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Working Group 2: Nitrogen - why is so little happening?

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Formal setting: The workshop was attended by 13 people from 7 countries. In order to stimulate and focus the discussion, a total of five short papers ("commentaries") were given, representing topics from two further countries (remote presentation via internet and paper sent via e-mail, respectively). The commentaries covered the "success stories" in nitrogen abatement, as well as the not-so-successful situations, and compared the situation of nitrogen-affluent regions with those suffering from undersupply. The presentations led to lively discussion and some generalizations over the very different situations occurring in Europe and the UNECE area.

General observations: A review of different country situations and experiences, mostly based on EEA databases, made clear that the release of nitrogen compounds (NO_x, NH_3, N_2O and nitrate leaching) has been tackled with considerable success, with substantial reductions in emissions reported in many countries. Emission reductions have been largest for oxidized nitrogen compounds, averaging 50% over the last 20 years over the EU countries. The reductions in emissions of reduced nitrogen have been much smaller over Europe as a whole (10-25%). But there are exceptions, Denmark and the Netherlands have made much larger reductions (in the area of 50%).

Monitoring data show reductions in concentrations and deposition, but in general these reductions for both oxidized and reduced nitrogen are clearly smaller than the reported reductions in emissions, indicating a need for further action. A number of different reasons were identified responsible:

*) In contrast to other pollutants (SO_2), where emission reductions are an order of magnitude, it has been more difficult to reduce emissions of nitrogen, especially ammonia. The resulting smaller reductions produce smaller signals in the observed concentration and deposition data.

*) Changes in the atmospheric processing of NO_x and NH_y compounds with time (due to changed atmospheric composition) has led to changes in the atmospheric residence times, thus affecting concentrations and also patterns of deposition.

*) Non-linearities in emission deposition patterns exist at local, regional and country scales and only disappear on large scale (where the overall mass balance is maintained).

As a consequence, the success stories presented were mixed, with some notable successes, in Denmark and the Netherlands. However over Europe as a whole, nitrogen deposition remains substantially in excess of damage thresholds for the health of the natural environment and human health. Proven success is mixed with new challenges – deriving from long-range transport of air pollution (including intercontinental transport) and new sources as e.g. urban ammonia emissions from waste collection.

Within the framework of the common agricultural policy of the EU the nitrogen challenge has been addressed only to a limited extend in the past. Only two countries that strictly addressed agricultural nitrogen (e.g., by way of compulsory farm nitrogen balances with ambitious limit values based on successful advisory systems) were successful in their reductions due to sincerity of efforts. These were the Netherlands (a notorious hotspot in nitrogen emission and deposition) and Denmark,

where pollution became visible in the form of algal blooms in the Baltic Sea. These two countries, despite large reductions in ammonia emission, retain a highly competitive agricultural industry. The substantial achievements in the Netherlands have not continued to further drive down emissions and deposition, which are still high in a European perspective, and current Nr deposition in the Netherlands remains well above thresholds for effects on semi-natural ecosystems and human health in the case of particulate matter and ozone.

Conclusions: Ammonia is the single compound that is considered central to the issues and is a key objective of additional control measures, for the following reasons. Ammonia emissions dominate N deposition and effects on sensitive ecosystems. Efforts directed towards ammonia abatement are considered to be most effective in reducing ecological effects. Efficient measures exist to reduce emissions at rather low (if at all) cost and they have been identified. Most prominently, low emission techniques in manure application (immediate incorporation, manure injection or trailing hose/shoe) will allow additional nitrogen be added to soils and plants and thus reduce the needs (and the costs) of mineral fertilizer. Further abatement measures exist in animal husbandry as well as in plant production, which too often are not taken advantage of. A considerable share of emissions is caused by large industrial style animal production units, which can be addressed relatively easily by appropriate measures. Emission reductions of nitrogen oxides (which are relevant for the same reasons as ammonia) also have not been too successful in removing negative impacts, at least mechanisms and policies are in place that need to be enforced, but such mechanisms need to be introduced for ammonia.

Ammonia has been identified as a compound that adversely effects vegetation, and a critical level for ammonia has been established. Moreover, ammonia contributes to the formation of secondary particulate matter, an important component of both rural and urban PM pollution. Many cities report ammonium nitrate as a significant fraction of PM10 in situations of limits exceedance. The ammonium nitrate is generally imported from the rural landscape and cannot be addressed by local action.

Key Recommendation: The WG recommends to establish a limit value for ammonia in the ambient atmosphere. This proposed limit value aims to protect sensitive ecosystems (such as Natura 2000 areas) and will facilitate a reduction in the formation of secondary PM, thus indirectly mitigating air pollution-related effects on human health. Sound evidence exists that quantitatively links ammonia concentrations and the environmental effects discussed.

This ammonia limit value is intended for implementation at an EU level. In defining measures to achieve compliance, regional emission ceilings might be considered an adequate approach by individual countries.

Accompanying measures: Implementing an ammonia limit value will need a number of prerequisites. First of all, an adequate level of the limit value needs to be established. This value needs to consider ecosystems and, if possible, the human health. Using information about the link in concentrations and effects, the TFRN should start collecting the scientific evidence available. With a focus on the protection targets, also monitoring concepts and requirements should be established (e.g., distance of measurement point to a point source as an animal house).

Ammonia emissions are also linked to the choice of consumers. Consumption of meat is known to be a key driver for applying nitrogen in animal feed production and loss to the environment in manure

processing. In order to cover and guide the behavioral changes required, establishing and improving concepts of nitrogen footprints is key. INI-Europe (the European section of the International Nitrogen Initiative) is a body providing interest and expertise to cover that task.

Extending from individuals, food choice is an issue of procurement in food service institutions. Here behavioral changes may be initiated, too. The national food agencies and their respective EU counterpart are institutions capable of addressing the issue.

It will be essential to provide and communicate success stories, i.e. a proof of evidence that ammonia abatement works and concentration limits are achievable. It can be the task of NGO's, but also the EEA, to get involved here.

Timeline: The accompanying measures should start as early as feasible ("now"). While ammonia effects are firmly established and quantified (including critical levels, loads and their exceedance), legally implementing an ammonia limit value needs some additional work, as establishing monitoring concepts and criteria. Thus a realistic scope for implementation is the revision of the air quality directive, currently announced for the second half of this decade.