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**ECONOMIC COMMISSION FOR EUROPE**

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

Working Group on Strategies and Review

Thirty-ninth session  
Geneva, 17–20 September 2007  
Item 3 of the provisional agenda

**REVIEW OF THE 1999 GOTHENBURG PROTOCOL**

**AMMONIA ABATEMENT**

Report by the Co-Chairs of the Expert Group on Ammonia Abatement

1. This report presents the results of the eighth meeting of the Expert Group on Ammonia Abatement, held in Braunschweig, Germany, on 26 April 2007, in accordance with item 1.8 of the 2007 workplan (ECE/EB.AIR/2006/11) adopted by the Executive Body at its twenty-fourth session (ECE/EB.AIR/89). Results of the session of the Expert Group with an expert panel on agriculture and nature of the Task Force on Emission Inventories and Projections held on 27 April 2007 are reflected in the annex<sup>1</sup>.

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<sup>1</sup> Documents and presentations from both meetings are available at: <http://tfeip-secretariat.org/unece.htm>, under “expert panel on agriculture and nature”. They can also be accessed at: [http://www.djfgeo.dk/njh/TFEIP/Braunschweig\\_2007/For\\_internet.htm](http://www.djfgeo.dk/njh/TFEIP/Braunschweig_2007/For_internet.htm).

2. Experts from the following Parties to the Convention attended the meeting: Austria, Canada, the Czech Republic, Denmark, Finland, Germany, Ireland, Italy, the Netherlands, Poland, Switzerland and the United Kingdom of Great Britain and Northern Ireland. The European Fertilizer Manufacturers' Association (EFMA) and the Spanish National Association of Producers of Pig Cattle (PigCHAMP Pro Europa/ANPROGAPOR) were also represented. A representative of the EMEP Centre for Integrated Assessment Modelling (CIAM) and a member of the UNECE secretariat also attended.

3. Mr. K. Smith (United Kingdom), the newly appointed Chair of the Expert Group, and Mr. M. de Bode (the Netherlands) co-chaired the meeting. Mr. U. Dämmgen of the German Federal Agricultural Research Centre opened the meeting and welcomed the participants.

### **I. REPORT ON THE WORKSHOP ON ATMOSPHERIC AMMONIA**

4. Mr. M. Sutton (United Kingdom) reported on the Workshop on Atmospheric Ammonia: Detecting Emission Changes and Environmental Impacts, which had been held from 4 to 6 December, in Edinburgh, United Kingdom, in line with the workplan of the Expert Group. The Working Group on Strategies and Review had taken note of the conclusions and recommendations of the workshop at its thirty-ninth session (ECE/EB.AIR/WG.5/2007/3)<sup>2</sup>.

5. The Expert Group noted in particular the following findings from the Workshop:

(a) Critical levels for ammonia had not been sufficiently precautionary and new values were set. The Expert Group noted that the International Cooperative Programme (ICP) on Vegetation and the ICP on Mapping and Modelling had adopted them for future use;

(b) The Netherlands had reported that the Dutch "ammonia gap" (i.e. the discrepancy between emissions-based and measured ammonia concentrations) had been closed in the sense that the trend with time had become consistent between measurements and modelling. However, an absolute difference between measurements and models still remained, owing either to an underestimation of emissions or an overestimation of dry deposition;

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<sup>2</sup> Report on the Workshop submitted to the thirty-ninth session of the Working Group on Strategies and Review is available at: <http://www.unece.org/env/wgs/docs39th%20session.htm>.

- (c) The ammonia air concentrations in the Netherlands and Denmark had fallen, indicating that the reduction measures taken had been effective;
- (d) Uncertainty in emissions had not been properly addressed by most countries;
- (e) Local assessment models for hot spots were needed;
- (f) Integration of policies on nitrate, ammonia and particulate matter was recommended. Ammonia abatement policies should be considered within a multi-effect (human health, greenhouse gases, acidification, eutrophication, and impacts on biodiversity), multi-media (air, water, soil) and multi-scale (local, regional, global) framework.

## **II. REPORT ON INTERNATIONAL AMMONIA CONFERENCE IN AGRICULTURE**

6. Mr. N. Ogink (the Netherlands) reported on the International Ammonia Conference in Agriculture that was held from 19 to 21 March 2007 in Ede, Netherlands.

7. The Expert Group noted the following conclusions from the Conference:

- (a) Promising abatement options involved animal feeding, low cost measures (so-called “soft measures”), and integrated measures (i.e. measures taking account of the entire production cycle and possible “pollution shifts”);
- (b) It was considered important to take an integrated approach to research, including through establishing better links between research on emissions and modelling as well as between deposition (the ammonia gap) and ammonia emissions, considered in the context of the nitrogen (N) cycle;
- (c) Communication with consumers was seen as essential. Consumers should be aware of polluting emissions from ammonia and their sources. To this end, participants suggested considering the introduction of an “Environmentally friendly production” label, drawing an analogy with the successful “Fair Trade” movement;
- (d) Over-regulation (as well as mutually conflicting regulation) should be avoided. A more flexible approach to regulation was also considered important.

8. The Expert Group agreed that the conclusions from the Conference should be considered in connection with the Guidance Document on Control Techniques for Preventing and Abating Emissions of Ammonia, and should be taken up in any possible future updates of the document.

### **III. PROPOSALS TO ESTABLISH AN EXPERT GROUP ON INTEGRATED NITROGEN**

9. Mr. Sutton informed the Expert Group about the outcomes of the workshop “Air pollution and its relations to climate change and sustainable development - linking immediate needs with long term challenges” (“Saltsjöbaden III”), which was held from 12 to 14 March 2007 in Gothenburg, Sweden, to discuss future challenges for the Convention<sup>3</sup>. One of the matters discussed at the workshop was the need to integrate action on losses of nitrogen compounds. A major conclusion was that the Convention provided a suitable framework within which to develop an integrated approach to controlling nitrogen pollution, including ammonia, nitrogen oxides, nitrous oxide, nitrate leaching and the wide range of problems associated with these losses.

10. The Expert Group was also informed furthermore about the outcomes of the discussions by the Working Group on Strategies and Review at its thirty-ninth session on the findings of the “Saltsjöbaden III” Workshop and the Edinburgh Ammonia Workshop. In response to the issues raised, the United Kingdom and the Netherlands had proposed establishing a group/task force on integrated nitrogen: one option was to redevelop (or to expand the remit of) the current Expert Group on Ammonia Abatement. The new group would have a number of objectives, including enhancing coordination between existing bodies under the Convention and considering the development of integrated strategies within the Convention. The Working Group had welcomed the proposal of a task force on integrated nitrogen and had invited the United Kingdom and the Netherlands to discuss and make recommendations for developing it further. It was pointed out that the Executive Body was reluctant to increase the number of its subsidiary bodies.

11. The Expert Group noted that the proposed changes were consistent with the conclusions of the International Ammonia Conference in Agriculture, which recommended that more work be done on integrating abatement measures for ammonia and other nitrogen compounds.

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<sup>3</sup> ECE/EB.AIR/WG.5/2007/9. The conclusions and other material from the workshop can be found at <http://asta.ivl.se>.

12. While in principle the Expert Group agreed that setting up a group on integrated nitrogen was likely to bring benefits, it listed a number of issues to be further considered:

(a) Clarification was needed as to how the role of the new group would differ from that of the other groups working on nitrogen under the Convention, in addition to the Expert Group on Ammonia Abatement. These included the Task Force on Emission Inventories and Projections and the Task Force on Measurements and Modelling under EMEP<sup>4</sup>, as well as the ICPs under the Working Group on Effects. In addition, nitrogen was covered to a significant extent by the Task Force on Integrated Assessment Modelling. Activities outside the Convention, such as the Nitro-Europe Integrated Project, were also mentioned. Any terms of reference and/or mandate should therefore need to relate clearly to the activities and responsibilities of these existing groups;

(b) One of the roles of a new group should be to encourage better communication between the existing bodies under the Convention concerning the emission of nitrogen compounds and strategies to respond to them;

(c) Some concerns were expressed as to the capacity of a new specialized group on nitrogen to fulfil its role within the existing structure of the Convention, given the already substantial workload of the existing groups;

(d) There was a need for the experts to exchange experience and update guidance on the practical methods of reducing ammonia emissions, and this applied as well to other losses of nitrogen compounds;

(e) If an integrated nitrogen protocol was to be developed under the Convention, a key issue to be addressed would be the setting of sensible targets for which integrated assessment methods would need to be developed. This implied a need for effective cooperation with the Task Force on Integrated Assessment Modelling;

(f) The new group would need to take a wide strategic approach. In particular, a key requirement would be for it to establish effective linkages between the Convention and across the other relevant conventions, such as the United Nations Framework Convention on Climate

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<sup>4</sup> The Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe.

Change (UNFCCC) and the Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention).

13. The Expert Group was, in general, favourable towards the proposals. The current members of the Expert Group had expertise in agronomy, soil science, agricultural engineering and economics as well as in ammonia emissions and deposition, but additional expertise would be needed in some areas to address integrated nitrogen, e.g. on nitrous oxide (N<sub>2</sub>O), nitrate (NO<sub>3</sub>), the nitrogen cycle (nitrogen fluxes and interdependencies), and non-agricultural sources of nitrogen emissions. Most importantly, a higher-level strategic approach might be necessary, since most of the representation of the current Expert Group focused on the technical matters of ammonia and abatement. The Expert Group considered that further direction from the Working Group and the Executive Body on this matter was required.

#### **IV. TECHNICAL UPDATES**

14. The Expert Group took note of the following technical updates provided:

- (a) Farm activity data in Austria (Ms. B. Amon, Austria);
- (b) Scaling up of ammonia abatement from using woodlands (Mr. S. Reis, United Kingdom);
- (c) Costs and efficiency of manure application techniques (Mr. K. Smith, United Kingdom);
- (d) International harmonization of measurement protocols for air scrubbers (Mr. N. Ogink, the Netherlands);
- (e) Harmonization of categorization of best available techniques (BAT) for animal housing and manure management (Mr. N. Ogink).

#### **V. GUIDANCE DOCUMENT ON AMMONIA AND CODE OF GOOD AGRICULTURAL PRACTICE**

15. At its seventh meeting (Pruhonice, Czech Republic, April 2006), the former chairman of the Expert Group, Mr. J. Webb (United Kingdom), had informed the Group of progress in the revision of the Guidance Document on Control Techniques for Preventing and Abating Emissions of Ammonia (EB.AIR/1992, chapter V). The Group had considered the document as finalized. It had agreed that the document should be submitted to the thirty-eighth session of the

Working Group on Strategies and Review as an informal document (in English only) to be considered within the review of the Gothenburg Protocol, and if there was no need for additional changes, that it be issued as an official document in 2007.

16. Since the thirty-eighth session of the Working Group, the Guidance Document has been only slightly modified on the basis of comments received from the Netherlands, on bio-scrubbers, and from the Russian Federation, on building ventilation control. In line with the Dutch recommendation, the Expert Group agreed to consider air scrubbers as a category 1 technique as regards new buildings in countries where they are considered to be practical, such as in Denmark, Germany and the Netherlands. However, for countries in Southern and Eastern Europe, where there was a lack of practical experience of scrubbers, these should remain as category 2. The Group agreed that the description of air scrubbers of the Guidance document would be adapted accordingly and circulated to the members of the Expert Group for comments.

17. It had been an agreement for the Expert Group to consider an update of the Code of Good Agricultural Practice (EB.AIR/WG.5/2001/7), so as to ensure agreement between the Code of Practice and the Guidance Document. However, the Expert Group felt that the Code would be more likely to fall within the remit of the proposed new group on integrated nitrogen. Ms. Amon pointed out that all Parties to the Gothenburg Protocol were required to develop and adopt their own code. Moreover, some countries had already adopted either multiple codes or a multi-media (e.g. air, water, soil) code. The Expert Group recommended that a technical update of the Code of Practice be one of the first tasks for the proposed group on integrated nitrogen.

## **VI. OTHER ISSUES**

18. At its last meeting, the Expert Group had requested an informal group to propose a method to assess the cost of abatement techniques. The group had sent around a proposal for feedback, but had received no comments. Although there was a European Union project on harmonization and categorization of best available techniques (BAT) techniques for animal housing and manure management, the proposal was still considered useful. The group was therefore invited to continue their work and to re-circulate their proposal.

19. The Expert Group considered the possibilities for developing a proposal for EU funding for a concerted approach for collection of farm activity data across Europe. The need for improved farm activity was now widely acknowledged. However, a suitable call for projects had not been identified. The Group suggested that the proposal be developed, if possible, in cooperation with the European Commission (Directorates for the Environment and Agriculture). Furthermore, the Group agreed that its Co-Chair, Mr. K. Smith, should follow this up with Italy (with the Agency for Environmental Protection and Technical Services (APAT)) and the

Statistical Office of the European Communities (Eurostat), in particular to find out about any existing plans of Eurostat to improve this information.



Annex

Results of the meeting of the Expert Group on Ammonia Abatement with an expert panel on agriculture and nature of the Task Force on Emission Inventories and Projections  
(Braunschweig, Germany, 27 April 2007)

1. Mr. U. Dämmgen (Germany) and Mr. N. Hutchings (Denmark) chaired the meeting and introduced its objectives.
2. They informed the meeting about the revision of the EMEP/CORINAIR Atmospheric Emission Inventory Guidebook (“the Guidebook”). The meeting considered, in particular, the definition of the new Tier system, the structural changes to be made, the harmonization with the Intergovernmental Panel on Climate Change (IPCC) Guidelines, and the review of inventories.
3. The meeting:
  - (a) Agreed that if the quality of inventories was to be maintained and improved, it would be necessary to make the stage 3 review process permanent. This would be particularly important where Parties choose to use a Tier 3 methodology;
  - (b) Discussed its role in the revision and future maintenance of the Guidebook. Its members emphasized the importance of conducting a peer review of the Guidebook prior to its approval.
4. The meeting was informed about the status of the draft chapters of the Guidebook related to agriculture and discussed the need for updating and improving them. It made the following conclusions:
  - (a) Chapter 1001 (Cultures with fertilizers, dating from 2003) would have to include emissions from senescence;
  - (b) Chapter 1002 (Cultures without fertilizers, dating from 2003) would have to improve the treatment of legumes. Chapters 1001 and 1002 should be merged;
  - (c) Chapter 1003 (Stubble burning, dating from 1996) clearly needed more attention;
  - (d) Chapter 1004 (Enteric fermentation, dating from 2002) would refer to IPCC methodologies throughout. The Guidebook chapter would have to stress the necessity to perform the energy balance in accordance with the carbon and nitrogen balances;

(e) In chapter 1005 (Manure management regarding organic compounds, dating from 2002), methane emissions would be treated in the IPCC Guidelines. The Guidebook needed to deal with non-methane volatile organic compounds (NMVOC) emissions, whose treatment was still a problem;

(f) Chapter 1006 (Pesticides and limestone, dating from 2003) would introduce carbon dioxide emissions from the application of urea (as does IPCC). No other changes were anticipated;

(g) Chapter 1009 (Manure management regarding nitrogen compounds) had been updated and was almost complete. However, as all chapters dealing with emissions from animal husbandry would have to consider animal losses during the production process, this needed some attention. A methodology to derive nitrogen excretions had yet to be written. Treatment of straw would have to be considered in connection with chapter 1002.

(h) Chapter 1010 (Particle emissions from animal husbandry, dating from 2006). Measurements had been performed at present, which were likely to improve the database. The chapter on particle emissions from plant production was almost complete. A conference titled "Particulate matter – PM – in and from agriculture" would be held in connection with the work on chapter 10XX, at Braunschweig on September 3 and 4, 2007

5. The meeting also agreed on the following items to be treated in the near future within the Guidebook:

(a) Projections: Projections had to be provided regularly. At present, no guidance was available which standardized the making of projections. The Task Force on Emission Inventories and Projections should address this issue using its new panel on projections. The respective IPCC documents would be helpful;

(b) Organic Farming: The description of processes in organic farming did not differ from conventional farming in principle. Thus, Tier 2 methods were applicable in organic farming without additional information. However, guidance had to be provided wherever possible to allow the treatment of organic farming using default factors. Typical default emission factors would have to be developed;

(c) Biogas from animal manures: Biogas plants dealing with fermentation of animal manures were to be dealt with in chapter 1005. Typical plants had to be described and a methodology should be established in accordance with IPCC (2006), chapter 1004 (Methane

emissions from manure management). Ammonia emissions from the digestate would have to be treated in Chapter 10.09 (storage, application, incorporation). The lack of activity data was considered to be a problem;

(d) Biogas from fermentation of energy crops and organic residues needed to be considered. In principle, this was an IPCC field of activity and work should be done in close co-operation with IPCC. The mechanisms for CH<sub>4</sub> emissions were described. Emission factors for ammonia, methane and nitrous oxide emissions from digestate stores were missing. The lack of activity data was considered to be a problem;

(e) New technologies: A paragraph should be added to the introduction: "Each country can include new technologies in their inventory as long as the new technology has been peer reviewed, published and is documented properly". The meeting did not see a necessity for a specific chapter on new technologies.

6. The meeting considered that its workplan needed to be coordinated with the contractors employed by the European Union for the Guidebook revision. The experts at the meeting would concentrate on Tier 3 but needed to make the contractors aware of Tier 1 and 2 methodologies for new sources (e.g., see above 5 (c)).

7. Mr. B. Reidy (Switzerland) gave an overview of the activities of the European Agricultural Gaseous Emissions Inventory Researchers Network (EAGER) ([www.eager.ch](http://www.eager.ch)) relating to the estimation of ammonia emission from manure management systems. Work on the congruency of methods to estimate ammonia emission from liquid manure management systems was described in a scientific paper to be published. Work had now moved on to farmyard manure management systems.

8. Mr. S. Bitman (Canada) presented work in which high spatial and temporal resolution ammonia emission estimates could be coupled with an atmospheric transport and chemistry model to simulate secondary particulate formation.

9. Mr. Dämmgen noted he would pass on the co-chairmanship of the expert panel to Ms. Amon. The meeting expressed its appreciation for the work of Mr. Dämmgen carried out over the years.

10. The meeting noted with appreciation the offer of Switzerland to host the follow-up meeting in spring 2008.