

AMMONIA EMISSIONS IN THE NETHERLANDS - SOME QUESTIONS FOR THE REVIEW COMMITTEE

INTRODUCTION

As outsiders to the ammonia discourse, Marcel Crok and myself have taken it upon us to review some aspects of the ammonia policies in the Netherlands (see <http://www.v-focus.nl/ammoniak2015/>). We have been gracefully invited by Mark de Bode of the Ministry of Economic Affairs to give our views to the review committee ('visitatie-commissie'). We have respectfully declined for a number of reasons. Obviously, as we just started our own review, we at the moment are in no position to be able to give a balanced and thorough perspective on the matters at hand.

Nonetheless, our decision not to accept the invitation, more importantly, is related to a number of scientific issues we have stipulated in the past few months but so far have not been addressed. Consequently, we must raise some vital concerns that should be at the heart of any scientific review of the Dutch ammonia discourse and we hereby courteously put forward these concerns to this review committee.

GENERAL

The literature that has been disseminated with the invitation is generally characterised by the absence of measurement datasets and insight into the mathematical data-handling. We are thus ultimately presented with *outcomes* of research without the possibility of entering a process of in-depth analysis and verification, which by default is required in any scientific discourse. There are, of course, scientific references made in the provided documents, but they shed far less light on the matters at hand than is required by any scientific standard. We will clarify this with a few examples below to which we will add questions to the committee that need answering if we are to take the research that shapes the current agricultural policies on ammonia at all seriously.

We will single out the following two documents: (i) *2 pagers emission calculation.docx*; (ii) *Trends in emissions of ammonia and the measured and calculated trend in the ammonia concentrationDef.docx*. This does not mean that the other documents are without issues, far from it.

We have made several requests at the different institutions for measurement- and model-datasets required for review and reproduction of published results. So far, we haven't received anything. It is extraordinary and antithetical to the scientific epistemic values of transparency, reproducibility, consistency, and integrity, that the crucial data and the manner in which the data are mathematically handled are not publically available. This is all the more pertinent as the literature accompanying the invitation clearly philanders with its scientificity by referring to substantial peer-reviewed work, the latter being an unarguable incentive to have all the data and its attending mathematics readily available for anyone asking for it.

2 PAGERS EMISSION CALCULATION.DOCX

As a general comment, it is remarkable that in this particular document, no explicit references are made to the range and uncertainties inevitably present in the results presented. We simply have to accept the results as such. Now, this is an expression of a fundamental problem with the emission data of ammonia from animal rearing. A number of issues stick out:

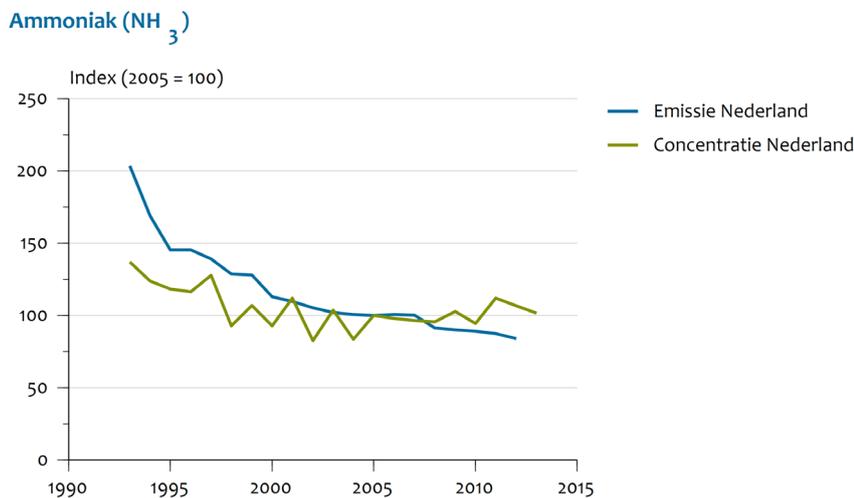
- It is mentioned that the 'first emission results of the experiments on grassland were internationally presented and published in 1994-1997 including data from nitric acid treated slurry (1: *Bussink et al., 1994*) and deep injection on grassland (2: *Huijsmans et al., 1997*). In 2001 the set of data at that moment was analysed and published (3: *Huijsmans et al., 2001*).' (p. 10) Having read these papers, none of them give any measurement data at all, just the end results. No supplemental data files have been made available either. Also, it is not at all clear in what manner the experimental data have been mathematically handled other than with general reference to two articles (Denmead, 1983; Ryden and McNeill, 1984). We have asked the WUR repeatedly to supply the measurement datasets of these experiments and the concomitant mathematical procedures, so far to no avail.
- Subsequently, it is stated that the 'data of the emission experiments with various manure application methods on arable land were published in 2003 (6: *Huijsmans et al., 2003*).' (p. 10) The paper referred to here asserts that the 'mean total volatilization, expressed as % of the total ammoniacal nitrogen (TAN) applied, was 68% for surface spreading, 17% for surface incorporation and 2% for deep placement.' No data are given to back these statements up, whereby the authors in effect ask the reader to

simply believe the outcomes of their experiments. No supplemental data files have been found on the Elsevier website of *Atmospheric Environment* either. Also, it is not at all clear in what manner the experimental data have been mathematically handled. Again, we asked the WUR for these data and the calculations but so far they haven't been released.

- The previous leaves us with the following proviso that needs to be fulfilled if any serious review of the ammonia regulation can be successfully performed or even that the published results will hold at all: *The measurements data of field- (e.g. experiments such as reported in Huijsmans, 2003) and housing-experiments, the manner in which these experiments were performed, and the mathematical handling of these data (including a priori assumptions) must be made available in workable formats.*
- *Specific and more elaborate questions have already been put forward to the WUR in line with the here-discussed topics to which we, however, have not received any satisfactory answers as of yet.*

TRENDS IN EMISSIONS OF AMMONIA AND THE MEASURED AND CALCULATED TREND IN THE AMMONIA CONCENTRATION DEF.DOCX.

A number of issues follow from this particular document, which requires in-depth clarification so far not provided. It is mentioned that the ‘concentration of ammonia in air measured in the National Air Monitoring Network (Landelijk Meetnet Luchtkwaliteit, LML) and the Monitoring network Ammonia in Nature areas (Meetnet Ammoniak Natuurgebieden, MAN), do not show a decreasing trend over the period 2005-2013.’



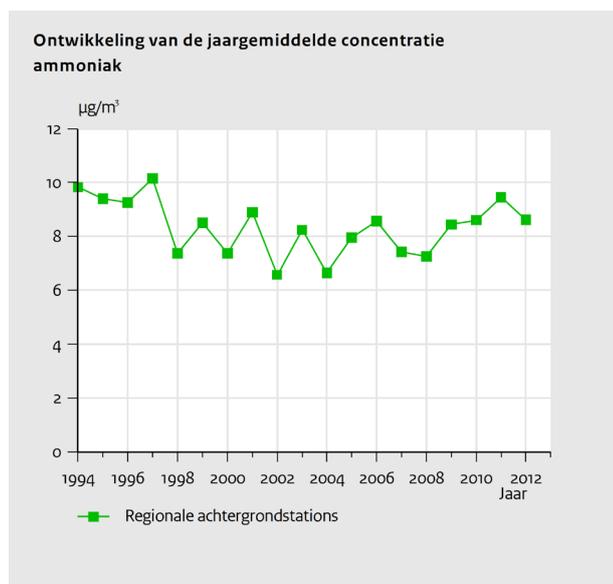
Bron: RIVM, 2014.

RIVM/juli4
www.clo.nl/nl0081

The caption of this figure states that the ‘concentration between 1993-2004 are based on the average of the LML sites, from 2005 onwards the concentrations are based on LML and MAN sites.’ Despite this caption, scientifically it is bad form to use a uniform colour scheme for such a graph, which in truth is a combination of two distinct datasets. At least the authors should have added the separate results of both the LML and MAN datasets. There is a graph available from a 2013-RIVM report that shows the LML-data only and is depicted in the actual $\mu\text{g}/\text{m}^3$ (see below; RIVM, 2013). Apart from a decline in 1997, the LML data show no decreasing trend at all and the discrepancy with the calculated emissions becomes larger at the end of this graph.

The document further notes that ‘the total national emissions of ammonia, however, do show a decrease over this period.’ Now, the framing of this sentence is altogether wholly misplaced as the agricultural emissions as calculated with the NEMA model (National Emission Model for Agriculture) depend on the input of different experimental set-ups for measuring ammonia-emissions for which the fundamental data and mathematical handling is not publically available (see above). Ergo, there is no way of knowing whether the NEMA-model is actually any good at all. Again, we are dealing here with a gross and unacceptable scientific omission.

It is further stated that the reasons that the ‘trend in the ammonia concentration is not directly comparable to the trend in the emissions’ are that the ‘ammonia concentration in air is the result of several processes’ such as ‘emissions from national and foreign sources, atmospheric transport, chemical conversion and deposition.’



More specifically, it is mentioned that ‘uncertainties in the corrections for meteorological variation and spatial distribution of the emissions in the OPS- (Operationele Prioritaire Stoffen) calculations’ and ‘uncertainties in the modelling of some of the atmospheric processes in the OPS model, such as chemical conversion of ammonia to aerosol and the deposition of ammonia’ should be taken into account.

From this, the following issues at least come to the fore:

- A model -basically a set of premises- is used to make predictions about some observable Y, a proposition, in this case ammonia concentrations in the atmosphere. When models do not conform to the reality measured -if a model said ‘the ammonia concentration in the atmosphere at time t will be x ’ but was really y - then the model has been falsified. Scientifically, there is no other conclusion possible, and this implicitly is granted in the document.
- A logical test for the models is to compare the measured concentrations at the eight LML stations with the calculated values. Ultimately, this is crucial as the models are used within policy for very local purposes. *These model-data should be readily available, as the RIVM produces yearly maps (GCN maps) since the early nineties.*
- We have asked for these model-data for the period 1993-2014, but the RIVM replied that these data are not available for the period 1993-2005. This is extremely unfortunate, and truth be told most likely false, as it hampers an independent assessment of past results, which is essential for the viability of the ammonia policies and the models on which these policies are based. Again, we simply are forced to assume, unscientifically, that everything produced by the models is reliable.

➤ The previous leaves us with the following proviso: *The model-data for the period 1993-2014 must be made available for the eight LML-stations as calculated in the appropriate year, thus sans hindsight re-calculations.*

We expect the committee to share our concerns about the absence of reproducibility of the presented results and we urge all relevant parties in The Netherlands to make these data and calculations publically available without further ado.

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See <http://www.ucr.nl/about-ucr/Faculty-and-Staff/Science/Pages/Jaap-Hanekamp.aspx>

See https://www.researchgate.net/profile/JC_Hanekamp

Marcel Crok, freelance science journalist.

See <http://www.staatvanhetklimaat.nl/over-marcel-crok/>

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