



**Natural England:
Air Quality Enquiry for the UK**

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Environmental Audit Committee Air Quality Inquiry. Written Evidence from the Joint Nature Conservation Committee, 14 December 2009.

1. Summary

- 1.1. This response focuses on the impacts of air quality on the natural environment in the context of UK nature conservation policies and obligations.
- 1.2. There is strong evidence of the effects of air pollution on semi-natural ecosystems in the UK. Large areas of sensitive ecosystems remain at risk from atmospheric deposition in 2020. This includes nature conservation sites protected under national and European legislation.
- 1.3. The UK's monitoring networks for concentrations and deposition of the main atmospheric air pollutants are adequate. There is a need to review monitoring requirements in respect of ecosystem impacts. JNCC is funding work in this area in collaboration with Defra and the country conservation agencies.
- 1.4. The Government's understanding of, and commitment to, investigating the environmental risks of air quality at a broad level is good. However, there is a need for more work to interpret effects in relation to policies for biodiversity and ecosystem services.
- 1.5. Impacts on ecosystem services should be a central part of air pollution policy alongside human health. There are synergies between air pollution policies focused on human health and environmental health.
- 1.6. The UK Air Quality Strategy should give greater attention to protection of ecosystems, including more ambitious targets.

2. The monitoring and modelling systems used by the Government and whether these provide an adequate measure of air quality

- 2.1. The UK monitoring networks and atmospheric models for concentrations and deposition of air pollutants are considered adequate for national level assessments and reporting. It is recommended that they should be maintained^{1.i}. Monitoring is an essential part of the evidence base needed to underpin policy. Appropriate monitoring allows changes to be detected and quantified and therefore provides an objective basis for assessing the nature and seriousness of threats to biodiversity. It improves the understanding of the processes causing change and enables the testing of predictive models.
- 2.2. There are also a number of monitoring schemes which provide evidence of air pollution impacts on ecosystems. Some of these schemes have been

ⁱ For local impact or regional assessments, for example in respect of risk assessments of impacts from a local installation on a protected nature conservation site, the number and location of monitoring sites and the relatively coarse resolution of long-range models mean that in some cases additional monitoring is required.

established and designed specifically to monitor the effects of air pollution on a small sample of sites and also provide information on the process underlying responses. Examples include the Government funded Acid Waters Monitoring Programme, Environmental Change Network and Forest Level II survey. A number of other schemes, which are not specifically targeted at assessing air pollution impacts, provide useful data on changes to vegetation which can be correlated to atmospheric deposition. As such, they provide a general detection mechanism, but attribution of a signal to a specific pressure, i.e. air pollution, is more difficult. An example is the Countryside Survey² which has shown vegetation change between 1978 and 2000, stabilising in 2007, consistent with a response to excess nitrogen and which correlates significantly with nitrogen deposition.

- 2.3. However, there are no schemes which provide direct and comprehensive assessment of air pollution impacts on terrestrial semi-natural ecosystems. This gap was identified in the report of the National Expert Group on Transboundary Air Pollution³ in 2001, which made recommendations for further monitoring. Yet, there are a wide range of surveillance schemes covering different aspects of UK biodiversity. Therefore, in collaboration with Defra, CCW, Natural England and SNH, JNCC is currently funding a research project to collate the evidence of nitrogen effects on biodiversity. This project will analyse a range of broad-scale vegetation datasets in order to correlate vegetation change with nitrogen deposition. It will use the results, together with other air pollution research and review, to provide evidence of nitrogen deposition and how it affects the UK's and devolved administrations' conservation policy obligations and targets, for example, those under the UK and country Biodiversity Strategies.
- 2.4. The project will assess the adequacy of the evidence base and whether new surveillance or a modification to existing surveillance is required. The recommendations will be put to the UK Terrestrial Biodiversity Surveillance Strategy⁴ Implementation Group. This work relates closely to a recommendation in the draft report of the Review of Transboundary Air Pollution¹ which states there should be a review of existing soils and vegetation schemes and proposals. However, the scope of their recommendation is wider than nitrogen deposition, which is the focus of the JNCC led study (as this is seen as the priority), and includes ozone, acidification and heavy metals.

3. The extent to which the Government fully understands and has identified the health and environmental risks caused by poor air quality

- 3.1. There is unequivocal evidence that air pollution has caused widespread changes to sensitive ecosystems in the UK. The Government funds a substantial research programme on air pollution effects on ecosystems, including a number of valuable long-term field manipulation experiments. This has provided the UK with a strong evidence base to support policy development, for example in relation to the National Emissions Ceilings Directive and the Gothenburg Protocol (and their current reviews).

- 3.2. The Government has commissioned a Review of Transboundary Air Pollution (RoTAP) which is due to publish its report in the spring 2010. The RoTAP report aims to review the current state of rural air pollution issues in the UK, evaluate the extensive measurements of atmospheric pollutants and their effects, and produce a synthesis of current understanding which will be used to inform air quality policies. The draft report is currently out for public consultation with a deadline of 11 January 2010.
- 3.3. It describes widespread exceedance of critical loads for acid and nutrient nitrogen deposition and presents strong evidence that nitrogen has reduced plant species diversity in semi-natural habitats across the UK. It also states that there is ongoing chemical recovery in soils and freshwaters, in response to reductions in deposition. However, recovering freshwater biological communities do not resemble their pre-acidification communities.
- 3.4. Therefore the Government's understanding of, and commitment to, investigating the environmental risks of air pollution at a broad level is good. However, it is also important to consider the significance of these effects in terms of the UK's biodiversity commitments.
- 3.5. In particular, the Habitats Directive⁵ requires Member States to take measures to maintain at, or restore to, favourable conservation status, the natural habitats and species of Community Importance. The UK's second report under Article 17 of the directive⁶, on the conservation status of habitats and species, identified air pollution as a threat to the conservation status of 53 out of the 77 habitats reported on for the UK Atlantic region.
- 3.6. The UK environment agencies and conservation agencies also use critical loads and levels when assessing the impacts of point sources on sites of international and national importance (i.e. Special Areas of Conservationⁱⁱ and Areas/Sites of Special Scientific Interest). The agencies have jointly developed a database of relevant critical loads for interest features on these protected sites and have modelled acid and nutrient nitrogen deposition to sites, apportioning this to major sources or source sectors. This shows that based on 2005 emissions, 79% of Special Areas of Conservation (57% by area) exceed the nutrient nitrogen critical load and 68% (40% by area) exceed the acidity critical load⁷. As well as a tool for informing site-specific risk assessment, it is potentially a useful policy tool to help target emission reductions.
- 3.7. Over the past decade, nutrient nitrogen critical load exceedance has remained virtually unchanged with approximately 60% of sensitive semi-natural habitat area in the UK being exceeded⁸. Even with the currently proposed emission reductions put in place, it is calculated that by 2020 approximately 50% of sensitive habitat area will still exceed the critical load¹. While the majority of this exceedance will be driven by deposition of reduced nitrogen (arising from ammonia emissions, the major source of which is agriculture) a significant amount will still come from oxidised forms of nitrogen (sources include transport, shipping, power generation and industry).

ⁱⁱ Special Areas of Conservation are defined under the Habitats Directive.

- 3.8. The ecosystem services concept offers an additional approach to evaluate the marginal benefits of different air pollution policies. Such an approach would provide a holistic consideration of the positive and negative impacts of air pollution on the services ecosystems provide and the resulting effects on human well-being. Defra funded a scoping study in 2008⁹ which scoped the potential for the approach to be applied to air pollution policy, using ammonia as a case study. It showed potential for the methodology, but data gaps remain particularly regarding the valuation of marginal benefits. However, the approach in respect to air pollution policy remains in its infancy and we recommend further development to identify and rectify the most critical data gaps and greatest uncertainties, such that the application of the concept in respect of air pollution is sufficiently robust to inform future policy development.
- 3.9. In conclusion, the UK Government has a strong understanding of the environmental risks caused by air pollution, although a number of research questions remain (for example, see the draft RoTAP¹⁰ report). There is convincing evidence of pollution impacts on ecosystems in the UK. In addition, risk assessment approaches, such as those based on critical loads, show a continued widespread threat to nationally and internationally protected sites and biodiversity in the wider countryside.
- 4. The extent to which the delivery chain for air quality is coherent, integrated, coordinated and effective and whether the bodies with responsibility for managing air quality have appropriate incentives, understand their role and responsibilities, and are adequately resourced**
- 4.1. Responsibility for air pollution policy and control is spread across different Government departments, both centrally and locally, as well as Government agencies.
- 4.2. The conservation agencies are statutory advisers under pollution and planning legislation and provide advice on the local impacts of air pollution arising from point sources, road schemes and other planning casework in relation to the various statutory obligations in addition to more strategic advice at a country and UK level. The conservation agencies generally support a more strategic approach to planning which influences sources of air pollution. Regional spatial plans provide an opportunity to address air pollution impacts on natural ecosystems, including protected sites. However, in practice this is difficult as there is a lack of both guidance and of atmospheric deposition modelling and source attribution tools available for use at the regional level. The country conservation agencies have found plans to be variable in quality and the extent to which they consider air quality.
- 4.3. One area which appears to fall between current governance structures is that of ammonia from agriculture, with the exception of large pig and poultry installations which are regulated under the Environmental Permitting Regulations (EPR) in England and Wales and the Pollution Prevention and Control (PPC) (Scotland) Regulations. Potential impacts of ammonia

emissions from such installations are therefore considered as part of the permitting regime. However, we advise that improved co-ordination at the planning and permitting stage, and greater involvement of the relevant environment agency during the planning process, would improve the efficiency of assessments. For other agricultural activities, which do not fall under the EPR or PPC (Scotland) Regulations, there are no formal mechanisms for dealing with emissions from other agricultural activities, other than the non-mandatory codes of good agricultural practice¹¹ in each country. For example, dairy and cattle farming was responsible for 56% of ammonia emissions in the UK¹² in 2005 and yet land use planning currently fails to take account of this. It would be beneficial to have a framework within land use planning policy within which agricultural development could take place.

5. The steps that need to be taken to ensure that air quality targets will be met in the future

- 5.1. Our evidence focuses on the impacts on biodiversity in relation to both concentrations of air pollutants and deposition. Our response in section 3 outlined the strong evidence of air pollution impacts on UK ecosystems. Whilst air pollution policies and commitments will reduce emissions further, and recovery from acidification is evident in some locations¹ there remains a continuing risk to ecosystems. Effects on ecosystems and their goods and services, should be a central driver for air pollution policy, alongside human health considerations. However, this is not always the case, for example the Air Quality Strategy (AQS) includes only a partial consideration of air pollution impacts on ecosystems. Therefore, this section of our response considers the gaps or shortfalls in current policies and where these could be better targeted to protect ecosystems.

Emission Ceilings

- 5.2. Exceedance of ecosystem critical loads was a major driver for the National Emissions Ceilings Directive and the Gothenburg Protocol. These policy instruments are now being reviewed, which will introduce lower national emission ceilings as well as additional pollutants, including fine particulates. There are many synergies between air pollution policies driven by human health issues and that for ecosystems, for example ammonia is a source of secondary fine particulate matter as well as a major contributor to eutrophication, and it is important that the co-benefits are maximised whilst conflicts minimised. Modelling studies in the UK and Europe have shown that even with the implementation of the maximum feasible technical reductions in emissions, a significant exceedance of critical loads remains¹³. Deposition of 'reduced' nitrogen (arising from ammonia emissions) is a major component of nutrient nitrogen and acid deposition. The nature of ammonia sources and the pollutant's atmospheric chemistry mean that policies which consider local spatial targeting of emissions should be considered in addition to broad scale national emissions ceilings¹⁴.

- 5.3. While the Environmental Audit Committee's inquiry is focused mainly on local air quality in certain regions, it also noteworthy that the Government is predicting that it will fail to meet its NECD target for NO_x. The NECD UK NO_x ceiling is 1,167kt and Defra predicts we will be 11% short of this target in 2010¹⁵. This is in part due to increase coal burning for electricity production¹⁶.
- 5.4. In response to a 1998 Environment Agency consultation on "Controls of Emissions from Coal and Oil Fired Power Stations", CCW and English Nature called upon the Agency to require the fitting of Selective Catalytic Reduction (SCR) on existing and new power stations to control NO_x emissions. At this time the technology was well founded and was being applied in other parts of Europe, such as Germany, where coal burning also provides a major source of electricity.
- 5.5. A report commissioned by Defra in 2008¹⁷ investigated how the UK could achieve compliance with the NO_x National Emission Ceiling for 2010 in a cost-effective manner. It recommended that the lowest cost option would be to target road transport, the cement industry, other industrial combustion (i.e. gas boilers, turbines, and engines) and coal power stations (bringing forward fitting of SCR, which is obligatory under current legislation by 2016).

Air Quality Strategy

- 5.6. The 2000 AQS did not address the impact of air pollution on ecosystems to any significant extent. It was primarily concerned with the improvement of air quality for the protection of human health. The Government have stated that the scope of the strategy should be progressively extended to address key ecosystem impacts¹⁸. JNCC welcomes this and are pleased to see that the 2007 AQS went some way to encompass wider concerns, such as atmospheric deposition (and critical loads exceedance), ammonia and ozone. However, despite this, we remain concerned that the 2007 AQS still provides little in the way of protection of ecosystems from air pollution, over and above actions and commitments already in place. For example, it excludes ammonia, which is now seen as a priority⁶ and avoids setting targets or objectives for critical loads exceedance (although the Government did include critical loads exceedance when evaluating the benefits of different policy options for the 2007 AQS).
- 5.7. JNCC has raised these concerns with Defra, and its predecessor bodies, on a number of occasions over the past 10 years and has advised that the AQS still fails to fully address Government commitments and policies for biodiversity.
- 5.8. The AQS considers the impacts of NO_x and SO₂ on ecosystems and defines national objectives for ecosystems for these two pollutants. These are 20ugm⁻³ annual mean/winter mean for SO₂ and 30ugm⁻³ annual mean for NO_x. The UK is currently meeting these objectives, where they apply. The NO_x objective is notably lower than the annual mean limit value for NO₂ for protection human health (40ugm⁻³). However, protection of ecosystems from these pollutants is inadequate under the AQS. It states that compliance with the objectives is not required in areas less than 20km from an agglomeration

or less than 5km from built up areas, major roads or Part A process. This is derived from the monitoring provisions of the 1st Air Quality Daughter Directive. However, these are the very areas where sensitive ecosystems are vulnerable to exceedance of the objectives. We have used the term exclusion zones to define these areas. It is estimated that 37% of SSSIs (and ASSIs) and 53% of Natura 2000 sites and Ramsar sites lie within the exclusion zones and are therefore not protected by the objectives²⁰.

- 5.9. We have advised Defra that this conflicts with the UK's nature conservation commitments, for example Article 6 of the Habitats Directive which requires prevention of deterioration to Special Areas of Conservation.
- 5.10. The review of the strategy in 2006 considered options for extending the 2000 Strategy's objectives for SO₂ and NO_x for protection of vegetation, but none was adopted in the 2007 strategy which stated that Defra will instead "take forward additional analysis and consider how best to ensure protection of ecosystems against air pollution in the medium to the long term." JNCC has offered to support the Government on this further work.
- 5.11. The new Directive on ambient air quality and cleaner air for Europe has amended the monitoring provisions regarding vegetation objectives to include provisions for Member States to place monitoring in "particularly vulnerable areas". This offers scope for extending compliance of the objectives to defined areas within exclusion zones. The conservation agencies are currently considering this and will advise Defra in their response to current consultation on the transposition of the Directive which closes on 29th January 2010.
- 5.12. The main drivers stated for this air quality inquiry are related to the UK's failure to meet the PM₁₀ targets under the EU Air Quality Framework Directive and the prediction that it will fail to meet the NO₂ limit value in parts of the country. Close to major urban, industrial areas or major roads the NO_x vegetation objective is also exceeded. This includes a number of protected sites. However, as they occur in the 'exclusion zones', there is currently no obligation within the AQS to meet this objective. Yet, these breaches are generally a result of emissions from the same sources that are responsible for the current breaches of human health standards. So there are benefits of tackling NO₂ in relation to human health that could represent a 'win-win' situation for ecosystem protection.
- 5.13. In future, many of the reductions in air pollution will be driven by efforts to reduce greenhouse gases. It is essential that the effects of climate change policies on air pollution emissions (and atmospheric chemistry), for example policies on power generation (CO₂) and agriculture (CH₄ and N₂O), are fully considered at an early stage in policy formulation, so that the co-benefits can be maximised and potential conflicts addressed. This is recognised by the Air and Local Environment Programme at Defra and the devolved administrations.

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- ¹ Draft Review of Transboundary Air Pollution. www.rotap.ceh.ac.uk
- ² <http://www.countrysidesurvey.org.uk/>
- ³ NEG-TAP, 2001. Transboundary Air Pollution: Acidification, Eutrophication and Ground-Level Ozone in the UK. National Expert Group on Transboundary Air Pollution. DEFRA, London. ISBN 1 870393 61 9
- ⁴ <http://www.jncc.gov.uk/page-4409>
- ⁵ Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora
- ⁶ http://www.jncc.gov.uk/PDF/FCS2007_ukapproach.pdf; <http://www.jncc.gov.uk/page-4060>
- ⁷ Bill Beally, Centre for Ecology and Hydrology *pers comm*.
- ⁸ <http://www.jncc.gov.uk/page-4245>
- ⁹ Hicks, K, Morrissey, T, Ashmore, M, Raffaelli, D, Sutton, M, Smart, J, Ramwell, C, Bealey, B and Heinemeyer A. 2008. Towards an Ecosystems Approach for Ammonia- Embedding an Ecosystem Services Framework into Air Quality Policy for Agricultural Ammonia Emissions. Defra Report NR0120.
- ¹¹ <http://www.environment-agency.gov.uk/netregs/businesses/forestry/62849.aspx>
- ¹² <http://www.northwyke.bbsrc.ac.uk/AmmoniaInventoryWebsite/AmmoniaInventory.html>
- ¹³ CCE. 2008. Hettelingh, JP., Posch, M., Slootweg, J. Eds. Critical Load, Dynamic Modelling and Impact Assessment in Europe: CCE Status Report 2008, Co-ordination Centre for Effects, Netherlands Environmental Assessment Agency, www.pbl.nl/cce
- ¹⁴ Defra research contract AC0109
<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=14938&FromSearch=Y&Status=2&Publisher=1&SearchText=AC0109&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description>
- ¹⁵ [UK national emissions ceilings Directive data submission, 2006](#)
- ¹⁶ ENDS Report 397, February 2008, p 14 © 2008 Haymarket Business Media
- ¹⁷ Entec, 2008. Multi-Pollutant Measures Database Interim Report to Defra: Meeting the NOx National Emission Ceiling for 2010.
- ¹⁸ Air Quality Strategy for England, Scotland, Wales and Northern Ireland. 2007. Defra.
<http://www.defra.gov.uk/environment/quality/air/airquality/strategy/index.htm>