



## India-UK Tackling AMR in the Environment from Antimicrobial Manufacturing Waste

### Announcement of Opportunity

Issued: 28 August 2019

Online Notification on Intent deadline: 16:00 BST / 20:30 IST on 14 October 2019

Full Proposals deadline: 16:00 BST / 20:30 IST on 12 November 2019

Information about your application, including the personal information provided on the forms, will be processed and stored electronically by NERC and DBT. The information contained in your application may be passed on to external reviewers in confidence. Reviewers will be asked to destroy information after the review and selection process is complete.

Your application and personal information will be stored by NERC and DBT for management purposes but will not be shared with other organisations outside the NERC-DBT partnership. We will use details provided in the application for correspondence about the call and may also use this information for future analyses of the performance of the programme.

By submitting your application to this call you have indicated your acceptance of these data protection terms and conditions.

### 1. Summary

The Natural Environment Research Council (NERC), on behalf of UK Research and Innovation (UKRI) and the Department of Biotechnology (DBT), Ministry of Science and Technology, Government of India are inviting collaborative and cross-disciplinary research proposals under the India-UK “AMR in the Environment from Antimicrobial Manufacturing Waste” Call.

This call aims to support new research to inform the development of strategies to limit environmental contamination by antimicrobial waste from pharmaceutical manufacturing, with the ultimate aim to contribute to global efforts to contain antimicrobial resistant infections of humans and animals.

Proposals are sought for collaborative and cross-disciplinary research projects involving researchers from both the UK and India. Up to £3.8m (80% FEC) is available from NERC to support eligible UK based researchers, and matched in terms of research effort from DBT to support eligible Indian researchers.

Applicants can request up to £800,000 (80% FEC) for the UK component of a project, and matched in terms of research effort for the Indian component. It is expected that up to five

projects will be funded. The maximum duration of projects is 3 years and projects are expected to start in June 2020.

NERC is managing the call on behalf of the UKRI and DBT partnership. **A Notification of Intent to Submit Proposal should be submitted on the online form through the NERC website no later than 16:00 BST / 20:30 IST on 14 October 2019.** The notifications will not be assessed and will be used to plan the assessment process. **Applicants should note that submission of a Notification of Intent is an obligatory requirement of this call and full proposals will only be accepted from those teams who submit a completed Notification of Intent form prior to the deadline.**

**A joint application should be submitted to the UK's Joint Electronic Submission System (Je-S). The closing date for applications is 16:00 BST / 20:30 IST on 12 November 2019.** Applications not submitted before the deadline will not be received or considered. After Je-S submission, The UK PI should download and share the full proposal with the Indian PI. The Indian PI should also submit an identical copy of the full Je-S proposal by email to DBT (at [icone@dbt.nic.in](mailto:icone@dbt.nic.in)) within the deadline.

**The closing date for Full Proposals is 16.00 BST / 20.30 IST on 12 November 2019.**

## **2. Background**

### *2.1 Funders*

[UK Research and Innovation \(UKRI\)](#) is the UK's main public research and innovation funding agency, which works in partnership with universities, research organisations, businesses, charities, and government to create the best possible environment for research and innovation to flourish. This call is supported by the [UKRI Fund for International Collaboration](#), which aims to enhance the UK's excellence in research and innovation through global engagement, forging new bilateral and multilateral research and innovation programmes with global partners. For practical purposes, [the Natural Environment Research Council \(NERC\)](#), is leading this call on behalf of UKRI, which welcomes interdisciplinary research approaches and research topics that span the remits of the UKRI Councils.

[The Department of Biotechnology \(DBT\)](#), Ministry of Science and Technology, Government of India, is entrusted upon promotion of research, development and innovation in the field of biotechnology. DBT funds and supports all Indian universities, research organizations, non-governmental organizations and industry working in the area of biotechnology. The DBT has promoted and reinforced the development of innovations in biotechnology, and life sciences with far-reaching impacts in fields that range from health, agriculture, environment to animal sciences and industry.

### *2.2 Scientific Background*

Antimicrobial resistance (AMR) is a global public health challenge, with antibacterial resistance (ABR) viewed as posing one of the most serious health threats. Bacteria are present everywhere, including in every living being and in the soil, water, sediment and air. With interconnected ecosystems (including humans, animals, the environment), the exchange of bacteria is continuous, and thus the ABR problem is not restricted to medical science alone. Understanding this problem requires effective collaboration among several disciplines.

The role of the environment in the evolution and dissemination of antibiotic-resistant bacteria is increasingly gaining attention. A growing number of published studies indicate high levels of antibiotics, antibiotic-resistant bacteria and antibiotic resistance genes in various environments around the world particularly those impacted by sewage, agriculture and pharmaceutical manufacturing effluent. This accumulation creates the conditions for the proliferation and transmission of resistant bacteria from the environment directly to humans as well as through [selection and horizontal gene transfer from commensal to pathogenic bacteria](#).

The role of antimicrobial manufacturing pollution is particularly pertinent in India. It is estimated that 80% of antibiotics sold by multinational antimicrobial companies on the global market are manufactured in Asia and there are at least 40 antibiotic active pharmaceutical ingredient (API) manufacturers and at least 250 pharmaceutical formulation companies manufacturing at least one antibiotic in India. Whilst the significance of the impact manufacturing waste might have on the environment is unclear, there is potential for high-levels of localised contamination because of the large quantity of antimicrobial waste generated during the production process relative to the diffuse environmental exposure that may result from patient or animal use. Recent studies have shown that some wastewater effluents from antibiotic manufacturing units contain a substantial amount of antibiotics, leading to contamination of rivers and lakes. The manufacturing process can also potentially contaminate environments through vaporisation or other solid waste disposal methods<sup>1</sup>.

Current global discharge standards for pharmaceutical industry waste do not include antibiotic residues and consensus around safe limits for antibiotic discharge has yet to emerge. Through the AMR Industry Alliance, the pharmaceutical industry is taking voluntary action to reduce the environmental impact from antimicrobial manufacturing by committing to (i) establish a common framework for managing antibiotic factory discharges, (ii) develop a mechanism to demonstrate supply chains meet the standards set, and (iii) agreeing, by 2020, targets on antibiotic levels released in waste discharge<sup>2</sup>. In September 2018 the AMR Industry Alliance published [science-driven, risk-based targets for discharge concentrations of antibiotics](#), which will be updated periodically as new reliable and robust data become available. The [Access to Medicines Foundation's AMR Benchmark](#) provides an independent evaluation of how pharmaceutical companies are slowing the rise of drug resistance. The 2018 Benchmark includes environmental stewardship metrics and will be updated for release in 2020. However, to date there has been no systematic monitoring conducted and significant knowledge gaps remain around the scale of contamination and the risks presented to the environment and humans, and this knowledge is needed to determine whether existing regulatory approaches to manage discharges are appropriate and reflect the latest science.

India and the UK both play a leadership role in global efforts to contain AMR via the UN Interagency Coordination Group on Antimicrobial Resistance and national action plans that highlight the role of the environment in the spread of AMR and the importance of international collaboration. Joint research on the impacts of the global supply chain of antibiotic manufacturing will, therefore, contribute towards reduction of the global impacts of AMR.

### **3. Scope**

#### **3.1 Programme objectives**

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<sup>1</sup> Sumanth Gandra, Jyoti Joshi, Anna Trett, Anjana Sankhil Lamkang, and Ramanan Laxminarayan. 2017. *Scoping Report on Antimicrobial Resistance in India*.

<sup>2</sup> Industry Roadmap for Progress on Combating Antimicrobial Resistance

This programme aims to support new research to inform the development of strategies to limit environmental contamination by waste from antimicrobial manufacturing, with the ultimate aim to contribute to global efforts to help contain resistant bacterial infections of humans and animals.

This initiative is targeted at resistant bacteria of humans and animals rather than other classes of pathogens. Proposals that are relevant to other classes of pathogen will be permissible only if the primary focus is clearly bacteria.

Research will focus on the situation in India, as a major producer of antimicrobials in the global supply chain of the healthcare industry, and a scientifically appropriate place to study this global issue. The research outcomes will contribute to assessing the human, animal and environmental health risk that this source of antimicrobial exposure to the environment represents, and to the development of international environmental standards for antimicrobials in manufacturing effluent and receiving environments.

Recent AMR scoping activity supported by DBT and UKRI identified the following knowledge gaps, which this programme will refine and seek to address:

- Understanding the extent of antimicrobial pollution from antimicrobial manufacturing waste (wastewater, solid waste and atmospheric emissions), its pathways through environmental systems, and its role in driving emergence and circulation of AMR in the environment. Challenges exist around understanding the selective and co-selective pressures of environmentally relevant mixtures of antibiotics and other chemicals on complex microbial communities, and spatial and temporal variations caused by production cycles, geography, climate and socioeconomic factors.
- Development and validation of globally relevant standardised methods and tools for detection of active antimicrobials and resistant bacteria in effluents and receiving environments. Challenges exist around integrating a suite of low cost, easy to use, chemical, biological, mass-balance and other tools that can be validated in a range of matrices, and are applicable over a broad analytical range.
- Determining the impact on human and animal health from environmental exposure to high levels of antimicrobial pollution and resistant bacteria and genes. Challenges exist around understanding how communities in areas with antibiotic manufacturing industry are exposed to antibiotics and resistant bacteria through their interactions with the environment (particularly through use of water systems, including wastewater channels), relative to communities with lower levels of exposure, and whether there is an enhanced risk of health impacts in these areas.

Projects must address at least one of the above research challenges with a view to research outputs contributing to ongoing efforts to develop international environmental standards to manage discharge of effluent from antimicrobial producers

Engagement with antimicrobial producers, pollution control agencies, health protection agencies and other stakeholders in the research design is strongly encouraged.

### *3.2 Proposal requirements*

The research and innovation will be delivered through bilateral joint projects. Projects must be a genuine and equal collaboration between UK and Indian researchers, and be focussed

on research in the Indian environment, although may include well-justified comparative studies in other locations.

## **4. Programme requirements**

### *4.1 Programme funding*

**NERC is managing the bid submission on behalf of the UKRI and DBT partnership.**

**Applications to the UK-India AMR in the Environment from Antimicrobial Manufacturing Waste programme must include UK-Indian partnerships – i.e. include at least one India-based Principal Investigator and one UK-based Principal Investigator. Only proposals that involve research collaboration between the UK and India will be considered.**

The programme is a partnership between UKRI in the UK and Department of Biotechnology (DBT), Ministry of Science and Technology in India. UKRI has £3.8m (80%FEC) available for this programme to fund the successful grant proposals. DBT has matched funding in terms of research effort. Applicants can request up to £800,000 (80%FEC) for the UK component of a project, and the equivalent in terms of research effort from DBT for the Indian component.

For each grant application, a lead Principal Investigator should be nominated from both the UK and India, and they will act as focal points for contact with the funding agency in their respective countries.

UKRI and DBT anticipate funding up to five collaborative projects.

#### *4.1.1 Studentships*

No PhD studentships are allowed on the UK components of this call. DBT will fund Indian manpower costs as per DBT norms. Investigators from India are required to follow “Modalities of Participation and Funding AMR Environment Call”.

### *4.2 Implementation and delivery*

The maximum duration of the projects is 36 months. Successful projects are expected to start in June 2020.

Projects must be genuinely collaborative and applicants should demonstrate how the team will work together to deliver the interdependent project outcomes. Projects will also be expected to participate in an annual programme meeting and should include within their projects budget allowance for key members to attend this meeting. These meetings will most likely be held in India so applicants should budget for their costs on this basis. Additional funding will be made available after awards are made for a UK and Indian group to take the lead on arranging the annual meeting and coordinating joint reporting and communications for the programme.

### *4.3 Knowledge Exchange and Impact*

Knowledge exchange (KE) is vital to ensure that research has wide benefits for society, and should be an integral part of any research.

All applicants must consider how they will or might achieve impact outside the scientific community and submit this with their application as a [Pathways to Impact](#) statement, with

associated delivery costs where relevant. Pathways to Impact activities do not have to be cost-incurring; it is not a requirement to include funded activities. Any funds required to carry out any proposed, outcome-driven activities identified within the Pathways to Impact **must** be fully justified within the Justification of Resources statement.

The Pathways to Impact will identify those who may benefit from or make use of the research, how they might benefit or make use of the research, and methods for disseminating data, knowledge and skills in the most effective and appropriate manner. An acceptable Pathways to Impact is a condition of funding. Grants will not be allowed to start unless unacceptable Pathways to Impact are enhanced to an acceptable level within one month of notification of the panel outcome.

All funded projects may also be required to engage with programme-wide KE activities, in which case appropriate funding for which will be provided by the programme.

#### *4.4 Data Management*

The [NERC Data Policy](#) must be adhered to, and an [outline data management plan](#) produced as part of proposal development. NERC will pay the data centre directly on behalf of the programme for archival and curation services, but applicants should ensure they request sufficient resource to cover preparation of data for archiving by the research team.

Applicants to this call should give full consideration to the practical requirements for data sharing both within the research teams and to the wider community and describe how this will be conducted. Applicants should ensure that they have requested appropriate resources for data management and data sharing. Indian PIs of the consortium should apply to their institutional review boards (IRBs)/ institutional ethics committees (IECs) at the time of submission of proposal to obtain necessary ethics approvals from all involved institutions. Please also refer to the Indian Funding Modalities document.

#### *4.5 NERC Facilities*

Prior to submitting a proposal, applicants wishing to use a NERC service or facility must contact the facility to seek agreement that they could provide the service required. Applicants wishing to use most NERC facilities will need to submit a mandatory 'technical assessment' with their proposal. This technical assessment is required for aircraft but not for NERC Marine Facilities (NMF – Shiptime and/or marine equipment) and HPC. For NERC, this means a quote for the work which the facility will provide. A [full list](#) of the Facilities requiring this quote can be found on the NERC website. The costs for the service or facility (excluding NMF and HPC costs) must be included within the Directly Incurred Other Costs section of the Je-S form and also within the facilities section of the Je-S form. Further information on [NERC services and facilities](#) can be found on the NERC website.

#### *4.6 Reporting requirements*

As with all NERC grants, there will be a requirement to report research outputs through the UKRI reporting system; this is required annually and continues for up to five years post grant end. In addition, grant-holders will be required to report to NERC biannually on progress and achievements. Indian grant holders will also be required to adhere to follow the standard reporting requirements of the Department of Biotechnology.

## 5. Application process

### 5.1 Notification of Intent

***A Notification of Intent to submit a proposal must be submitted for all potential proposals to the call via the online application form by 16:00 BST / 20:30 IST 14 October 2019.***

Only one Notification of Intent form needs to be submitted per project. The notification must follow the instructions provided on the online form and include details on the research themes that the proposed research will address and the institutions, investigators and project partners that are expected to be involved. NERC and DBT will use this information to plan the proposal assessment process. It should be noted that submission of the Notification of Intent is a requirement of this call and full bids will only be accepted from those teams who submit a completed Notification of Intent to submit online form prior to the deadline. **The Notification of Intent form is available from the [Announcement of Opportunity page](#) on the NERC website.**

It is expected that proposals will evolve between the Notification of Intent and the Full Proposal (including personnel and partnerships), but the major research elements are expected to remain broadly the same, within the confines of any feedback from the Notification of Intent stage. Similarly, the Principal Investigator should not change between the Notification of Intent and Full Bid stages. Applicants considering any significant changes in the scope of a project should agree any significant proposed changes with NERC prior to submitting their Full Proposals.

### 5.2 Full Proposals

**Closing Date: 16:00 BST / 20:30 IST 12 November 2019**

This programme will support collaborative projects between the UK and India and each project should submit a joint proposal that sets out the research to be carried out by both the UK and Indian partners. All proposals must include researchers from the UK and India. The UK applicant must submit the proposal on behalf of the consortium through the [Research Councils' Joint Electronic Submission system \(Je-S\)](#).

Once the UK PI has submitted the application through Je-S, the UK PI is requested to download the application and share this with their Indian PI who should also submit it to DBT.

The UK applicant should list the Indian collaborators as Project Partners on the Je-S form. Each individual organisation should be listed as a separate Project Partner. The approximate value of the Indian collaborators and other contributions should be recorded in the project partner in-kind support section of the proposal form.

The following additional attachments must be provided on the lead proposal:

- CVs for each of the named Indian collaborators (maximum 2 pages per person) should be combined into one document as attachment type 'Non-UK Components'.
- Completed DBT proposal submission proforma as attachment type 'Non-UK Components' which summarises details of the Indian applicants and their requested costs (see Indian Costs below).



**Indian researchers must submit the proposal as a single consolidated PDF file by e-mail to [icone@dbt.nic.in](mailto:icone@dbt.nic.in) using the proforma provided**, with reference to the modalities of 'Participation and Funding for Indian Investigator(s)'. Both these documents are available on [the Announcement of Opportunity page on the NERC website](#).

Successful grants will have their UK costs paid through Je-S and their Indian costs paid through DBT's system.

Applicants should select Proposal Type - 'Standard Proposal' and then select the Scheme – 'Directed' and the Call – 'Tackling AMR in the Environment India'.

**The UK-India Tackling AMR in the Environment from Antimicrobial Manufacturing Waste call will close on JeS at 16:00 BST / 20:30 IST on 12 November 2019 and it will not be possible to submit to the call after this time.** Applicants should leave enough time for their proposal to pass through their organisation's Je-S submission route before this date. Any proposal that is incomplete, or does not meet NERC's and DBT's eligibility criteria or follow NERC's submission rules (see [NERC Grants Handbook](#)), will be office rejected and will not be considered.

All attachments, with the exception of letters of support and services/facilities/equipment quotes, submitted through the Je-S system must be completed in single-spaced typescript of minimum font size 11 point (Arial or other sans serif typeface of equivalent size to Arial 11), with margins of at least 2cm. Please note that Arial narrow, Calibri and Times New Roman are not allowable font types and any proposal, which has used either of these font types within their submission, will be rejected. References and footnotes should also be at least 11 point font and should be in the same font type as the rest of the document. Headers and footers should not be used for references or information relating to the scientific case. Applicants referring to websites should note that referees may choose not to use them.

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.

Proposals for this call should be submitted in NERC standard grant format following the requirements outlined in Section F of the [NERC research grant and fellowships handbook](#).

Please note that on submission to council ALL non PDF documents are converted to PDF, the use of non-standard fonts may result in errors or font conversion, which could affect the overall length of the document.

Additionally where non-standard fonts are present, and even if the converted PDF document may look unaffected in the Je-S System, when it is imported into the Research Councils Grants System some information may be removed. We therefore recommend that where a document contains any non-standard fonts (scientific notation, diagrams etc.), the document should be converted to PDF prior to attaching it to the proposal.

The expected start date for projects funded under this Announcement of Opportunity is June 2020.

### *5.2.2 Full Proposal components*

In addition to the standard Je-S pro forma, the **lead** component of each proposal should include the following documents:



1. A **Case for Support** comprising:
  - a) A common **Previous Track Record** incorporating all UK and Indian Research organisations involved in this proposal (up to **2 sides of A4**).
  - b) A common **Description of the Proposed Project** (up to **8 sides of A4** including all necessary tables, references and figures) to include:
    - i) Underlying rationale and scientific issues to be addressed.
    - ii) Specific interdependent objectives of the project, including their relevance to objectives of the call.
    - iii) Methodology and approach.
    - iv) Risks and mitigation strategies.
    - v) Programme and/or plan of research, evidence of access to required facilities, data, collections.
    - vi) Ethical considerations, in particular for projects with human participants and the sharing of biological material.
2. **UK Costs:** a common **Justification of Resources** (up to **2 sides of A4**). This should be for all UK Research Organisations involved, for all Directly Incurred Costs, Investigator effort, use of pool staff resources, any access to shared facilities and equipment. For further information of what to include in the Justification of Resources, see section E in the [NERC Research Grants Handbook](#).
3. **Indian costs:** justification of these resources and details of the Indian Investigators should be submitted on the separate form provided and entered into Je-S as attachment type '**Non-UK Component**'. For full details of eligible costs please refer to the 'Modalities of Participation and Funding for Indian Investigator(s)'. Both documents are available to download from [Announcement of Opportunity page](#) on the NERC website.
4. A common **Pathways to Impact** (up to **2 sides of A4**), detailing:
  - a) Those who may benefit or make use of the research;
  - b) How they might benefit and/or make use of the research; and
  - c) Methods for disseminating data/knowledge/skills in the most effective and appropriate manner.

Full details of the requirements for [Pathways to Impact](#), and a suggested template can be found on the NERC website. The costs of knowledge exchange activities in the plan should be fully integrated into the proposal costings and justified in the Justification of Resources section.
5. A common **Outline Data Management Plan** (up to **1 side of A4**). This section includes information about how the project will manage data produced and identify data sets of long term value that should be made available to the relevant data centre for archiving and reuse at the end of the grant. Further guidance regarding [NERC's Data Policy](#) is available.
6. **Project Partner Letter(s) of Support** (up to **2 sides of A4 each**). A Letter of Support is required from each named Project Partner. This letter should confirm that the support and facilities required to enable the associated collaborations will be made available. The Je-S system will require a letter of support for the Indian collaborators listed as Project

Partners. A 'dummy letter of support' should be submitted and indicated that that this is the letter of support for the Indian named collaborator.

Each component proposal (including the lead) will additionally require the following attachments, where applicable:

- a) A **CV** (up to **2 sides of A4**) for each named PI, Co-I, research staff post and Visiting Researcher.
- b) PIs wishing to use **NERC facilities** will need to submit a mandatory 'technical assessment' with their proposal (excluding HPC) as detailed in section 4.5 above. NERC Services and Facilities must be costed within the limits of the proposal, and agreement that they can be undertaken within the timeframe of the spend must be provided by the facility. This means a quote for the work which the facility will provide. A [full list of the Facilities](#) requiring this quote can be found on the NERC website.

## 5.2 Eligibility

### 5.2.1 UK researchers

Normal individual eligibility applies and is in Section C of the [NERC research grant and fellowships handbook](#). Research Organisation eligibility rules are in Section C of the handbook.

NERC research and fellowship grants for all schemes may be held at approved UK Higher Education Institutions (HEIs), approved Research Council Institutes (RCIs) and approved Independent Research Organisations (IROs). Full details of [approved RCIs and IROs](#) can be found on the UKRI website.

UK Investigators may be involved in no more than two proposals submitted to this call and only one of these may be as the lead UK Principal Investigator.

### 5.2.2 Indian researchers

All Indian researchers generally eligible to apply for DBT funding opportunities are eligible to apply as Principal Investigators from India. Please refer to the 'Modalities of Participation and Funding for Indian Investigator(s)' for further consideration.

## 6. Assessment Process

Proposals will be internationally peer-reviewed and final funding recommendations made by a panel consisting of independent experts. Applicants will be given the opportunity to provide a written response to peer review comments prior to the panel.

The assessment criteria to be used will be:

- Research Excellence
- Fit to Scheme including:
  - Relevance to the programme aims and objectives
  - How well the project addresses the identified research challenges
  - Potential for impact
  - Evidence of a genuine collaboration between the UK and Indian partners

Feedback will be provided to both successful and unsuccessful applicants.

NERC and DBT will use the recommendations of the panel along with the overall call requirements and the available budget in making the final funding decisions. The Funders are aiming to achieve a balanced portfolio of projects across the programme that best address the overarching aims of the programme.

## **7. Timetable**

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| • Announcement published:                           | w/c 19 August 2019           |
| • Deadline for submission of Notification of Intent | 14 October 2019              |
| • Deadline for submission of full proposals:        | 12 November 2019             |
| • Peer review:                                      | November 2019 – January 2020 |
| • Panel meets:                                      | February 2020                |
| • Projects start:                                   | June 2020                    |

## **8. Contact**

For all enquiries, please contact:

- UK - Victoria Wickens ([amr@nerc.ukri.org](mailto:amr@nerc.ukri.org))
- India – Amit Parikh ([icone@dbt.nic.in](mailto:icone@dbt.nic.in))