

## JNCC Response to Questionnaire for Peer Review

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JNCC Peer review comments have been provided under the questions in blue text.

### Questionnaire for Peer Review

We would like to ask you to review the expert judgement and position paper of Prof. Arthur Petersen based on your scientific expertise. The expert judgement and position paper advocate for an assessment threshold of 1 mol/hectare/year used in project-specific calculations of nitrogen depositions, in the context of permitting. Both documents largely summarise and review existing scientific literature and jurisprudence. An additional document has been included with further clarification on the references used.

The following questionnaire has been prepared for this peer review; it is not exhaustive, so please feel free to provide your own insights as well. Various areas of expertise are involved in this review, and we ask you to answer only the questions relevant to your own expertise.

Therefore we estimated a division between the questions:

- Legal expertise: questions 1, 2, 3, 5, and 7.
- Atmospheric/Model expertise: questions 1, 3, 4, 5, and 7.
- Philosophy of science expertise: questions 1, 3, 5, and 7.
- Environmental/Ecological expertise: questions 1, 3, 5, 6, and 7.

**1. What do you think of the way Petersen uses the references?**

**a) Are the references used correctly or incorrectly, and why?**

The references used provide a strong basis for the discussion and provide part of the logic required to address the problem. From a purely scientific point of view it is understandable why the references are used where they are.

**b) Is there any research/study that you believe is missing?**

The evidence provided gives part of the picture. It would benefit from a clearer outline of:

- the policy certainty requirements;
- the uncertainty for the predictive models within AERIUS Calculator (eg OPS and SRM-2);
- Model uncertainty when not included in AERIUS Calculator; and
- a comparison to certainty needs of policies and regulations more generally.

**2. What do you think of the cited jurisprudence from both the Dutch Council of State (ECLI:NL:RVS:2023:1299) and the highest administrative court in Germany (ECLI:DE:BVerwG:2019:150519U7C27.17.0)?**

**a) Is the jurisprudence interpreted correctly or incorrectly, and why?**

**b) Is there any jurisprudence that you believe is missing?**

The cited jurisprudence provides a partial picture. Inclusion of further caselaw could strengthen the case for scientific underpinning of thresholds and justify use of thresholds to avoid “death by a thousand cuts”. Please see Sections 2.2 and 2.3 of Chapman and Kite, 2021.

**3. What do you think of the argumentation that there should be an assessment threshold?**

Assessment thresholds are an acceptable tool to assist with decision making on individual proposals in the context of ecological assessment. The argumentation is consistent with the UK justification for use of thresholds outlined in Section 2.2 of Chapman and Kite, 2021.

a) **On which points do you agree or disagree, and why?**

- Agree thresholds should be evidence based wherever possible.
- Agree there is justification to use a threshold.
- Disagree that the threshold makes AERIUS Calculator not fit for purpose.
- Disagree that measurability should be the sole basis for a threshold applied to plans and projects **alone** to determine if further assessment is required. Measurability is less open to challenge when applied “in-combination”. Insufficient information is provided on the policy needs to advise further at this time.

b) **Are the presented arguments correct?**

Please see comments about missing context from Question 1. The arguments could benefit from additional discussion on:

- The context for policy needs including suggestions or limits of acceptable uncertainty.
- A next step that uncouples models from thresholds because a model’s certainty is not inherently related to decision rules implemented within it. As pointed out in the paper, the threshold can be changed and that can be used in AERIUS. AERIUS’ predictive ability for calculating concentration and deposition before the application of a threshold used for decisions would not be hindered. The work should also reference the actual model uncertainty and consider comparing to other models.
- Evidence for what would be certain enough or “fit for purpose” if this is available. AERIUS has enabled tracking of plans and projects over time and as such may have further information about development pressure and likelihood for emission sources coming forward that could inform the threshold development and provide further scientific basis beyond measurable changes in air quality leading to changes in estimated nitrogen deposition.

c) **Are there arguments that you believe are missing?**

Decision making necessarily relies on predictive tools when determining permission for plans and projects giving rise to nitrogen deposition or outcomes of overarching policies to address emissions or mitigation of effects on nature. The effect of a plan or project cannot be measured until it is permitted and built so modelling is required and this comes with uncertainties. The argumentation seems to indicate that most if not all modelling tools are insufficiently certain to avoid “false certainty”. False certainty is provided as the primary reason AERIUS Calculator is not fit for purpose. The arguments could benefit from outlining the type of threshold that is acceptable or model uncertainty that would result in an acceptable level of “false certainty”.

Without a description of how the rationale solely applies to AERIUS and ecological assessment, the proposed rationale has implications for other decision-making that relies on modelling and uses thresholds. For example, the approach may extend to assessment of human health in relation to changes in air quality which relies on modelling. It is noted that human health assessment typically relates to concentration in air which usually has less uncertainty than deposition estimates.

More discussion of the implications of the approach for legally required in-combination assessment is required. A worked example would help for the assumption that an individual proposal that “falls in the noise of background pollution” will mean that all proposals below this threshold acting “in-combination” will also fall into the background. Chapman and Kite (2021) found that individually small proposals unlikely to cause a significant effect because they are not measurable (eg 1% of critical level/load) can lead to a change that is no longer at a level considered to have no likely significant effect when modelled together for their additive outcome. This point about individual vs additive effects is where the proposed approach remains most open to challenge in our view.

**What do you think of the argumentation that 1 mol/ha/year is a justifiable choice for an assessment threshold?**

The line being drawn at 1mol/ha/year is partially sufficient when compared to the lower thresholds (eg 0.005mol/ha/y). It is unclear why the evidence provided might rule out other thresholds although the upper end of 35mol/ha/y does seem reasonable based on evidence provided.

There is an opportunity to include further rationale such as expected number of the below threshold proposals in the thresholds considered for use within AERIUS or other tools. The Netherlands has a long-standing register (ca 9 years) of existing sources and an exceptional number of monitoring stations when compared to other countries. The argumentation should discuss how this data is being used to determine the fit for purpose aspects of AERIUS Calculator in the assessment and to determine a threshold. Currently the proposed approach sets a bar difficult for any model or tool to manage and remains theoretical in absence of grounding with currently measured data.

**d) On which points do you agree or disagree, and why?**

It is agreed that a threshold should be necessarily precautionary however 1mol/ha/y remains only partially justified. Solely basing thresholds on measurability has been found to be unsound in other courts and remains open to challenge because it does not account for the Habitats Directive requirement for “in-combination” assessment alongside assessment alone for plans and projects.

**e) Are the presented arguments correct?**

The arguments lack full context to determine their correctness in the relation to policy need for decision making by local authorities, regional governments or national government on plans or projects assessed under the transposed legislation of the Habitats Directive.

**f) Are there arguments that you believe are missing?**

The current argument could benefit from more detail on:

- Policy certainty needs
- Model certainty and predictive nature of tasks (permission for plan/project as well as wider policy development and evaluation)
- In-combination effects and how the threshold addresses this
- Reflection on the type, density and frequency of proposals coming forward during the use of AERIUS (via Register or Monitor) to inform thresholds drawn for proposals before proceeding to in-combination assessment or appropriate assessment.

**g) If you do not consider 1 mol/ha/year a justifiable choice, is there an alternative assessment threshold that is justifiable, and why?**

With the existing information it is difficult to provide an exact figure. For comparison, the most precautionary thresholds outlined in Chapman and Kite (2021) are 0.013kgN/ha/y for woodland and 0.0093kgN/ha/y for grassland see Table 3.2 in main report. These are equivalent to 0.93mol N/ha/y and 0.66molN/ha/y respectively. Please note these thresholds were developed for a specific set of development pressures and policy ambitions in the UK but the method could be applied in other countries.

**4. What do you think of the argumentation that significant effects can be considered negligible, based on the principle ‘small chance times a small effect**

**produces a negligible risk’?**

- a) **On which points do you agree or disagree, and why?**
- b) **Are the presented arguments correct?**
- c) **Are there arguments that you believe are missing?**

In the UK, “significant effects” is related to more than a threshold but must have a credible risk of effect with presence of a pathway from the source of emissions to the receptor (eg nature). This may then lead to further detailed assessment [appropriate assessment] to determine whether there is an adverse effect (the legal test through which a development may or may not be granted permission). “Significant effect” does not necessarily mean there will be harm. The test is to rule out “likely significant effect” and thus is necessarily precautionary even to the point of being unmeasurable change alone.

Although recently challenged, in the UK we have a professional judgment based threshold of 1% of the relevant critical level or load has been traditionally used for screening to determine if an appropriate assessment is required for that development in question. It is interesting that the 35mol N/ha/y is roughly equivalent to the UK 9.8% for a nitrogen critical load of 5kgN/ha/yr or 4.9% of a 10kgN/ha/yr nitrogen critical load. The contribution of 35mol N/ha/y can be considered a damaging level of nitrogen deposition in some UK country protocols.

The concept that a ‘small chance multiplied by a small effect produces negligible risk’, is similar to the argument used in the UK that any process contribution of 1% or below the critical level/load will not be significant either alone or in combination with other proposals and therefore an appropriate assessment is not required. The concern raised by this position is that multiple developments each below 1% can have an additive effect above 1% and therefore can potentially be significant (eg likely significant effect cannot be ruled out and thus appropriate assessment is required). Chapman and Kite (2021) discuss this and the caselaw and any threshold should account for this additive in-combination effect.

5. What do you think of the argumentation that nitrogen deposition below 1 mol/ha/year has a small effect (at most) on Natura 2000 areas from an ecological-scientific perspective?

a) On which points do you agree or disagree, and why?

When considered as an amount of reactive nitrogen on its own, it is difficult to see how this could be determined as ecologically relevant. It is when other factors required by caselaw come in that it is understandable why a very low threshold would be set, however the proposed threshold of 1mol/ha/y is equally as difficult to defend with limited evidentiary basis.

b) Are the presented arguments correct?

Although technically correct, the argument could benefit from commentary by trained ecologists or a comparison to dose-response of habitat to nitrogen deposition.

c) Are there arguments that you believe are missing?

As above, the arguments appear to be missing:

- Policy context;
- In-combination consideration; and
- Expected change that measures have been secured to reduce emissions in future if the argumentation relies on effects alone or in-combination being “in the background noise”.

d) If you believe 1 mol/ha/year has more than a small effect, is there an alternative responsible choice, and why?

Any responsibly assigned threshold must consider how proposals act together and generate an in-combination effect that can be ruled out for likely significant effect (eg not require further appropriate assessment). Chapman and Kite (2021) cite a workshop with ecologists that was used to determine some Decision Making Thresholds for a project alone that outlined a level of nitrogen deposition, over a specified period of time, that ecologists considered to have no likely significant effect called Objective Compliant Change (see Appendix 1 of Chapman and Kite, 2021). This threshold is one alternative that was considered relevant for UK habitats and could be tested in the Netherlands.

6. Do you have any further comments on the documents?

The conclusions would benefit from clarity about policy context and in absence of additional information JNCC have commented in context of decision making by local authorities, regional governments or national government on plans or projects assessed under the transposed legislation of the Habitats Directive.

Measurable changes in air quality and resulting deposition are a product of all active plans and projects as well as unpermitted or unregulated activity. This varies substantially over time in between measurement intervals in most cases and particularly for annual averages as used in ecological assessment. To ascertain contribution from an individual proposal with very small magnitude via actual measurement is highly unlikely and extremely difficult in absence of planned detection and specialist activity to do so (eg tracers/isotope markers for specific emission sources released from that emission source as part of an experiment) and restricted by technological capability.

The approach proposed to assign AERIUS Calculator as too small scale and having false precision needs further testing or more evidence that that outlined in the position paper and supporting documents provided. AERIUS Calculator’s certainty is not necessarily coupled with the decision rules and thresholds used and should be considered separately in our view.

See Position Paper “However, AERIUS Calculator is not suitable for permitting purposes because the spatial scale (ha level) is too small and the calculation’s lower limit is too low (0.005 mol/ha/year). These both lead to false certainty.”

It would help to have an indication of what is suitable for small scale decision making such as that found in planning and permitting.

### **References**

CHAPMAN, C. & KITE, B. 2021. Guidance on Decision-Making Thresholds for Air Pollution. JNCC Report No.696 (Main Report), JNCC, Peterborough, ISSN 0963-8091.