



Atmospheric Pollution and Human Health in a Chinese Megacity

Announcement of Workshop

Beijing, China 14 – 16 July 2014

The Natural Environment Research Council (NERC) and Medical Research Council (MRC) are inviting applications from UK scientists to attend a joint workshop with the National Natural Science Foundation of China (NSFC) in Beijing on 14 – 16 July 2014 on the Atmospheric Pollution and Human Health in a Chinese Megacity.

The deadline for applications is 4pm on 2 June 2014.

NERC and MRC, working with NSFC, are planning a major investment in research on urban air pollution in a Chinese megacity and its impact on health. The exact level of investment is still to be confirmed, but NERC has already committed £2.5m in this area and NSFC has already committed 30m YUAN over a five year period (£2.84m at the current exchange rate).

This investment provides the opportunity for UK scientists to form substantial collaborations with Chinese scientists to undertake research.

As an initial step to help build partnerships and facilitate collaboration, NERC, MRC and NSFC will hold a joint workshop on 14 – 16 July 2014 in Beijing. The aim of the workshop will be to discuss the key science challenges that relate to the aims of this programme and how they could best be addressed. It will also facilitate networking, discussion and enable researchers to share ideas on key research questions relevant to this call. The outcome of the workshop will shape the scope of the call. The RCUK China Office has facilitated the development of this collaboration and will be assisting in the running of the workshop.

The full workshop programme and further details will be published in June.

NERC and MRC are also planning a collaboration with India on urban air pollution and details of this will be published later this year.

The Background to and Aims of the Programme

China has many environmental issues, severely affecting its biophysical environment as well as human health. Air pollution is a severe problem – one that we ignore at the risk of our health and our economy. Smog hangs heavy over Beijing, Shanghai and Hong Kong, where children grow up with asthma and other respiratory illnesses. Of particular concern is PM_{2.5} air pollution. In Beijing, Shanghai, Guangzhou and Xi'an, PM_{2.5} concentration levels in all four cities exceed World Health Organisation (WHO) air quality guidelines. This means higher health risks to the cardiovascular system, cerebrovascular system and an increase in the probability of cancer and premature death.

The Chinese government has acknowledged the problems and made various responses, but the improvements are small.

Huge progress has been made in improving air quality in the developed western world and the sulphur-based smogs of the 19th and 20th centuries no longer afflict UK cities. There is a strong temptation to assume that the approaches taken to improve air quality in the developed world will also be those most appropriate to improvement of air quality in the cities of China. Such a view is, however, naive as the causes and controls of pollution are likely to be different from those in the western world of the 1950s and 60s when air quality policies first became established. For example, if wind-blown soil and dust, biomass burning or secondary organic compounds formed from natural emissions are major contributors to airborne particulate matter, mitigation measures would be very different to those required if the major source is from coal combustion. It is also potentially inappropriate to attempt to 'export' very expensive monitoring and compliance technologies designed many decades ago for US and European cities. Consequently, regionally specific studies are needed in order to i) understand the sources and atmospheric transformations of air pollutants, ii) to provide predictive capability for the impact of similarly region-specific mitigation measures and iii) create sustainable monitoring and compliance technologies.

While it is assumed that the exposure-response functions for air pollutants determined through epidemiological studies in the developed world are applicable to the less developed world, there have been rather few studies to cast light on this question. It is likely that important differences exist, especially for particulate matter, as the sources and chemical composition are likely to be very different to the mix which prevails in western cities. Considerable added value could be achieved in this study if the air pollution measures were accompanied by health outcomes in a nested study. Susceptible individuals could be monitored in relation to extensive local and personal pollutant exposures, such as particulates, oxides of nitrogen, ozone and sulphur dioxide. The subjects would be monitored daily for symptoms and health outcome measures. There is particular interest in the use of low cost individual exposure sensor approaches for carrying out research such as this.

It is therefore proposed to conduct a large collaborative study of air quality and health in a megacity in China. Measurement data would be shared and interpretations developed jointly. Specific objectives of such a campaign would include the following:

- Detailed estimates of the quantitative attribution of the various toxic air pollutants to the sources responsible for them.
- An enhanced understanding of the atmospheric circulation and the atmospheric chemical processes responsible for the transformation of air pollutants and the formation in the atmosphere of secondary pollutants including ground-level ozone and secondary organic aerosol.
- Application of numerical models of air quality to estimate the air quality and health benefits of a range of mitigation measures.
- Scale up of low cost long-term monitoring technologies for studying spatial and temporal trends and compliance in air quality, for validation and improvement in modelling predictions and as a legacy capability beyond the fixed research programme.
- Increased understanding of the health effects in susceptible individuals over time periods when there are large fluctuations in pollutants compared with normal controls, to identify health outcomes of air pollution.

Impact:

Using the results generated in this study, together with published exposure-response functions, the burden of disease associated with different pollutants, and with the specific sources of those pollutants will be estimated. Using a numerical model which links emissions to airborne concentrations, abatement scenarios can be evaluated for their effectiveness. Combining this

knowledge with economic cost-benefit assessments allows the most cost-effective measures for health improvements to be identified. These might include fitting flue gas desulphurisation plant to a local power station or fitting particle traps to diesel electricity generators.

Enhanced knowledge of pollutant-driven health effects can also be used to encourage behavioural changes. For example, pollutants such as sulphur dioxide and ozone are much reduced in the indoor environment relative to outdoors, and pollutant lung dose can also be reduced by limiting vigorous exercise on high pollution days. Emerging economies form a key market for low cost environmental sensor technologies, since many have yet to prescribe in law their data requirements or technologies needed for exposure assessment or compliance monitoring. The translation of sensor devices into a possible operational environment is the key next step in the commercialisation of technology developed.

The workshop

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It is planned that the workshop will start with a reception on the evening of 14 July 2014 and end at lunchtime on 16 July.

Attendance at the workshop does not automatically enable project bids to be submitted or guarantee funding. Conversely, absence from the workshop does not preclude bidding into the call that will follow the workshop.

To attend the workshop you must complete the expression of interest ("EoI") proforma, following the instructions provided on the form. The proforma, together with a CV of no greater than 2 sides of A4, should be sent to Simon Howe (atmospheric@nerc.ac.uk) by 16:00 on 2 June 2014. Invited participants will be notified in week commencing 9 June. Submission of these documents will be taken as an indication of availability on the dates of the workshop.

Applicants for the workshop should outline their relevant area of expertise, any current overseas collaborations and links, their personal rationale for being involved in the workshop. They should also state in what area they are considering submitting an application in line with the aims of this programme. Please note that the total number of participants from the UK is limited and NERC/MRC will try to ensure a balance in terms of different disciplines/expertise and the number of attendees from the same institution. It is expected that 10 to 15 UK participants will be invited to attend.

All reasonable expenses for UK participants attending the workshop will be covered by NERC in line with NERC policy on recovering travel and subsistence.

For further information please contact:

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