Subject
Report: "uncertainty assessment of NOx, SO2 and NH3 emissions in the Netherlands"

Dear reader,

Please find enclosed the research report titled, "Uncertainty assessment of NOx, SO2 and NH3 emissions in the Netherlands", by Van Gijlswijk et al. (2004). This report documents an investigation carried out by TNO/MEP and the Copernicus Institute (Utrecht University) on commission of the Netherlands Environmental Assessment Agency (RIVM/MNP). The main findings and areas of application with respect to the results are summarised below.

In the last few years the RIVM/MNP has intensified its research on uncertainty analyses in response to recommendations from an international review on this topic. For emission monitoring, this varied from methodological studies on expert assessment and the role of dependencies (Janssen et al., 2003; Van der Sluijs et al., 2002; Van Oorschot et al., 2003), to conducting integrated uncertainty analyses on greenhouse gas emissions (Olivier et al., 2002) and acidification (as the study documented in the enclosed report).

Uncertainties in emission figures have been reported since 1999 in the RIVM/MNP Environmental Balance ("Milieubalans") and calculated according to a first-order approximation method (called Tier-1). In the study documented here, the uncertainty in the contribution of different emission sources to total acidification is assessed more thoroughly (Tier-2). Emission experts were systematically interviewed on uncertainties, which simultaneously provided information on the quality of the underlying knowledge base. Expert elicitations were performed for processes contributing most to total acidification. International default uncertainties were used for minor processes (according to the UNECE/CLRTAP Good Practice Guide). The results of this integrated study were reported in the Environmental Balance, 2004.

Uncertainties in emission monitoring in NOx, SO2 and NH3 for 2000 amount to ±15%, ±6% and ±17%, respectively, and ±10% for total acidification equivalents (95% uncertainty intervals). The default uncertainties have an important influence on the uncertainty and data quality of the NOx interval. Additional elicitations on a limited number of processes may lead to significant improvements here.

Using the word "uncertainty" does not imply that knowledge on emission processes is limited by definition, as there are many types of uncertainty, varying from fundamental undeterminable uncertainty to completely known and measured system variation. To
enable us to handle these differences in a meaningful way, we determined the quality of
the underlying knowledge base as well as the quantitative uncertainty.
They were combined in so-called diagnostic diagrams, as shown in Figure 5.12, where
the processes are depicted that contribute most to total uncertainty. Simultaneously, their
data quality is indicated. The quality assessment of the knowledge base indicates a weak
validation of NOx and SO2 values. In general, the knowledge base for activity data is better
than that for emission factors.

An important application of the results is the better support for decision-making
processes. Situations where both uncertainties and stakes are high require a different
starting point for making decisions (such as the precautionary principle) than situations
where knowledge on small uncertainties is complete. Transparent uncertainty
information is therefore necessary.

Uncertainty figures from this study have been used in the RIVM/MNP assessment of
agreed European emission targets for 2010 (Beck et al., 2004). Both the uncertainties in
emission monitoring and in development estimates were taken into account in judging
the feasibility of meeting targets.

The results can further be used in international reporting initiatives for acidifying
substances, similar to practices for greenhouse gas emissions. Moreover, improvements in
the emission monitoring process can be formulated by using diagnostic diagrams, since
the diagrams indicate strong and weak parts of the available knowledge base.

The visualisation presented here is preferred to providing uncertainty ranges only.
It also increases the transparency of the data quality and improves communication on
uncertainties, making it a valuable tool for supporting the decision-making process. In
conclusion, from this study, transparent communication on the meaning of uncertainties
and their data quality are seen to be worthy of more attention.

With kind regards,

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Appendix

Recent RIVM/MNP references on uncertainty analyses and their applications


