

Clean Air for NSW – NSSL Contribution

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1. Do you have any comments on the proposed actions in the Clean Air for NSW Consultation Paper to improve air quality? (Please use headings to identify each action)

Overall comments:

The NSW Smart Sensing Network (NSSL) is a joint initiative of the NSW Government, the University of Sydney and UNSW with expertise in a number of sensing sciences. The NSSL commends the EPA for producing such a thorough and extremely clear summary on the current air quality measures and plans for the future. While Australia has generally good air quality we strongly believe that collaborative efforts by government, industry and researchers, can lead to significant improvements and make our state an international leader in air quality, avoiding the sorts of problems in other countries, most typically those recently experienced in London, UK.

The NSSL is directed by Prof Ben Eggleton of the University of Sydney and Prof Justin Gooding, world leaders in the physical sciences relating to sensing. The flagship project of the NSSL is the Air Quality coordinated by Dr Tomonori Hu, a post-doctorate researcher with broad expertise in the optical science and engineering associated with air quality measurement techniques. The NSW Smart Sensing Network would like to make some suggestions for NSW Air Quality.

Technology expertise in NSW:

The NSSL firmly believes that new innovative technologies for sensing air quality are needed. With the rapid changes in combustion processes, such as diesel, and with more complex and varied chemicals, such as nanoparticles, it is becoming apparent that we require better sensors that enable us to more precisely sense distributions of particles and gases through time and space. The development of such technologies will span from discovery science at the laboratory benchtop to application, testing and validation in the marketplace.

Building on the world class testing and measurement facilities of the NSW Office of Environment and Heritage, the NSSL would like to see the expansion of research capacity and further collaboration. We would like to bring together a wider range of health, industry and research experts. An example is the International Laboratory for Air Quality and Health at the Queensland University of Technology. This WHO-accredited laboratory has strong linkages between industry and research, resulting in major impact for the field of air sensing. A NSW version of such a facility, or one that collaborates strongly with the QUT laboratories would enable the great innovations and scientific discoveries.

2. Are there other issues and actions that Clean Air for NSW should cover?

Local air quality: *micro-air* as opposite to *macro-air* quality

The Clean Air for NSW document highlights the air quality issues over large distances – often many kilometers between town and suburbs. Although there are some mentions of particular locations, such as the Hunter Valley rail corridor, it is imperative that spatial temporal air quality is measured at a smaller scale and at more frequent intervals. This needs to be at building, room and personal spaces and temporal with events such as a vehicle passing or human respiration. As seen in the media and reported in a variety of documents, the public have concerns about air quality along rail corridors, road and rail tunnels and in the vicinity of main roads. People fret over immediate and long term health effects. Indoor air quality is of concern and possibly underreported, or misrepresented by nearby outdoor measurements. Air Quality can be seen as an issue of workplace health and safety; from offices, where impacts of air conditioners, printers and aerosols may not be fully known to mines and factories where changes in air quality may be more blatant. Part of this solution lies in the availability of reliable, accurate low-cost air sensors.

Addressing the feasibility of low cost air sensors

Low cost manufacturing and seen a proliferation in the number of low cost air sensors. These devices are not calibrated and do not meet accepted standards (in comparison to the stringent reliability tests of the ambient monitoring methods). However they may still provide useful data about the local air quality. Anecdotal reports tell of an office worker suffering bad air, measuring with a low cost sensor, then further validating in detail. In many cases remediation can be simple; increasing the ventilation to the outside and sealing the air flow from the problematic room. Although a general survey of low cost air sensors was performed by the NSW government ([link](#)), a more rigorous study on these low cost devices could makes recommendations to which are the most accurate, compare with accredited technologies, identify strengths and weaknesses of the technologies. Steps towards standardization can be made. There are commercialization opportunities for NSW should technical expertise in low cost sensors be mastered. Similar to temperature and humidity measurement, many people just say it would be nice to have some way of reporting a possible bad air environment based on a measurement, rather than intuition of how the air *feels*. The low cost sensors are an excellent first indicative step in a controlled study at finer spatial and temporal resolutions.

3. How do you want to be informed about and involved in improving air quality?

Data to the public – app based approach

The NSSL has a working knowledge of the NSW Office of Environment and Heritage ambient air monitoring sites, and believe the systems in place are extremely robust. The collected data is of excellent quality and uploads to the NSW OEH website in real time. To even further improve this it is suggested to have a mobile phone application to show this data. Historical air quality results and forewarnings for specific events such as back burning or high ozone days could be included in the app. Notifications made by mobile phone apps immediately are well received. Similar initiatives have been undertaken in Tasmania and in London, UK.

Adding to the citizen science agenda, it may also be helpful to be able to report bad air quality environments via this application. This could involve just reporting a certain location the user may be at using the GPS on the phone, with some kind of rating system on the local air. Or, the reporting can be done uploading measurements from low cost devices (identifying what sensor was used would be part of the report), or using a specific sensor that the NSW government has developed (as mentioned previously). Once a significant number of reports at a site accumulate, then a formal action may be called for by the NSW government. This kind of approach is beginning to appear at various locations in the world, e.g. San Francisco ([link](#)), and it would be nice to see NSW to be at the fore front as well.

4. Do you have any other comments or ideas on improving air quality in NSW?

What we measure we improve. The NSSL has broad capacity and knowledge over the physical sciences and engineering to advance sensing technology that will provide the measurements to tackle air quality problems. Air Quality affects everyone. Collaboration and cooperation between all stakeholders through government, industry, researchers and the community at large is needed. The NSSL puts itself forward as a central player in that collaborative effort.