NPL
National Physical Laboratory

Contact:
Fiona Auty
Head of Government Relations
National Physical Laboratory
fiona.auty@npl.co.uk

Response to the Clean Air Strategy Consultation 2018

August 2018

The National Physical Laboratory (NPL) is a world-leading National Measurement Institute and is responsible for measurement strategy and delivery in the UK. NPL is owned and funded (in part) by BEIS. NPL sits at the heart of the UK's National Measurement System (NMS) and works in partnership with government, academia, applied research labs and industry to deliver the greatest benefit for the UK and the world.

We conduct high-quality measurement science and provide products and services that enable businesses and public organisations to make reliable measurements and have confidence in the decisions they make based on them. NPL is one of the UK's Air Quality Reference Laboratories and has over 30 years' experience in making air quality measurements in the UK. NPL currently operates three of the UK's air quality networks[1] on behalf of Defra, does quality assurance and control for the Automatic Urban Rural Network (AURN)[2] and provides measurement expertise for Defra's Local Air Quality Management (LAQM).[3] NPL is also part of a new collaboration with the London Mayor's Office to monitor and tackle air pollution in London.[4]

Below we set out an executive summary followed by NPL's responses to the questions that we consider most relevant to its area of expertise.

Executive Summary

1. The development of evidence based policy and the assessment of the impact of policy relies on there being confidence in the underlying data used to draw conclusions. Producing such data requires a sufficient number and range of accurate and traceable measurements to be made in the field. Whilst modelling is extensively used in the UK to predict ambient pollutant concentrations, these models are underpinned entirely by measurement data for their development, validation, calibration and on-going refinement. The accuracy and reproducibility of measurement is important in order to maximise the confidence in the conclusions that can be drawn from the data.

2. In summary, the main recommendations we make in response to the consultation are that:

   - **Research is needed to clarify the exact forms of pollution that cause the worst health effects, so that pollution reduction activities can be best targeted**

---

[1] http://www.npl.co.uk/measurement-services/environmental-monitoring/air-quality-networks
[2] https://uk-air.defra.gov.uk/networks/network-info?view=aurn
[3] https://laqm.defra.gov.uk/
[4] http://www.npl.co.uk/news/npl-forms-part-of-mayors-specialist-team-to-tackle-air-pollution-in-london

> The Strategy rightly focusses on PM$_{2.5}$ as the priority for health effects. However, the inclusion of all airborne particles in this size range, regardless of composition, is the result of lack of knowledge of the detailed health effect mechanisms. This can be corrected, ultimately leading to smarter targets than the crude PM$_{2.5}$ measure.

- **More real-world measurements should be made to improve confidence in the data produced**

  > Not enough field (ambient concentration) measurements are currently made to answer with confidence many of the questions posed by this consultation.

  > More direct measurements of real-world emissions, and of emissions factors (i.e. emissions under controlled conditions) are required to better populate, and subsequently benchmark, emissions inventories, and improve the quality of data used in air quality models.

  > Investment in new, low cost sensor technologies now is likely to lead to substantial future benefits in terms of better knowledge of spatial variation in pollutant concentrations, assessing and reducing personal exposure, and developing targeted actions by government and individuals.

- **Defra should require measurements to be taken under accreditation**

  > Many research-based measurements are not made under appropriate accreditation (e.g. to ISO 17025), or with full traceability to accepted references. This fails to maximise their value for evidence-based policy decisions.

- **Cross-checks between the models and measurements should be made more frequently and emissions inventories improved accordingly**

  > There needs to be greater cross-checking between the results of models and field measurements, so that deficiencies in the models are identified more quickly and issues of uncertainties are addressed.

Consultation questions:

1. Understanding the problem

Q1. What do you think about the actions put forward in the understanding the problem chapter? Please provide evidence to support your answer if possible.

6.   The emphasis on investment in modelling, data and analytical tools is very welcome. Air pollution is indeed complex, and more definitive science is needed to understand the details of the relevant pollution sources, and the evolution and fate of the pollutants once they are in the atmosphere.

7.   We feel there is not enough emphasis on linking the data on concentrations to data on health effects, especially for the various components of PM$_{2.5}$ particles. For example, it is at least plausible that soluble particles such as ammonium salts will simply dissolve in contact with human airways, with minimal health effects compared to insoluble particles such as those from combustion sources and brake wear. This would of course mean that the action on ammonia proposed in Chapter 7 would have only a small beneficial health effect, even though the headline PM$_{2.5}$ concentration could

drop significantly. While the current default position is that any drop in $PM_{2.5}$ concentration is good, more effort in understanding the health problem will enable better targeted actions in future.

8. To improve confidence in the data produced and help understand the problem, there needs to be an increase in the number of real-world measurements made. We feel that not enough field (ambient concentration) measurements are currently carried out to confidently answer many of the questions put forward in this consultation. More direct measurements of real-world emissions, and more accurate and traceable measurements of emissions factors (i.e. emissions under controlled conditions) are required to better populate, and subsequently benchmark, emissions inventories, and improve the quality of data used in air quality models. This is especially true of wood-burning stoves. Over time, increasing the frequency of real-world measurements will enable the UK to monitor long-term trends in air quality.

9. In addition to increased measurements, we think it is vital that more frequent cross-checking between the field measurements and the models is carried out. This will mean that deficiencies in the models, like the historical underestimate of diesel NO_X emissions within the inventories, will be identified more quickly.

10. Finally, many research-based measurements are not made under appropriate accreditation (e.g. to ISO 17025), or with full traceability to accepted references. To maximise their value for evidence-based policy decisions, we suggest that Defra should require air quality measurements to be taken under accreditation. At NPL we have a dedicated suite of test and calibration facilities that are accredited under ISO 17025 for carrying out instrument tests to the MCERTS standards. Certified instruments provide the best basis for monitoring concentrations and emissions. NPL is working to develop a technical protocol against which low cost sensor systems can be accredited for air quality monitoring.

Q2. How can we improve the accessibility of evidence on air quality, so that it meets the wide-ranging needs of the public and other interested parties?

11. We welcome the Government's commitment to maintaining a strong evidence base and improving both the transparency about the methods by which air quality assessments are made and accessibility of air quality data. We suggest that the UK-Air website is more widely promoted on government websites such as the NHS Choices website in relation to health. In addition, websites that provide information on the weather which often display pollution ratings could link directly to the UK-Air website. C40 consortium[5] is also aiming to improve citizen engagement through tools developed by the Cambridge Environmental Research Consultants (CERC) to display concentration predictions.

2. Protecting the nation's health
Q3. What do you think of the package of actions put forward in the health chapter? Please provide evidence to support your answer if possible.

12. We welcome all the measures to reduce human exposure to pollution, to improve the provision of information to the public, and to encourage changes to behaviour that will lower both emissions and exposure.

---

[5] https://www.c40.org/cities

13. Following on from the comments in paragraph 7 above, the task of protecting the nation's health can be made much more efficient if there is reliable knowledge of the health effects of all relevant pollution components. We feel there is too much emphasis given to pollutants set in legislation many years ago, together with the limit values decided at that time. This is especially true of NO_2, where the limit value was set low on the understanding that it would be met through technological improvements to engine design. In this example, the understanding was proved to be incorrect, and although the legal ramifications of current concentrations are considerable, the actual health effects are still unclear. It is also true of $PM_{2.5}$, which is treated as a single pollutant for historical reasons, when it clearly is not.

14. To check their own exposure, people have started wearing or carrying low cost air sensors. Currently these sensors do not have to undergo standardised or independent quality assurance, opening up the potential for people to base decisions about their lifestyle on inaccurate data. The UK needs to support the development of these sensors and standardise ways of measuring air pollution, and find ways of integrating different data sets to give us more information about pollutant exposure and health.

4. Securing clean growth and innovation

Q7. What do you think of the package of actions put forward in the clean growth and innovation chapter?

15. We welcome the Government's commitment to supporting innovation in the area of clean growth. We agree that it is important that the development of novel technologies and solutions have a dual purpose to both support improvements in air quality and decarbonisation to address climate change.

16. We are pleased see 'Green Great Britain Week' included in the actions. We believe this provides an excellent opportunity to raise public awareness about air quality and climate change issues and the research and technology that is being developed to provide solutions. NPL looks forward to participating in the events.

17. We think it is vital that the funding from UKRI to support Clean Air Innovation is available to the best researchers in industry and public sector research organisations as well as those researchers in academia.

Q9. In your view, what are the barriers to the take-up of existing technologies which help tackle air pollution? How can these be overcome?

18. Technologies need to be evaluated before they will be invested in and adopted by customers. There is a barrier to market uptake because early entrants have not delivered on performance, resulting in potential customers lacking trust in results, and there is no standard to judge against. We think that funding is needed to develop and test technical protocols with industry participation to ensure technologies are fit for purpose. A standard for performance would provide guidelines for business and increase customer confidence and market uptake.

Q10. In your view, are the priorities identified for innovation funding the right ones?

19. We agree that the priorities identified for innovation funding are correct, however we feel that some of the priorities need to be expanded to include additional areas. We also believe there is scope for more research to be carried out on VOCs at home and in the work place, for example intelligent building management systems can be developed to measure both indoor and outdoor air.

These can be used to improve air quality in the workplace, schools and homes by controlling air intake and managing VOCs and CO_2 levels.

20. Finally, we believe that funding for research on ammonia emissions from agriculture should also include ammonia emissions from vehicle exhausts in cities. Improved technologies are required to deliver a suitable online reference method, followed by low cost sensors to replace low accuracy diffusive samplers.