



**Atmospheric Pollution and Human Health in a Chinese Megacity
A UK-China Collaboration**

Guidance for invited Full Proposals from UK applicants

Closing date for UK Full Proposals: 16:00 UK time 7 May 2015

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1. Summary

The Natural Environment Research Council (NERC), the Medical Research Council (MRC) and the National Natural Science Foundation of China (NSFC) are investing in a strategic research programme on urban air pollution in the megacity Beijing and impacts on health. This will be delivered by research partnership between UK scientists and Chinese scientists.

Urban air pollution is a severe problem in China with significant impacts on the economy and the health of the population. This programme will support research on the sources and emissions of urban air pollution in China and the processes underlying and impacting on this, and how air pollution impacts on health. This will be combined to understand the effect of interventions and thus form cost effective and appropriate solutions for the benefit of the population.

NERC and MRC have a budget of £5.5m (£3m of which is from the Newton Fund) for the overall programme and NSFC have 40m YUAN. NERC/MRC funds will specifically be used to support UK researchers, while NSFC funds will fund Chinese researchers. The programme is split into four themes:

- sources and emissions of urban atmospheric pollution;
- processes affecting urban atmospheric pollution;
- exposure science and impacts on health; and
- interventions and solutions.

It is expected that there will be one collaborative grant within the sources and emissions theme; one collaborative grant within the process theme; two collaborative grants on the exposure science and health theme; and one collaborative grant on the integration and solutions theme. In order to allow integration between the different themes, research must be based in Beijing.

This delivery of this programme is part of a three stage process. The first stage was for Expressions of Interest (EoIs), which is now complete. This is now the second stage of the process and is the **guidance for invited applicants to the Full Proposal stage** for those that were successful at the EoI stage. Full Proposals will be put through peer review and go to a Moderating Panel. The final stage will be for leading members of the successful Full Proposal teams to attend a kick-off workshop where they will identify integrative and coordination activities between the different grants and themes and develop a detailed implementation plan. Grants will start in January 2016 and will be up to four years long.

The closing date for UK Full Proposals in JeS is 16:00 UK time 7 May 2015.

2. Background

2.1 Science background

Worldwide, populations are rising and more people are living in cities. This increase will be most dramatic in Asia and Africa, which are least urbanised at present, leading to the development of more “megacities”. A megacity is usually defined as a metropolitan area with a total population in excess of ten million people. Although the definition depends on where the line is drawn in terms of boundary (built up area, urban area, administrative area) and whether population estimates are accurate, especially with rapid growth as is seen in many Chinese cities

Megacities hold many challenges, including social and cultural change, crime and terrorism, homelessness, traffic congestion, urban sprawl and environmental issues. In China, urban air pollution is a severe problem with occurrence of haze increasing in severity and frequency between the 1950s and 2000s, caused by the particular weather conditions and increasing pollution. Five hundred million people in 86 cities are thought to be affected by haze in China. As a consequence, there is an increased prevalence of asthma and other respiratory problems in children. China is faced with one of the highest particulate matter concentrations, and in particular PM_{2.5} concentrations, which regularly exceed World Health Organisation (WHO) air quality guidelines in Beijing, Shanghai and Guangzhou. This has been linked to 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 to date 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 of pollution are likely to be different from those in the western world of the 1950s and 1960s 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 or road transport. Furthermore, it would be very difficult to transfer mitigation strategies of sources acting in isolation in other countries where the co-presence of different sources and interactions of different pollutants will result in a very different situation in China. Additionally, the specific weather and climate of China, and the physical structure of these megacities (e.g. numerous very tall buildings) make for a very different situation. It is therefore unwise to use expensive monitoring and compliance technologies designed many decades ago for US and European cities.

While it is assumed that the exposure-response functions for air pollutants determined through epidemiological studies in the western world are applicable to the situation in China, 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. In addition, diets and genetic predisposition to certain health outcomes will likely be very different in other regions of the world, affecting the susceptibility of the population to air pollution related health effects. Recent medical advances in systems biology, toxicology and monitoring of human population environmental exposures could allow strong interdisciplinary links to be made between research in air pollution and human health, for example in vulnerable groups such as children and the elderly.

Consequently, studies are urgently needed in Chinese megacities in order to: understand the sources and emissions of urban air pollution; understand the chemical and physical processes affecting air pollutants; explore associations between air pollutant exposure and disease; provide predictive capability for the impact of mitigation measures; and create sustainable monitoring and compliance technologies. This needs to then feed into feasible solutions both in technology and policy for the benefit of the population.

2.2 Programme background

Atmospheric Pollution and Human Health in a Chinese Megacity is a strategic research programme jointly supported by the UK's Natural Environment Research Council (NERC) and the Medical Research Council (MRC), and the National Natural Science Foundation of China (NSFC). This programme will be delivered by research partnership between UK and Chinese scientists. NERC and MRC have jointly made available £5.5m for this programme (including support from the Newton Fund) and NSFC have 40m YUAN. As an initial step to help build partnerships and facilitate collaboration, NERC, MRC and NSFC, with support from RCUK China and the Chinese Academy of Sciences (CAS) Institute of Atmospheric Physics, held a joint workshop on 14-16 July 2014 in Beijing. The aim of the workshop was to discuss the key science challenges that relate to the aims of this programme and how they could best be addressed. It facilitated networking and discussion, and also enabled researchers to share ideas on key research questions relevant to a research call. The outcome of the workshop has been used to shape the scope of the call for research proposals. The full information on this workshop can be found on the NERC programme pages¹. All potential applicants are encouraged to read the information about the workshop in order to be fully informed before submitting an application.

In the UK, NERC is the leading public funder of environmental science with the vision to place environmental science at the heart of responsible management of our planet. The NERC strategy "The Business of the Environment"² identifies three strategic priority areas for research to meet society's needs: 1) benefiting from natural resources; 2) resilience to environmental hazards; and 3) managing environmental change. This programme addresses the second area in particular, but also has relevance to the other two.

MRC's mission is to: encourage and support high-quality research with the aim of improving human health; produce skilled researchers; advance and disseminate knowledge and technology to improve quality of life and economic competitiveness, UK and worldwide; and promote dialogue with the public about medical research. MRC's strategic plan 2014-2019 "Research Changes Lives"³ aims to support medical research which increases the pace of the transition to better health. This includes environment and health research which will explore the impact of our environment on health and wellbeing, as is being delivered through this programme.

NSFC is a funding agency for basic research across China, with a remit covering all research areas, except social science and humanities.

2.3 Newton Fund

Part of the NERC funds and all of the MRC funds for this programme have been received directly from the Department for Business, Innovation & Skills (BIS) as part of the Newton Fund⁴. The

¹ <http://www.nerc.ac.uk/research/funded/programmes/atmospollution/#xcollapse4>

² <http://www.nerc.ac.uk/latest/publications/strategycorporate/strategy/>

³ <http://www.mrc.ac.uk/news-events/publications/strategic-plan-2014-19/>

⁴ <https://www.gov.uk/government/publications/newton-fund-building-science-and-innovation-capacity-in-developing-countries/newton-fund-building-science-and-innovation-capacity-in-developing-countries>

Newton Fund intends to strengthen science and innovation partnerships between the UK and emerging knowledge economies. The Fund forms part of the UK's Official Development Assistance (ODA) commitment which is monitored by the Organisation for Economic Cooperation and Development (OECD)⁵. ODA funded activity focuses on outcomes that promote the long-term sustainable growth of a sub-set of countries on the OECD Development Assistance Committee list⁶ and is administered with the promotion of the economic development and welfare of developing countries as its main objective. The fund covers three broad categories of activity: i) people: improving science and innovation expertise (known as "capacity building"), student and researcher fellowships, mobility schemes and joint centres; ii) programmes: research collaborations on development topics; and iii) translation: innovation partnerships and challenge funds to develop innovative solutions on development topics. Of these, this programme relates partially to the first and more majorly to the second activity. Collaborations under the call will contribute to economic development and social welfare China, in line with the Newton Fund's aims. All applications under this call must be compliant with these specifications (see this point under section 5.3.2).

3. Building on previous investments

NERC has made previous investment in urban atmospheric science and health research, including the Urban Atmospheric Science programme which funded the ClearFlo (Clean Air for London) project⁷ which used long-term integrated measurements complemented by modelling to improve predictive capability for air quality. With other funders, including MRC, NERC led the Environmental Exposure and Health Initiative (EEHI) which funded new knowledge on the interconnections and pathways between pollutants and interacting stressors, exposure routes and health effects in humans. This included the TRAFFIC project⁸, which aims to better understand the health problems caused by air pollution and noise from traffic in London, and the AWESOME project⁹ (Air pollution and WEather-related health impacts: methodological study based on Spatio-temporally disaggregated multi-pollutant models for present-day and future), which is examining the effects of air quality and climate policies on air pollutant exposures and health. The MRC also funds research in this area, including research grants exploring environmental exposure and chronic disease, and strategic investments, in particular the MRC-Public Health England Centre for Environment and Health in London. The Centre brings together leading research groups in environment and health to support diverse themes including Air Pollution (Noise and Health), the "Exposome", Small Area studies, Systems Toxicology, Biostatistics and Cohort studies. In particular, the "Exposome" concept is a new paradigm in systems biology 'omic' techniques (metabolomic, epigenomic, transcriptomic, proteomic, adductomic, etc.) that seeks to develop and validate biomarkers as measures of the totality of individual human exposure (including chemical and biological agents, radiation, psychosocial, etc.) to improve understanding of the links between environment and chronic disease. More broadly, this includes the European Commission (EC) funded EXPOSOMICS project¹⁰ that includes development of personal exposure monitoring systems to continuously assess exposure to the individual. There are also numerous cohorts in Europe looking at air pollution and health, including the ESCAPE network (European Study of Cohorts for Air Pollution Effects)¹¹ and the SAPALDIA study (Swiss Cohort Study of Air Pollution and Lung Disease in Adults)¹². There have also been investments by the EC in air pollution in China, including MARCO POLO (Monitoring and

⁵ <http://www.oecd.org/>

⁶ <http://www.oecd.org/dac/stats/DAC%20List%20used%20for%202012%20and%202013%20flows.pdf>

⁷ <http://www.clearflo.ac.uk/>

⁸ <http://www.kcl.ac.uk/biohealth/research/divisions/aes/research/ERG/research-projects/traffic/index.aspx>

⁹ <http://awesome.lshtm.ac.uk/>

¹⁰ <http://www.exposomicsproject.eu/>

¹¹ <http://www.escapeproject.eu/>

¹² <http://www.sapaldia.net/en/>

Assessment of Regional air quality in China using space Observations, Project Of Long-term sino-european co-Operation) and PANDA (Partnership with ChiNa on space Data)¹³.

4. Process and assessment

4.1 Overall process for programme delivery

An Expression of Interest stage was used to identify projects invited to submit a Full Proposal. Only applicants successful at the Expression of Interest stage are eligible to submit Full Proposals.

This document represents the guidance for invited applicants to the Full Proposal stage. **If you were not invited to submit a Full Proposal then any submission by you will be rejected.**

These are collaborative projects between the UK and China. Applicants from the UK must apply through JeS with Chinese collaborators listed as Project Partners. Chinese applicants will apply through NSFC's system. Both applications will have a common Case for Support attached in each system. Successful grants will have their UK costs paid through JeS and their Chinese costs paid through NSFC's system.

The closing date for UK Full Proposals in JeS is 16:00 UK time 7 May 2015.

Full Proposals will be put through peer review and go to a Moderating Panel. The final stage will be for leading members of the successful Full Proposal teams to attend a kick-off workshop in November 2015 in advance of the award of grants where they will identify integrative and coordination activities between the different grants and themes and develop a detailed implementation plan. Grants will start in January 2016 and will be up to four years long.

4.2 Application process for Full Proposals

4.2.1 Basics

The closing date for Full Proposals is **16:00 UK time 7 May 2015**. No proposals can be submitted after this time. Full Proposals will need to be submitted through the Joint Electronic Submission (JeS) system (<https://je-s.rcuk.ac.uk>). The JeS call name is "Newton: Atmospheric Pollution and Human Health in Chinese Megacity" and scheme is "Directed International".

Applications must be completed in English.

It is expected that proposals will evolve between the Expression of Interest and the Full Proposal stage. Successful EoI will have been provided feedback on their proposal and applicants should take this into consideration when preparing their Full Proposal.

Teams may wish to expand their partnerships from the EoI stage and this will be acceptable, although it is expected that the UK PI remain the same. Individual researchers may be named on a maximum of two different proposals, but on only one as the lead Principal Investigator. This is across the call as a whole, and not restricted to individual themes. Proposals with individuals listed on more than two will be rejected.

It is also expected that projects may wish to change the resources requested from that originally proposed in the EoI; this is acceptable providing they remain within the upper limits set by the call.

¹³ <http://www.marcopolo-panda.eu/>

If significant changes from the proposed strategy in the EoI are being considered for the Full Proposal, or for any other issues that require clarification, applicants should get in touch as soon as possible with NERC/NSFC to discuss.

It is very important to note that from January 2015, NERC has updated its position on adherence to grant rules¹⁴. **This means that any applications which fail to adhere to the page lengths of documents, font size, the specified budgetary limits of grants, the specified start date, etc. will automatically be rejected and there will be no opportunity for amendment or appeal.**

4.2.2 Application guidance

Applications should follow the guidance in points 173-187 of the NERC Grants Handbook¹⁵.

For proposals under themes 1 and 2 of this call, grant sizes are equivalent to NERC Discovery Science Large Grants and therefore specification of attachments and documents length should be followed according to point 197 of the NERC Grants Handbook.

For proposals under themes 3 and 4 of this call, grant sizes are equivalent to NERC Discovery Science Standard Grant and therefore specification of attachments and documents length should be followed according to point 188 in the NERC Grants Handbook.

Applicants are required to submit an additional attachment as type "Other" which summarises details of the Chinese applicants and their requested costs. There are further specifications on the UK-Chinese collaborations in section 4.2.3.

For any joint proposals, i.e. where a research proposal consists of more than one component proposal enabling funding to be awarded directly to different Research Organisations, guidance provided in points 205-210 of the NERC Grants Handbook should be followed.

The NERC Grants Handbook was updated in November 2014 so it is advisable to check rather than assume knowledge.

4.2.3 UK-Chinese collaborations

UK applicants will be expected to submit their associated costs in JeS and Chinese applicants will be expected to submit through NSFC's system with their associated costs. Each project will have the same Case for Support document which will be attached in both JeS and NSFC's system.

Given the dual nature of the process, UK applicants should ensure that Chinese partners adhere to NSFC rules for submission and eligibility¹⁶. **Full Proposals which do not follow NSFC rules or include Chinese applicants who are ineligible will also be rejected by NERC with no opportunity for appeal.** It is advisable to check with NSFC if there is any doubt.

In order to allow for reporting on Newton Fund activities, **UK applicants should include their Chinese collaborators as Project Partners in their JeS application with their NSFC costs added as a partner contribution.** The list of collaborators and their costs should also be summarised as an

¹⁴ <http://www.nerc.ac.uk/latest/news/nerc/grant-regs/>

¹⁵ <http://www.nerc.ac.uk/funding/application/howtoapply/forms/grantshandbook.pdf>

¹⁶ "二、申请资格" and "三、限项规定" of <http://www.nsf.gov.cn/publish/portal0/tab87/info47747.htm> for specific regulations and restrictions.

additional attachment on your submission. You also must **include the Chinese collaborators as part of the Track Record section of your Case for Support.**

4.2.4 Finances

UK applicants should follow the financial conditions set out in Section E of the NERC Grants Handbook. In addition to this, according to Newton Fund rules, requests for capital will only be considered if the proposed equipment is to remain in China for use after the project is completed. If equipment is returned to the UK after the project this cannot be funded through the Newton Fund and an alternative source of funding should be sought.

4.2.5 Data management

NERC requires that strategic research programmes implement a data management scheme which covers practical arrangements during the programme and subsequent long-term availability of the data set. In line with the NERC data policy¹⁷ the data from the programme will be lodged with the appropriate NERC Designated Data Centre. NERC puts an obligation upon PIs to ensure that data management is undertaken in a suitable way. At the Full Proposal stage, applicants are required to submit an outline Data Management Plan (ODMP) as a separate mandatory attachment, to identify the data sets likely to be available to NERC Data Centres for archiving and reuse at the end of the grant. There will be no charge to the project for a NERC Data Centre to accept and manage the agreed data sets at the end of the grant but any in-project data management activities should be costed and included within the proposals. If proposals do include any costs for the Data Centre then these will be removed from the proposal before award. For any population or patient based studies, the applicants must comply with requirements for data management in the MRC Guidance for Applicants and Award Holders 2014¹⁸ (section 4.2.6).

4.2.6 Use of animals and/or human participants

For any proposals including the use of animals and/or human participants in research, the guidance in sections 8.2 and 8.3, respectively, of the MRC Guidance for Applicants and Award Holders 2014¹⁸ must be followed. Applicants using animals and/or human participants are also required to complete and submit the template form in annex 1 an additional attachment as type "Other" in JeS.

4.2.7 Funds for developing Full Proposals

There are be some funds available to help support costs (i.e. travel and subsistence, meeting room hire) associated with the development of Full Proposals. There is an amount on offer per Full Proposal which is invited to submit. Given that the budgets of grants are different for each theme, the limits are scalable:

- £15k for proposals in the sources/emissions theme;
- £10k for proposals in the processes theme;
- £7k for proposals in the exposure science and health theme; and
- £7k for proposals in the intervention and solutions theme.

NERC will not refund any staff time/per diems and the Research Council policy for travel and subsistence must be adhered to. Funds will be reimbursed via purchase order, on receiving evidence of expenditure via receipts and a spreadsheet summarising what has been spent on what and by

¹⁷ <http://www.nerc.ac.uk/research/sites/data/policy/data-policy.pdf>

¹⁸ <http://www.mrc.ac.uk/documents/pdf/guidance-for-applicants-and-award-holders/>

whom. Please send to atmospheric@nerc.ac.uk by Thursday 4 June 2015. **Any claims received after this date will not be reimbursed.**

4.3 Assessment process for Full Proposals

Full Proposals will go through parallel peer review in JeS and in NSFC's system, the latter in Chinese. The Full Proposals will go out to external reviewers from both JeS (internationally) and from NSFC (in China), with the aim of achieving a minimum of five reviewers in total (2-3 reviewers each). There will be a PI response stage in JeS around mid-July to mid-August 2015 for the reviews received by NERC; PIs should be ready to respond to this and consult with their teams, including their Chinese collaborators. NSFC's system does not have the facility for a PI response stage.

The reviews and PI response will be brought together at a joint UK-Chinese Moderating Panel.

Further details of NERC assessment process is available on the NERC website¹⁹.

The primary assessment criteria will be Excellence and Fit to Scheme (both Scientific and Non-scientific objectives – see section 5.3). Further details of the assessment criteria are available on the NERC website²⁰, as well as details of guidance and scoring for reviewer²¹ and panels²².

4.4 Kick-off Workshop

The assessment process will identify the successful Full Proposals which NERC and NSFC anticipate funding. Individuals from successful Full Proposals will be required to attend a kick-off workshop in China in November 2015 (specific date to be confirmed). It is a mandatory requirement that successful projects (at least two UK and two Chinese attendees per proposal) attend this workshop. The aim of this workshop is for project teams to come together and work with other successful proposals to explore opportunities to network, learn from each other and develop collaborative work that could add value to the initial investments. This integration might include various mechanisms such as: project integration (joint initiatives, meetings, regular communication, etc.); linking project plans/timelines/data dependencies/data flows; and possible work shadowing between projects. These follow-on activities are not intended to re-shape existing strategies but to help refine and adapt where there is value and to build in additional research activities that could not be delivered by a single award alone. It will also allow for important agreements to be put in place regarding data sharing and access between the UK and China.

Following this workshop, a proposal detailing these activities will be prepared and then assessed. The final award of grants will not happen until the funders are satisfied with the proposal for this integration and coordination. **Applicants should be aware that there will be no funds for these activities added to grants and therefore a degree of flexibility should be incorporated within the original application budget in order to allow for this integration and coordination.**

¹⁹ <http://www.nerc.ac.uk/funding/application/assessment/>

²⁰ <http://www.nerc.ac.uk/funding/application/assessment/assesscriteria/>

²¹ <http://www.nerc.ac.uk/funding/application/howtoapply/forms/programmeguidance.pdf>

²² <http://www.nerc.ac.uk/funding/application/howtoapply/forms/programmepanelguidance.pdf>

5. Grant requirements

5.1 Grant specifics

It is expected that there will be:

- one collaborative grant on the sources/emissions theme;
- one collaborative grant on the process themes;
- two collaborative grants of roughly equal size on the exposure science and health theme; and
- one collaborative grant on the integration and solutions theme.

The budgets for each theme are:

- £2.1m from the UK and 15m YUAN from China for the sources/emissions theme;
- £1.4m from the UK and 10m YUAN from China for the processes theme;
- £1.2m from the UK and 10m YUAN from China for the exposure science and health theme; and
- £0.6m from the UK and 5m YUAN from China for the intervention and solutions theme.

All UK funds are listed at 80% FEC.

Applicants should remember to incorporate flexibility into their application budget in order to carry out activities for integration and coordination at the programme level (i.e. between different grants and themes) which will not be decided until after the decision on the successful Full Proposals (see section 4.4). There will be no additional funds for these activities. The final award of grants will not happen until the funders are satisfied with the proposal for integration and coordination.

Grants will start in January 2016 and will be up to four years long.

5.2 Scientific scope of themes

This section sets out the scientific objectives of the individual themes for this call and also includes the specification of context and approaches. Applicants should address all of the scientific objectives laid out in the theme for which they wish to apply and should also adhere to the specification of the context and approaches. If applicants fail to meet any of the specifications outlined below then the funders reserve the right to reject their application.

5.2.1 Sources and emissions of urban atmospheric pollution theme

Delivery

It is expected that there will be one grant funded to deliver this theme. The UK has a budget of £2.1m (at 80% FEC) for this theme and NSFC has a budget of 15m YUAN. Grants will start in January 2016 and be up to four years in duration.

Scientific objectives

In this theme it is expected that proposals address the following scientific objectives:

- Implement an urban atmospheric pollution measurement campaign at an appropriate scale, both spatially and temporally, in particular to align with the objectives of research on air pollution and human health. This measurement campaign will be linked to other measurements required as part of the other objectives, below.

- In-situ characterisation of the nature (both chemical and physical components) of urban atmospheric pollution/pollutants, considering relevance to individual exposure.
- Understand source apportionment of urban atmospheric pollution/pollutants and link this back to the chemical composition of urban atmospheric pollution/pollutants.
- Improve and verify appropriate existing emission inventories in the context of the sources, relevance to health, and future scenarios.

Applicants are encouraged to ensure that there are links between the different objectives. It is expected that applicants will address in approximately equal amounts the regulated pollutants of PM, NO₂ and ozone, although other pollutants can be included also.

5.2.2 Processes affecting urban atmospheric pollution theme

Delivery

It is expected that there will be one grant funded to deliver this theme. The UK has a budget of £1.4m (at 80% FEC) for this theme and NSFC has a budget of 10m YUAN. Grants will start in January 2016 and be up to four years in duration.

Scientific objectives

In this theme it is expected that proposals address the following scientific objectives:

- Implement an urban atmospheric pollution measurement campaign at an appropriate scale, both spatially and temporally, in particular to align with the objectives of research on air pollution and human health. This measurement campaign will be linked to other measurements required as part of the other objectives, below.
- Understand the chemical processes of importance for controlling regional haze and individual exposure.
- Understand the physical processes of importance for controlling regional haze and individual exposure.
- Use the above data to create new and improved existing predictive modelling capability of urban atmospheric pollution.

Applicants are encouraged to ensure that there are links between the different objectives. It is expected that applicants will address in approximately equal amounts the regulated pollutants of PM, NO₂ and ozone, although other pollutants can be included also.

5.2.3 Exposure science and impacts on health theme

Delivery

It is expected that there will be two approximately equal sized grants funded to deliver this theme. The UK has a budget of £1.2m (at 80% FEC) for this theme and NSFC has a budget of 10m YUAN. Grants will start in January 2016 and be up to four years long.

Scientific objectives

The aim of this theme is to enhance our understanding of the impact of environmental exposures on human health, capitalising on novel measurement technologies and advanced research approaches in environmental epidemiology and internal signatures of exposure. In this theme it is expected that proposals address the following scientific objectives:

- Building on understanding of the health threats from air pollution in the urban setting, define and measure the key atmospheric pollutants present, and their speciation.

- Develop improved personal measures (e.g. personal monitoring; metabolomic, proteomic, epigenetic, etc.; biomarkers) of spatial and temporal exposure to these key pollutants that can be applied in the population setting.
- Explore the causal relationships between exposure and health/disease of individuals in the population setting.

Collaborative partnerships between the disciplines required to tackle the development of these measures are strongly encouraged; for instance, between population health scientists and physical/engineering scientists (e.g. in the development of innovative sensors), toxicologists, chemical biologists and fundamental biomedical researchers.

5.2.4 Interventions and solutions theme

Delivery

It is expected that there will be a single grant funded to deliver this theme. The UK has a budget of £0.6m (at 80% FEC) for this theme and NSFC has a budget of 5m YUAN. Grants will start in January 2016 and be up to four years long.

Scientific objectives

In this theme it is expected that proposals address the following scientific objectives:

- Test interventions which provide cost-effective, context specific, whole system and long sighted solutions for air quality challenges which demonstrate potential for positive impact on people's lives. Interventions must be appropriate to the situation but may consider tackling the pollution at source, exposure to pollution or further upstream looking at preventative or precautionary approaches. They should consider health benefits, cost-benefit more broadly, risk, legal and policy, and other social and economic factors.
- Build capacity and establish long-term infrastructure for future investments, including sustainable monitoring and compliance technologies, and a platform for further collaborations.

This theme is strongly dependent on the other themes and thus to feed into the research above, the applicants must consider how they could draw together and integrate the science outputs from the other projects. In preparing their application, this framework should be considered at a project level and relate to the research plan. When the programme begins there will be a kick-off workshop for successful projects and a proposal will be submitted on additional activities for coordination and integration (see section 5.3) but this will differ from the project in this theme because it will be at a programme level and be additional activities which add value at this level.

5.2.5 Specification of context and approaches

To allow for integration between the different grants in the themes, proposals should focus on the Chinese megacity Beijing. There would be value in approaching the research via contrasting studies, either different cities in China or with UK/Europe. However, it would be expected comparisons with locations outside of Beijing would be based on existing data, rather than new observations.

Where regional and broader scale processes (such as emissions, removal and secondary chemistry) beyond the boundary of the megacity influence urban air quality these can be included in the application. However, the focus of this call and therefore any proposals submitted must be on the need for measurements and modelling at a local scale relevant to personal exposure and thus health.

It is expected that there be some form of measurement campaign in Beijing as part of this programme. However, applicants can include elements of chamber studies and other experiments and laboratory research to broaden the approach if they deem it necessary.

The funders recognise the importance of the inclusion of social and economic sciences in order to achieve the desired impact of the research. However, as this falls outside the remit of any of the funders it would be expected that any application submitted does not have more than 10% of their research activity covering basic social or economic research. There would not be an issue with using tried and tested social or economic science approaches (e.g. cost-benefit analysis) in order to set results in a whole system viewpoint as this would not be considered as basic social or economic research.

The focus of this programme is outdoor urban atmospheric pollution. However, in order to understand the full picture of individual exposure, indoor measurements can be taken, but this should not be the emphasis of the research.

The focus of this programme is impacts of urban atmospheric pollution on health. While impacts on other issues such as agriculture and climate can be cited and explored if deemed necessary in order to set the work in a broader context, these should not be the main considerations, and these should not be investigated at the expense of looking at impacts on health.

5.3 Fit to scheme

5.3.1 Scientific objectives

The scientific objectives for each theme have been given in section 5.2. The applicants should make clear in their application how these are being addressed. As part of the scientific objectives, it is also a requirement that applicants follow the specifications laid out in section 5.2.5.

5.3.2 Non-scientific objectives

There are several non-scientific objectives that applicants are expected to address:

1. Applications must be a collaboration between the UK and China and it is expected that these represent genuine and meaningful partnerships between the UK and China.
2. It is expected that individual projects will give some consideration to linking up with other projects/themes funded as part of this call so that the programme is an integrated and cohesive investment. This should include some funds set aside for integration, coordination, joint knowledge exchange, etc. and some suggestions for mechanisms and activities to approach this. The costs for these mechanisms and activities should be included in the application, but the applicants should remember to incorporate flexibility into their application budget in order to fit in with the final plan for integration and coordination which will not happen until after the successful Full Proposals are decided (see section 4.4).
3. Part of the NERC funds and all of the MRC funds are from the Newton Fund and thus it is a requirement that funding be awarded in a manner that fits with ODA guidelines. All applications must therefore be compliant with these guidelines. Note that this applies to UK funding only, and not Chinese, but as these are collaborative projects, it is expected that the project as a whole is ODA compliant and make clear that its primary purpose is to promote the economic development and welfare of China.

Applicants are strongly encouraged to demonstrate how the main research outcomes will be specific to welfare and development of China, rather than merely creating the conditions where development might occur. Applicants should consider how their project will:

- address poverty and development issues;
- address the issue identified effectively and efficiently;
- use the strengths of the UK to address the issue; and
- demonstrate that the research component is of an internationally excellent standard.

UK applicants should address ODA compliance (economic development and welfare of China) in both the JeS summary and then more fully, in the Case for Support.

It is expected that through collaboration the projects should seek to increase the skills and knowledge base at the partners institutions in this area, improving their ability to undertake and disseminate research in order to maximise the countries impact on issues of poverty and economic growth.

Any benefit to the UK has to be the secondary consideration and should not lead to a project being funded if it does not primarily deliver the development objective.

4. Proposals must include a consideration of the partnership between the medical and environmental sciences. Although it is not necessary to include researchers of both disciplines if this is not appropriate to your plan, it is necessary to ensure appropriate advice is received from someone within the other discipline.

5.4 Eligibility

For the UK partners, eligibility for this call is restricted to UK-based researchers normally eligible for funding from NERC. Further information on NERC eligibility can be found on the NERC website and in the NERC Research Grants Handbook²³. Individual researchers may be named on a maximum of two different proposals, but on only one as the lead Principal Investigator.

5.5 Studentships

No associated studentships are being funded in the UK as part of this call and will be cut from proposals if included.

²³ <http://www.nerc.ac.uk/funding/application/howtoapply/forms/grantshandbook.pdf>

6. Timetable

Date	Event
March 2015	Full Proposals invited Full Proposal call opens in JeS and NSFC system
16:00 7 May 2015	Full Proposal call closes
May 2015 – August 2015	External peer review
Approx. mid July to mid-August 2015	PI response stage due (UK applicants only)
September 2015	Full Proposal Moderating Panel in London, UK
October 2015	Successful applicants informed
November 2015 (date TBC)	Kick-off workshop in Beijing, China
January 2016	Grants start
January 2020	Grants end

7. Post award

Applicants should be aware that according to the Newton Fund requirements, there will be some additional terms and conditions associated with the UK grants which are awarded. This will include additional reporting requirements which will be confirmed in due course.

8. Contacts

For queries about this programme and call please contact:

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