission sources, fluxes and receptors of reactive N; and (c) an evaluation of measures and instruments, taking into account abatement effectiveness, related costs, and synergies and tradeoffs with other Nr emissions or environmental quality targets. The integrated approach also served as an instrument to communicate the issue and to support policy development and decision-making despite existing uncertainties. The Task Force took note of the usefulness of N budgets to check on inconsistencies in data and to communicate results to policymakers.

11. The Vice-Chair of the Bureau of the Working Group on Effects presented the effects-oriented research under the Convention. The Task Force noted that it continued to benefit from

the scientific basis and research networks of the Working Group on Effects when evaluating the effects of Nr on ecosystems, materials and human health.

12. Another Vice-Chair of the Bureau of the Working Group on Effects reported the effects of Nr on ecosystems using various examples of chemical and biological changes observed at sites and modelled across Europe, supported with photographs documenting the visible changes in receptors. The Task Force noted the effectiveness of using such visual evidence in communicating the impacts of Nr to policymakers, and supported the plan of the Working Group to publish an easy-to-understand and colourful booklet about the effects of Nr on ecosystems.

II. NATIONAL EXPERIENCES ON NITROGEN POLICIES

13. The Task Force welcomed the information by the representative of Canada reported on the status of Nr in Canadian ecosystems and national research activities. The most intense N emissions sources and their effects are localized. Canada was developing an integrated Nr science approach in order to inform policymakers on the full implications of the N cycle.

14. The Task Force also welcomed further national reports: (a) the representative of Hungary reported on research results on N budgets and exchange between different media, in which NH_3 played an important role, and on the national legislation to abate Nr emissions; the representative of the Czech Republic presented work on N budgets in a network of 14 sites, and the results indicated appropriate fertilization levels for different crops and emphasized that N leaching was underestimated; and (c) the representative of Bulgaria reported on current Nr management practices and related national legislation.

15. The representative of the North-West Research Institute of Agricultural Engineering And Electrification in the Russian Federation reported on the activities of the focal point to link with relevant research institutions and companies to establish a network of experts on Nr. She also announced the workshop on Nr in agriculture in the Russian Federation and countries in Eastern Europe, the Caucasus and Central Asia (EECCA), with an emphasis on the current state of research and practice. It was tentatively scheduled to be held in September 2009 in Saint Petersburg, Russian Federation. The Task Force welcomed the activities in the Russian Federation, the initiative to have a workshop aimed at promoting the abatement of NH_3, and encouraged active participation in the planned workshop.

III. WORK UNDER OTHER INTERNATIONAL CONVENTIONS AND ACTIVITIES

16. The representative of the European Commission reported on the review and revision of the European legislation on NH_3 and environmental attainment with current policies. The objectives established by the thematic strategy on air pollution would not be met without further action. The full implementation of the Nitrate Directive of the European Union (EU), which was aimed at preventing and reducing the water pollution caused by nitrates from agricultural sources, is estimated to have a positive side effect in reducing NH_3 emissions by 9 per cent. The

Task Force took note of the interaction between policy instruments in regard to achieving the targets set by international processes.

17. The representative of the activities in combating eutrophication in the Baltic Sea under the Convention on the Protection of Marine Environment of the Baltic Sea Area (HELCOM) reported on efforts, which had been taken to reduce nutrient inputs from various sources to prevent further eutrophication, and were being further strengthened by the 2007 Baltic Sea Action Plan.

18. The representative of the Netherlands reported on the launching of the new United Nations Environment Programme global partnership in nutrient management to be presented to the United Nations Commission on Sustainable Development. The programme's primary goal was to facilitate knowledge-based partnerships between and within countries to avoid nutrient over-enrichment with tools to identify and implement cost-effective solutions tailored to individual circumstances. The Task Force took note of the new process and encouraged its delegates to be in contact with the relevant national representatives to the Commission.

19. Mr. Sutton reported on the progress with ENA. The final results of the assessment were to be published in 2011. Many of the chapters would provide useful information for the work under the Task Force, including links to all relevant international conventions. The Task Force took note of the work of ENA in reviewing the possibilities for more effective coordination between Nr management issues in international conventions in future.

20. The representative of JRC described the Sevilla process, which comprised work on the elaboration and review of the best available techniques (BAT) reference documents (BREFs) in the European Bureau on Integrated Pollution Prevention and Control (IPPC). The Task Force took note that BREFs covered many issues addressed by annex IX of the Gothenburg Protocol.

21. The representative of the Association for Technology and Structures in Agriculture in Germany presented preliminary results on "BAT support" project supporting BAT for European intensive livestock farming, which linked to the national implementation of the IPPC Directive of the EU. He noted the need to use various performance indicators on control options and related costs to ensure that overall best options could be chosen for policy.

IV. NITROGEN AND ANIMAL PROTEIN

22. The representative of Imperial College in the United Kingdom reported on the application of multi-criteria decision analysis to NH_3 control strategies. She emphasized the importance of changes in consumer behaviour, as changes in diet could reduce abatement costs and have additional side-benefits compared with technical measures.

23. Mr. Oenema presented work on human diets and direct effects on the environment. The amount of animal protein consumed was linked to various environmental effects, e.g. land use,

greenhouse gas emissions and biodiversity. The Task Force took note of the fact that high rates of meat consumption in human diets could have adverse effects on the environment through losses of Nr, and that lowering meat consumption had various beneficial effects, including a substantial lowering of the societal cost for mitigation NH_3 and greenhouse gas emissions. It also noted that impacts on land use were significant and needed to be considered more in detail.

24. The Task Force took note of the importance of the impacts of diet choices to N cycle. It agreed to establish an expert panel on N and human food. It would assess the effects of plant and animal originated protein use on the environment, and to provide options for improving Nr use efficiency. The panel would report its findings to the meetings of the Task Force for its consideration.

V. WORKING GROUPS

25. Mr. Bittman reported different ways to present tentative amendments to annex IX of the Gothenburg Protocol. The Task Force had made considerable progress in agreeing on many issues on amending annex IX. It took note that it was not able at short notice to provide an agreed amendment proposal on annex IX. It decided to describe the progress and possible options for the consideration by the forty-fifth session of the Working Group on Strategies and Review in September 2009 (see annex).

26. The Task Force also decided to have an additional meeting in the latter part of 2009 to be able to develop a proposal of a draft amendment text for annex IX of the Gothenburg Protocol. The draft amendment text would be prepared well in advance before the meeting. The Task Force invited the secretariat to ensure that the additional meeting would be included in the official 2009 calendar of meetings of the Convention.

27. The representative of the Energy Research Centre of the Netherlands) presented a proposal for a text to describe an integrated approach to N as part of a possible amendment to annex IX of the Gothenburg Protocol. The Task Force agreed on the text on integrated consideration of Nr in the environment: “Parties shall safeguard that measures targeted towards NH_3 abatement minimize Nr release in other chemical forms or to other environmental media as covered in relevant international agreements. Likewise, synergies of measures not primarily targeted at NH_3 emission reduction should be taken into account. Parties should/shall ensure that the Advisory codes of good agricultural practices, referred to in section A of annex IX, will describe in more detail: (a) an integrated way to consider Nr in the environment; (b) measures that suggest successful abatement of reactive N; and (c) instruments (indicators) to control the success of such measures.” The Task Force agreed to propose a text describing an integrated approach to N to the forty-fifth session of the Working Group on Strategies and Review for its possible inclusion in the Gothenburg Protocol.

VI. RESULTS FROM WORK IN 2009

28. The Task Force took note of the successful fulfilment of its 2009 workplan items. It noted, in particular:

(a) Contributions to the status report on the impacts of airborne N on the environment and human health, drafted by the Bureau the Working Group on Effects;

(b) Collaboration with the ICP Modelling and Mapping, in particular developing indicators on biodiversity;

(c) Collaboration with the Task Force on Emission Inventories and Projections and its experts on emissions from agricultural and natural sources, in particular when revising the NH_3-related documents;

(d) Contributions to the elaboration of aspirational targets for 2050 with the Task Force on Integrated Assessment Modelling;

(e) Establishment of links in technical collaboration with several international processes relevant to Nr;

(f) Initial N budgets in selected countries and regions, and the need to provide details on this for revising NH_3-related documents;

(g) Establishment of national focal points in 20 countries, 6 of which had provided national reports on the Task Force on Reactive Nitrogen;

(h) Participation in the work of ENA and dissemination of findings for the Task Force, including collaborative work on N budgets.

(i) Contributions to the revision of annex IX of the Gothenburg Protocol, the Guidance Document and the Framework Code.

VII. FURTHER WORK

29. The Task Force agreed on its draft 2010 workplan items:

(a) To continue improving coordination of activities across and outside the Convention and collaborate with subsidiary bodies under the Convention to complement the work of the subsidiary bodies of the Convention, in particular by collaborating:

(i) With the ICP Modelling and Mapping, in particular on critical loads and dynamic modelling of N effects, including the development of indicators through the use of N budget approaches;

(ii) With the Task Force on Emission Inventories and Projections to prepare a joint workshop on agricultural emission projections and to continue ensuring consistency between development of emission estimates and the estimation of efficiencies of agricultural emissions abatement;

(iii) With the Task Force on Integrated Assessment Modelling, participating in relevant meetings, in particular providing advice to avoid pollutant swapping,

considering aspirational targets and effects of human behaviour including dietary choices;

(b) To continue the work of the former Expert Group on Ammonia Abatement; to develop technical and scientific information on an integrated approach to mitigation of agricultural N emissions with particular reference to the revision of the Gothenburg Protocol, and in particular to update the Framework Code and the Guidance Document; to inform the Working Group on Strategies and Review's deliberations on revisions to annex IX of the Gothenburg Protocol; and to take account of reference documentation on the application of BREFs;

(c) To continue providing technical information on making and using N budgets and estimating N emissions at various spatial scales and for various system boundaries;

(d) To continue developing and providing technical and scientific information to support the revision of the Gothenburg Protocol in relation to the whole N cycle;

(e) To request the national focal points to report their experiences, including any difficulties that they have in developing and implementing an integrated approach;

(f) To further consider the results from ENA;

(g) To provide technical information on the effects of human diets on the Nr use and emissions;

(h) To hold the Task Force's fourth meeting, tentatively scheduled to be held in May 2010, and to submit its report.

Annex

REPORT ON WORK IN PROGRESS ON ANNEX IX OF THE GOTHENBURG PROTOCOL

I. INTRODUCTION

1. The current annex IX of the Gothenburg Protocol has ten provisions, including:

(a) The requirement for Parties to establish an advisory code of good agricultural practice to control NH_3 emissions, with provisions on:

(i) N management, taking account of the whole N cycle;
(ii) Livestock feeding strategies;
(iii) Low-emission manure spreading techniques;
(iv) Low-emission manure storage systems;
(v) Low-emission animal housing systems;
(vi) Possibilities for limiting NH_3 emissions from the use of mineral fertilizers;

(b) Mandatory measures and quantitative emission reduction targets for:

(i) Urea and ammonium carbonate fertilizers;
(ii) Manure application;
(iii) Manure storage on large poultry and pig operations;
(iv) Animal housing on large poultry and pig operations.

2. The underpinning for the mandatory measures and emission abatement targets are provided in the Guidance Document on control techniques for preventing and abating emissions of ammonia (EB.AIR/WG.5/2007/13).

II. CONCLUSIVE REMARKS

A. General options

3. The Task Force agreed on the general procedure that any proposals for emission abatement techniques and targets in the annex IX should be accompanied by scientifically sound underpinning in the accompanied Guidance Document and by an explanatory note in order to provide scientific underpinning for each proposed option on each section of the annex IX.

4. The Task Force agreed on the general procedure that all options and techniques described in the Guidance Document would be categorized into one of the three following categories, namely:

(a) **Category 1 techniques.** These were well researched, considered to be practical, and there were quantitative data on their abatement efficiency, at least on the experimental scale;

(b) **Category 2 techniques.** These were promising, but research on them at present was inadequate, or it will always be difficult to quantify their abatement efficiency. This did not mean that they could not be used as part of an NH_3 abatement strategy, depending on local circumstances.

(c) **Category 3 techniques.** These had been shown to be ineffective or were likely to be excluded on practical grounds.

5. The Task Force agreed that possible proposals for ambition levels for emission abatement should reflect different categories of techniques and/or implementation levels, in agreement with the suggestions of the forty-fourth session of the Working Group on Strategies and Review in April 2009.

6. The Task Force considered low-protein animal feeding as one of the most cost-effective and strategic ways of reducing NH_3 emissions, and that the list of mandatory measures in the current annex IX should be extended by provisions on low-protein animal feeding.

7. The Task Force considered that N management, taking account of the whole N cycle was one of the most strategic ways of reducing NH_3 emissions.

8. The Task Force defined N management in agriculture as “a coherent set of activities related to N use in agriculture to achieve agronomic and environmental and/or ecological objectives”. It emphasized the need to consider all aspects of N management and all objectives in a balanced manner.

B. Manure and fertilizer application

9. The Task Force took note of several ambition levels for NH_3 emissions abatement from spreading animal slurries to land. These would be related to different degrees of requirement to use low-emission spreading techniques (as specified in the Guidance Document).

10. The Task Force took note of several ambition levels for NH_3 emissions abatement from spreading solid manure to land. The levels would relate to different degrees of requirement to incorporate the manure into the ground.

11. The Task Force took note of different ambition levels related to techniques for NH_3 emissions abatement from the application of urea-based fertilizers. These would include the possibility of restrictions to the usage of urea-based fertilizers.

12. The Task Force took note of substantial co-benefits from using low-emission manure spreading techniques. These included financial savings by reducing Nr losses, allowing reduced

fertilizer inputs, by potential for increased agronomic flexibility, and by, in the case of organic manures, a parallel reduction in odour emissions. The Task Force also noted that, in some cases, the economic benefit to the farmer of using low-emission application methods outweighed the costs of applying these measures.

C. Animal housing and manure storage

13. The Task Force took note of several ambition levels related to the application of different techniques for NH_3 emissions abatement from manure storage on large poultry and pig farm operations.

14. The Task Force noted various ambition levels related to application of different techniques were proposed for NH_3 emissions abatement from animal housing systems on large poultry and pig farm operations.

15. The Task Force took note of different ambition levels related to the application of different techniques for NH_3 emissions abatement from manure storage on large cattle farms

16. The Task Force noted that the present text of annex IX did not include any provisions for the mitigation of NH_3 emissions from cattle housing and the storage of cattle manure. Given the substantial contribution of these sources to overall NH_3 emissions in the Economic Commission for Europe (ECE) region, the Task Force agreed that it would be vital to include such options. On the basis of the elaborated discussions and review reports, the Task Force discussed several ambition levels related to different requirements to apply low-emission techniques for NH_3 emissions abatement from large cattle housing systems.

17. The Task Force noted that the development of animal welfare regulations by EU would lead to prohibition of the reference housing method for some animal categories (e.g. cattle (tied stalls) and for laying hens (cages)). These changes may also increase NH_3 emissions per animal. The Task Force noted that the structural changes required to meet such animal welfare objectives could provide the opportunity for synergies to include NH_3 mitigation options with a reduced cost of implementation. As with manure spreading measures, reduction in NH_3 emissions provides co-benefits in conserving the financial value of manure N in the farming system, and, in many cases, parallel reductions in particulate matter and odour emissions.

D. Implementation time and farm size categorization

18. The Task Force noted that the costs of implementing low-emission techniques would in some cases depend on the number of years allowed before implementation of any mandatory requirements. For example, any mandatory requirements to use low-emission technologies for animal housing, manure storage and manure spreading would be cheaper to install if a long-term implementation period was set before such techniques were required (e.g. 2020, 2025). This

would facilitate gradual change in the industry, as well as allow for benefits to be taken in developing the economies of scale.

19. The Task Force noted that there were varying degrees of feasibility to implement technical measures based on the size of farm holdings. For low-emission techniques for the spreading of slurries, the use of specialist contractors had been shown to reduce costs, making these techniques more available to small farms. By contrast, the smallest farms would find it difficult to implement many other technical measures.

20. The Task Force noted that there were several possibilities to consider farm sizes, including the use of indicators based on: numbers of animal places, numbers of livestock units, and annual amount of N excreted (either total or for livestock while not grazing).

21. The Task Force took note on the proposal to classify farm sizes in three categories: (a) large industrial-scale intensive farming operations; (b) medium-sized farms; and (c) small farm holdings, including those operated as part-time operations. The distribution between these headings would vary between livestock type and across the ECE region.

22. The Task Force noted that the large intensive farms could be considered for an industrial perspective to emission reduction, requiring the application of BAT. For the medium size farms, many low-emission technologies could also be applied. By contrast, for the small farm holdings, in many cases it would be difficult to apply low-emission technologies. Were mandatory measures to be agreed, a possible approach would be to provide full exemption to the smallest farm holdings from any mandatory requirements.

23. The Task Force noted that the use of such a farm size classification would lead to an overall reduced level of mandatory requirements in regions where small farms comprised a significant fraction of all farms, such as countries with economies in transition.

24. The Task Force noted that further development was required by the Task Force to address such farm size classifications, to consider the most suitable size class ranges to classify farm sizes in three categories, as proposed above, and the indices used to define them, including those for cattle farming.

25. The Task Force noted that a general principle that any mandatory options should consider the need for special provisions to allow other exemptions. This would make these options more practical to implement and thereby possibly encourage ratification of the amendments.
