



NERC-MRC-MoES-DBT

Announcement of Opportunity (AO): Atmospheric Pollution and Human Health in an Indian Megacity – Initial Proposals

Closing date for initial proposals is 16:00 UK time 10 December 2015

1. Summary

The Natural Environment Research Council (NERC) and the Medical Research Council (MRC) in the UK and the Earth System Science Organization, Ministry of Earth Sciences (ESSO-MoES) and Department for Biotechnology (DBT) in India are investing in a strategic research programme on urban air pollution in the megacity Delhi and impacts on health. This will be delivered by research partnership between UK scientists and Indian scientists.

Pollution in Indian cities is a rapidly increasing problem, with significant impacts on the economy and health of the population. The vision of this programme is to initiate efforts on air pollution hazards and impacts on health in a rapidly urbanising society and the evidence to support cost-effective measures for air quality improvements related to anthropogenic pollutants in a mega city of India (Delhi).

NERC and MRC have a budget of £6.5m (£4m of which is from the Newton Fund) for the overall programme. ESSO-MoES and DBT will provide matching funds. NERC/MRC funds will specifically be used to support UK researchers, while ESSO-MoES/DBT funds will fund Indian researchers.

The delivery of this programme is a two stage process. The first stage is a call for initial proposals for which this is the Announcement of Opportunity. The second stage for full proposals will enable development of an integrated programme. Grants will start in December 2016 and will be three to four years long.

The closing date for initial proposals in JeS is 16:00 UK time 10 December 2015.

2. Background

2.1 Science background

Rapidly increasing pollution sources in South Asia has been a matter of growing concern with concentrations of particulate matter, sulphur dioxide and oxides of nitrogen frequently exceeding health regulation limits. A recent study has estimated excess mortality of around 10,000 in an Indian

city (Delhi) due to both cardiovascular and respiratory causes, based upon occupational related acute exposures alone¹. Furthermore, rapid growth in urban populations and additional factors such as variance in solar radiation, biogenic emissions, and wind-blown dust and soil, all result in exacerbation of the issue. A study in Delhi on the impact of exposure to airborne nanoparticles from road vehicles estimated around 500 premature deaths per million people in 2010 which could rise to almost 1900 deaths per million in 2030 under a business as usual scenario. However, with vigorous mitigation measures under a best estimate scenario this would reduce to a very low number of deaths per million people in 2030², serving to illustrate the potential health benefits of air quality improvements.

2.2 Programme background

Atmospheric Pollution and Human Health in an Indian 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 Indian Ministry of Earth Sciences (ESSO-MoES) and Department for Biotechnology (DBT). The vision of this programme is to provide new knowledge on air pollution issues and impacts on health in a rapidly urbanising society and the evidence to support cost-effective measures for health improvements related to atmospheric pollutants in Delhi, India. This programme will be delivered by a research partnership between UK and Indian scientists. NERC and MRC have jointly made available £6.5m for this programme (including support from the Newton Fund) and ESSO-MoES and DBT will provide matching funds. As an initial step to help build partnerships and facilitate collaboration, NERC, MRC, ESSO-MoES and DBT, with support from RCUK India, held a joint workshop on 11-13 May 2015 in Delhi. 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 [APHH resources webpage](#). In addition information will also be available at the ESSO-MoES and [DBT](#) websites. All potential applicants are encouraged to read the information about the workshop in order to be fully informed before submitting an application.

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 Fund](#). The 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 \(OECD\)](#). 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 list](#) 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

¹Gujar, B.R., Jain, A., Sharma, A., Agarwal, A., Gupta, P., Nagpure, A. S. & Lelieveld, J. (2010) Human Health Risks in Megacities due to Air Pollution. *Atmospheric Environment* 44, 4606-4613.

²Kumar P., Gurjar, B.R., Nagpure, A.S. & Harrison, R.M. (2011) Preliminary Estimates of Nanoparticle Number Emissions from Road Vehicles in Megacity Delhi and Associated Health Impacts. *Environmental Science & Technology* 45, 5514-5521.

welfare India, in line with the Newton Fund's aims. All applications under this call must be compliant with these specifications (see this point under section 3.5).

3. Grant and science requirements

3.1 Grants

The total UK budget for this programme is £6.5m and matching fund will be available from the Indian side. Some of these funds will be held back for programme management activities. It is expected that approximately five to eight UK-India collaborative proposals will be funded. Grants will be three to four years in duration and begin in December 2016. This AO is for initial proposals which address the programme scope and themes as laid out below.

3.2 Programme scope

Applicants should take care to ensure that their proposals fall within the scope and remit of the programme:

- Proposals should focus on the Indian megacity Delhi but using information and making comparisons with existing studies/data outside of Delhi would be within scope. Any elements of the work from outside of Delhi should be based on extending existing work and not investing in new infrastructure.
- The focus of this programme is the 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 they should not be investigated at the expense of looking at impacts on health.
- 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 only as part of a study involving measurement of outdoor air pollution.
- Considering beyond the immediate boundary of Delhi and understanding regional and long distance processes will be relevant and important in this programme. However, this should always be related back to the need to understand individual exposure and impacts on health.
- Observations at all levels are relevant to the programme, from the surface through to Earth observation.
- Pollutants of interest in this call are those of relevance to health, and their precursors.
- Above and beyond the focus of the programme, as laid out above, applicants will need to ensure that their proposals are within the remit of the funders, i.e. environmental science and medical science. Proposals can include the development of new technologies or the adaptation of existing technologies, as long as these are then applied to address the science themes of the programme outlined below. Proposals which focus on social/economic research are beyond the remit of the funders and will not be accepted.
- Using existing infrastructure and facilities will be important to add value to this programme. Applicants are encouraged to make use of existing Indian and UK capabilities, some examples are listed in annex A.

3.3 Programme platform

The programme aims to have a 'platform' which will consist of shared observations, modelling and integration activities which is utilised by the programme as a whole. Proposals should lay out, in addition to the novel science that they plan to undertake, what element of their proposals they

would see being embedded as part of the programme platform. The integration activities can include both sharing of research activity for different purposes (e.g. observations, measurements and other data) and coordination of activity (e.g. QA/QC between labs, agreed spatial and temporal resolution, same range of chemicals, common timetable, use of the same models, etc.). It is anticipated that the programme will utilise existing and develop new instruments to undertake long term measurements. It may also undertake intense observational campaigns during the lifetime of the programme.

3.4 Themes

The programme has been defined in terms of four science themes. Proposals can cut across multiple themes and are not expected to cover every element of each theme. The themes are embedded within the overall programme platform, as mentioned above. The programme will support a number of projects which will undertake scientific research on different aspects of pollution in Delhi relating to one or more of the themes outlined below.

The four science themes are:

3.4.1 Theme 1: Emission validation and sources

This theme aims to understand air pollutant emissions and sources and validate existing emission estimates in Delhi.

Research required under this theme includes, but is not limited to:

- New field and laboratory observations of emissions to understand what pollutants are present, their speciation and the temporal (including seasonality) and spatial concentrations in Delhi. It is critical that measurements are representative of human exposure to pollutants.
- New field and laboratory observations to understand the key sectors which are a source of emissions. This will include: road and rail vehicle(including fleet composition and activity); residential, heating, cooking, small scale industries; biomass burning; landfill; construction; waste burning; dust; biogenic; point sources. Given that there are multiple sectors, a prioritisation of activity will be necessary to target sectors with the biggest uncertainties.
- Using top down measurements and integrating measurement techniques to link with observations. For example, by micromet, remote sensing, inverse modelling, tunnel studies, etc.
- Integration of new knowledge into model frameworks.

3.4.2 Theme 2: Processes: physical and chemical

This theme aims to characterise and quantify the chemical environment, understand pollutant burden in the atmosphere and determine the influence of meteorology and bidirectional feedbacks on air pollutants.

Research required under this theme includes, but is not limited to:

- New field and laboratory observations to characterise the context of the chemical environment.
- Understanding pollutant burden in the atmosphere, including the background, inputs from within the city, inputs from outside of the city and exports.
- Understanding chemical interactions and transformations of atmospheric pollutants.
- Determining the influence of meteorology and bidirectional feedbacks on air pollutants.
- Integration of new knowledge into modelling.

Research should consider the temporal (include seasonal) and spatial scale, including understanding how processes vary within the microenvironment.

3.4.3 Theme 3: Exposure validation and health outcomes

This theme aims to enhance understanding of the impact of urban environmental exposures on human health by measuring and validating personal exposures; identifying which components of air pollution are associated with cardiopulmonary, cardiovascular and other health outcomes in India; and exploring causal relationships between exposure and disease, including characterising the relative toxicities and toxicological mechanisms of pollution components.

Research required under this theme includes, but is not limited to:

- Carrying out personal exposure validation (e.g. use of personal exposure monitors), including creating personal exposure profiles and time activity patterns for individuals and various subpopulations (including vulnerable groups), reconciling personal exposure with ambient monitoring data and understanding exposure in different microenvironments.
- Exploring the relative toxicities and toxicological mechanisms of atmospheric pollutants and pollutant mixtures (e.g. via toxicity assays).
- Relating exposures (spatial and temporal) to biomarkers of effect and health / disease outcomes that can be applied in the population setting.
- Utilising unbiased systems biology approaches including 'omics technologies to understand susceptibility to atmospheric pollutant exposure.

Epidemiology and exposure research projects can utilise cohort studies / panel studies (which can be nested within a cohort), and adopt computational biology approaches (e.g. for scaling up to populations).

3.4.4 Theme 4: Mitigations and interventions

This theme aims to understand what is required in order to improve air pollution within the confines of factors which are under our control, what is effective, cost efficient and considers future change.

Research required under this theme includes, but is not limited to:

- Defining the current and future landscape, including the baseline scenario of the key sources and future projections/scenarios and uncertainties, for example in the mixture of transport (road versus rail), the transport fleet (petrol/CNG/LPG/diesel), the presence of power stations in urban areas, the domestic energy mix (solid biofuel, LPG) and any likely behaviour and lifestyle change.
- Using the understanding of the landscape, understanding what interventions can be made and verifying their efficiency and effectiveness, including consideration of wider impacts (e.g. relating to climate impacts) and cost. This should consider the translation activities of interventions in order to make them available to end users (e.g. evidence-policy translation, decision support tools, etc.) with the appropriate confidence and uncertainty definitions.

3.5 *Non-scientific objectives*

There are several non-scientific objectives that proposals must address:

1. Applications must be a collaboration between the UK and India and it is expected that these represent genuine and meaningful partnerships between the UK and India.

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 activities which are part of the platform (see section 3.3) but also just how the activity of your proposal will be relevant to other projects/themes.
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 but as these are collaborative projects, it is expected that the project as a whole is ODA compliant and that it is made clear that its primary purpose is to promote the economic development and welfare of India.

Applicants are strongly encouraged to demonstrate how the main research outcomes will be specific to improving the welfare of India in terms of better health and reducing the pollution. Applicants should consider how their project will:

- address health and pollution 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 India) 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 economic growth.

Any benefit to the UK has to be the secondary consideration over the above.

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 consideration of the links with the other discipline.

4. Process and assessment

4.1 Overall process for programme delivery

The projects will be commissioned in a two stage process:

- Stage 1 – call for initial proposals
- Stage 2 – development of full proposals and an integrated programme

This AO is part of stage 1.

4.2 Stage 1 – Call for initial proposals

The aim of this stage of the programme is to select the projects, based on an initial proposal that will form the components of the programme. The projects must be collaborations with both UK and Indian partners and can address more than one theme (see section 3.4). Projects must give an

indicative cost. Projects must also specify how they might link to other themes and contribute to the overall programme platform (see section 3.3).

The initial proposal will be sent out for external peer review. A moderating panel of independent experts will review the proposals, the peer review feedback and responses to the peer review comments from the applicants. The projects will be ranked on the basis of two principal criteria:

- Scientific excellence
- Fit to the programme objectives (both scientific and non-scientific)

Balance of projects across the different themes will be a further important consideration in order to achieve a coherent programme.

Further details of the assessment criteria are available on the [NERC assessment criteria webpage](#), as well as details of guidance and scoring for [reviewers](#) and [panels](#).

The panel may also make specific recommendations on how the projects might work together.

The funders (ESSO-MoES, DBT, NERC and MRC) will then select the projects that the programme wishes to support. At this point no final funding decision has been made.

4.3 Stage 2 – Development of full proposals and an integrated programme

Successful projects from stage 1 will be invited to a meeting to define the detailed structure of the programme as a whole. The aim of this meeting will be for the successful scientists to work together to define the overall programme platform. It is anticipated that this will consist of:

1. *Integration requirements.* This will cover the inter-relationships between the projects and opportunities for additional elements for the projects.
2. *Infrastructure requirements.* The aim will be to define the overall infrastructure requirements for the programme and agree which projects will deliver which elements, or whether components will be developed separately.

It is a mandatory requirement that successful project researchers (at least two UK and two Indian attendees per proposal) attend this meeting which will be held in Delhi in May 2016 (specific date TBC).

Funders will specify funding limits for the projects within the resources available. Full proposals will then be developed based on the outcomes of the workshop and developed to take into account the platform requirements. Those involved in developing elements of the common platform will be expected to share and iterate these elements of the proposal with other members of the programme.

The full proposals will be reviewed by the same panel that reviewed stage 1 to ensure that the science excellence and programme fit of the proposals, as assessed at stage 1, are maintained. Assuming that this is the case then awards will be made.

4.2 Application process for initial proposals

4.2.1 Basics

The closing date for initial proposals is **16:00 UK time 10 December 2015**. No proposals can be submitted after this time. Proposals will need to be submitted through the [Joint Electronic](#)

[Submission \(JeS\)](#) system. The JeS call name is “Atmospheric Pollution and Human Health in an Indian Megacity DEC15”. **There will be a single joint UK-Indian application through JeS which will be shared with ESSO-MoES and DBT.** The UK applicants must be the submitting partner and enter their details in JeS and Indian applicants enter their details as part of the attachments within JeS (further detail below).

Applications must be completed in English.

UK grants are funded at 80% Full Economic Costing (FEC).

It is very important to note that from January 2015, NERC has updated its [position on adherence to grant rules](#). Applicants should ensure that their proposal conforms to all eligibility and submission rules, otherwise their proposal may be rejected without peer review. More details on NERC’s submission rules can be found in the NERC research grant and fellowships handbook and in the submission rules on the NERC website.

4.2.2 Eligibility

Individual UK/Indian 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. An Indian researcher can participate **only in one funded proposal** and thus in the event of a researcher being awarded two proposals, he/she will have to withdraw from one.

For UK researcher eligibility, please refer to section C of the [NERC Research Grants Handbook](#).

Indian researchers from the Government institutes including Indian Institute of Technology, Indian Institute of Sciences, Government laboratories, Universities, Academic institutions, and other related institutes are eligible to apply.

4.2.3 Application guidance

The initial proposal will consist of a proforma plus attachments. The staff information on the proforma should include details only of the UK applicants as Indian applicants will be listed as part of the attachments. As such the UK applicant must be the submitting partner. The JeS initial proposal form will not allow for joint submissions (i.e. where a research proposal consists of more than one component proposal enabling funding to be awarded directly to different Research Organisations). As such it should include the expected Co-Investigators and their Research Organisations. If grants are invited to submit full proposals, some of the Co-Investigators would then become the Principal or Co- Investigators on the component grant proposals and not be named on the lead grant proposal.

The **only** attachment types that applicants will be able to upload to JeS as part of this application are:

- Case for Support.
- Justification of Resources (up to 2 sides A4 for all Research Organisations in the proposed grant, including justification for items of equipment between £10,000 and the OJEU threshold (see paragraph 142 of the [NERC Grants Handbook](#)) (for UK costs only).
- CVs (up to 2 sides A4).
- Other.

Any attachment which is uploaded as type “other” will not go out to peer review and these attachments should therefore only be used for information to NERC office, if necessary.

All documents should be completed in single-spaced typescript of minimum font size 11 point Arial font or other sans serif typeface of equivalent size to Arial 11, with margins of at least 2 cm, unless otherwise specified in a given template. References must now also be presented in minimum font size 11 point. Please note that Arial narrow and Calibri are not allowable font types as they are smaller and any proposal which has used either of these font types within their submission will be rejected. Applicants referring to websites should note that referees may choose not to use them.

Given the limitation on attachment types, the Case for Support should be produced as **one document** which includes the sections:

1. Previous Track Record (up to 2 sides A4).[mandatory]
2. Description of Proposed Research (up to 8 sides A4). [mandatory]
3. Outline Data Management Plan (up to 1 side A4) (see section 4.2.5). [mandatory]
4. Pathways to Impact plan (up to 2 sides A4) (see section 4.2.6). [mandatory]
5. Table of Indian collaborators (as per template in annex B).[mandatory]
6. Summary of Indian costs to MoES/DBT (as per template in annex C). [mandatory]
7. Project Partner Letter of Support (up to 2 sides A4 each). [if appropriate]
8. Certificates from Indian PI and endorsement from head of their institute (as per template in annex D). [mandatory]
9. Facility Forms – Use only for application forms for High Performance Computing (HPC) when use of ARCHER exceeds 160MAU (in any one year). [if appropriate]
10. Technical Assessment – Mandatory for any NERC Facility selected on the JeS proforma except those listed in the previous point. The attachment should be a quote from the relevant facility (see section 4.2.7). [if appropriate]
11. Use of animals and/or human participants in research form (see section 4.2.8) (as per template annex E). [if appropriate]

Note that the Previous Track Record, Description of Proposed Research, Outline Data Management Plan and Pathways to Impact plan are part of a joint UK-Indian submission and thus must include the activity of both the UK and Indian scientists.

Applicants should be aware that in the later full proposal three quotations for each item of equipment requested over £25k and a Business Case (up to 2 sides A4) are required for equipment requests over the OJEU threshold limit (see paragraph 142 of the [NERC Grants Handbook](#)).

Applicants are advised that they should convert their attachments to PDF prior to upload in order to avoid formatting issues.

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 India for use after the project is completed. However, this will be done with mutual consultations with the Indian agency. 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.

DBT will fund eligible Indian academics at 100% of the full economic costing in terms of equipment, consumables, contingency, overheads and manpower salary costs employed under the project. Cost proformas must be duly filled while submitting the project and are non-negotiable.

4.2.5 Data management

The funding agencies from UK and India require that strategic research programmes implement a data management scheme which covers practical arrangements during the programme and subsequent long-term availability of the data sets. In line with the [NERC data policy](#) the data from the programme will be lodged with the appropriate NERC Designated Data Centre. Similarly as per national data policy of Government of India, the data has to be deposited with ESSO-MoES/DBT respectively. There will be no charge to the project for a NERC Data Centre or ESSO-MoES/DBT 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. 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 2015](#) (section 2.8). In reference to study on population or patient based studies in India it shall be as per [ICMR guidelines](#).

4.2.6 Pathways to Impact

NERC requires all grant proposals to include a Pathways to Impact plan, which should focus on engagement with users (industry, business, government, charities or the general public), specifically considering what will be done during and after the project to increase the likelihood of the research reaching the identified beneficiaries and maximise the likelihood of the identified benefits being achieved. Further information is given in point 185 of the [NERC Grants Handbook](#) and on the [NERC pathways to impact webpages](#).

4.2.7 Facilities

Applicants for NERC grants may also apply to NERC for access to any of the NERC [services and facilities](#). Prior to submitting the proposal, applicants must first contact the facility to seek agreement that they could provide the service required and obtain a technical assessment (quote). Applicants should contact the relevant facility at least one month prior to the grant or fellowship proposal closing date to ensure that the facility can provide the quote in time to be submitted with the proposal. Applicants should refer to the point 219 of the [NERC Grants Handbook](#) for further detail.

Indian applicants can request the use of facilities available at ESSO-MoES institutes.

4.2.8 Use of animals and/or human participants

Institutional and national biosafety guidelines for studies related to usage of infectious agents and/or handling of animals infected with such organisms must be followed. Regulations that control the use of non-human animals for scientific experimentation in India and UK must be considered while preparing the project proposals. Mode of treatment, restraint, alleviation of pain and suffering using appropriate anaesthesia or medication with detailed description of procedures etc. should be provided in the proposal. Handling and disposal of infectious organism or infected animals should also be followed according to local (city) and national norms. Investigators must provide a signed statement that 1) they will follow guidelines for use of animals for research available in UK and in India and that 2) before initiation of the proposed research work, appropriate approvals from Institutional and/or central animal ethics and biosafety committees will be obtained for experimental protocols to be adopted in their projects.

For any proposals including the use of animals and/or human participants in research, the guidance in sections 4.2 and 5.1, respectively, of the [MRC Guidance for Applicants and Award Holders 2015](#) must be followed. Applicants using animals and/or human participants **must** complete and submit the template form in annex E as part of the Case for Support (see section 4.2.3). If the project involves pre-clinical/clinical trials/experiments/exchange of biological samples etc. the applicant must obtain appropriate approvals from independent ethics committees to comply with requirements in both UK and India. The funders will ensure that ethical clearances and other clearances are in place and copies of these will be conveyed to the funders before implementing the project.

4.2.9 Studentships

NERC, MRC and MoES will not be funding studentships as part of this call but DBT will fund PhD students as per normal DBT guidelines.

5. Timetable

Call for initial proposals released	September 2015
Call for initial proposals closes	16:00 10 December 2015
External peer review	December 2015 – March 2016
Moderating panel	March 2016
Integration meeting	May 2016
Full proposal deadline	July 2016
Panel	August 2016
Award grants	August 2016
Grants start	December 2016

6. Contacts

For queries about this programme and call please contact:

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