A Contact us form has been submitted at 2025-11-10 05:55 PM:

Name: [redacted]

Email: [redacted]

Company or Organisation:

Your job title or role:

Share a URL:

How did you hear about us / other: Other

Who does your enquiry relate to: General enquiry

Your enquiry: I have several questions about ARIA\'s exploration of climate cooling that I would be most grateful for responses to:
1. Could ARIA provide details of its ethical framework?
2. Why is ARIA exempt from FOI requests (given their stated respect for transparency)?
3. Could they provide details of ARIA\'s internal governance structures?
4. What grants have ARIA awarded to date related to climate engineering research?
5. How does ARIA distinguish between operations\/programmes and research?
5. Could they provide their environmental impact statement?
6. Could they provide their details of their risk assessment policy?
7. Could they comment on these mainstream articles earlier this year that seem to be indicating that ARIA are deploying solar GE in the UK?
https:\/\/www.theguardian.com\/commentisfree\/2025\/mar\/12\/solar-geoengineering-uk

[redacted]

4 December 2025

Dear [redacted],

Request for information

We are writing in response to your recent request for information to the Advanced Research + Invention Agency ("ARIA") dated 10 November 2025.

Request 1

"Could ARIA provide details of its ethical framework?"

A copy of ARIA's Ethics and Social Responsibility Policy is enclosed at **Annex 1**. Details of the Exploring Climate Cooling programme's oversight and governance process can be found on ARIA's website: Exploring Climate Cooling | Oversight and Governance. For your convenience, a copy of this page is enclosed at **Annex 2.**

Request 2

"Why is ARIA exempt from FOI requests (given their stated respect for transparency)?"

ARIA's exemption from the Freedom of Information requests was debated extensively and agreed to by both Houses of Parliament during the passage of the Advanced Research and Invention Agency Act 2022. Ultimately, it was agreed that the exemption would help reduce the administrative burden on ARIA's small team.

However, ARIA is committed to building in public – we engage with the scientific community through workshops and public calls for feedback. We publish all opportunity spaces and programme theses before launching solicitations, and publicise all awarded research projects. Further details of ARIA's opportunity spaces, programmes and funded projects may be found on our website: https://www.aria.org.uk/.

Request 3

"Could they provide details of ARIA\'s internal governance structures?"

Details of ARIA's governance structure and its relationship with central government can be found in the ARIA Framework Agreement. For your convenience, this is enclosed at **Annex 3**. Further details of the Exploring Climate Cooling programme's governance structure can be found in the Programme Oversight and Governance document enclosed at **Annex 4**.

Request 4

"What grants have ARIA awarded to date related to climate engineering research?"

A list of projects which have been funded by ARIA's Exploring Climate Cooling programme is available on ARIA's website: Exploring Climate Cooling | Funded Projects. ARIA's website provides full details of this funding, including details of the teams which have been funded, the amount of funding awarded to each team, the project leads, the scope of their projects, and copies of the contracts under which funding was awarded. For your convenience, a copy of the relevant website pages is enclosed at **Annex 5**.

Request 5

"How does ARIA distinguish between operations\/programmes and research?"

Details of how ARIA's programme teams operate can be found on our website: ARIA | How we work. For your convenience, a copy of this page is included at **Annex 6**. Details of the work carried out by ARIA's functional teams may be found on our website under the heading 'Our functional teams': ARIA | Our team.

Request 6

"Could they provide their environmental impact statement?"

Any outdoor experiment funded by the Exploring Climate Cooling programme will first be subject to an independent and publicly available environmental impact assessment. This statement will be published on the Exploring Climate Cooling page.

No outdoor experiments have been conducted and therefore no environmental impact assessments have yet taken place. We are therefore unable to provide you with the requested information. However, as mentioned, this information will be made available to the public once the environmental impact assessments have been conducted.

Request 7

"Could they provide their details of their risk assessment policy?"

Details of how the Exploring Climate Cooling programme assesses risk can be found in the Programme Oversight and Governance document enclosed at **Annex 4**. In particular, we draw your attention to the decision tree at page 6, which outlines how decisions regarding outdoor experiments will be made.

Request 8

"Could they comment on these mainstream articles earlier this year that seem to be indicating that ARIA are deploying solar GE in the UK? https:\/\/www.theguardian.com\/commentisfree\/2025\/mar\/12\/solar-geoengineering-uk"

ARIA is unable to comment on third party articles. ARIA is not funding the deployment of climate cooling approaches, nor are we funding research to facilitate the deployment of such technologies. ARIA's Exploring Climate Cooling programme focuses strictly on foundational research, modelling, and where necessary, carefully controlled, small-scale outdoor experiments to investigate fundamental scientific processes.

The Exploring Climate Cooling programme is funding five small, controlled outdoor experiments, three of which are currently planned to take place in the UK. These experiments will only proceed if ARIA's stringent governance requirements are met in full. An environmental impact assessment will be performed and made publicly available before any experiment starts, and experiments will have to be developed through engagement with local communities. All funded experiments will be time-bound and limited in size, scale so their effects dissipate within 24 hours or are fully reversible.

Further details about the projects being funded by the Exploring Climate Cooling programme can be found on ARIA's website and at **Annex 5**.

Yours sincerely,

ARIA

Annex 1: Ethics and Social Responsibility Policy

April 2024

ARIA – Ethics and Social Responsibility Policy

CONTEXT

ARIA's mission is to pursue new technological options that are currently intractable but have transformative potential for humanity. But research at the edge of the possible often means there is currently little or no research or societal consensus and, therefore, requires a highly responsible approach. This document covers ARIA's approach to ethics and social responsibility in the design and delivery of programmes, and ARIA's approach to the professional ethics and integrity of the research we support.

ETHICS AND SOCIAL IMPLICATIONS OF OUR PROGRAMMES

Core principles

- We do not advance science and technology for their own sake; our mission requires that everything we do be considered in a social context.
- At the very early stages of R&D, we cannot define with certainty how a new scientific and technical breakthrough will impact society. But we can and must consider and anticipate the expected social benefits and the potential social risks.
- Consideration of social benefits and risks requires broad engagement, beyond ARIA's team and across institutions, disciplines, and communities.
- ARIA's job is not to determine what is best for society, but rather to pave new scientific and technological pathways that can be further developed by the public and private sectors, who will ultimately be responsible for governance and deployment.

GOVERNANCE AND OVERSIGHT

ARIA ensures that oversight of ethics and social responsibility runs through the core of our governance model, from the Board, the Accounting Officer and its Programme Directors, in the following ways:

1. To facilitate broad engagement around the social implications of ARIA's work and ensure that we are considering perspectives beyond our team, we publish and openly solicit feedback on our programmes before launch, and publicise who and what we are funding.

2. Programme Directors must engage with the ethics and social issues and stakeholders in their respective opportunity spaces, as part of the discovery and beyond, in order to develop an informed hypothesis of the intended benefit and potential social or ethical risks of their programmes.
3. Programme Directors' assessments of social benefits and risks are considered by ARIA leadership and external evaluators as part of the approval process for every programme.
4. ARIA's Board Ethics and Social Responsibility sub-Committee is responsible for reviewing and sharing recommendations on ethical and social aspects of all programmes and research activities to the Board, the Accounting Officer and the Programme Directors.

GUIDELINES ON RESEARCH INTEGRITY

- All ARIA staff must follow the **Seven Principles of Public Life** (known as "the Nolan Principles") which set out ethical standards to which those working in the public sector are expected to adhere, including for integrity. The 7 principles are: Selflessness, Integrity, Objectivity, Accountability, Openness, Honesty, and Leadership.
- The **Concordat to Support Research Integrity** ("Concordat") is an interpretation of the Nolan principles within the research context, providing a national framework for good research conduct and its governance. ARIA subscribes to the principles of the Concordat, which are to:
    - uphold the highest standards of rigour and integrity in all aspects of research
    - ensure that research is conducted according to appropriate ethical, legal and professional frameworks, obligations and standards
    - support a research environment that is underpinned by a culture of integrity and based on good governance, best practice, and support for the development of researchers
    - use transparent, timely, robust and fair processes to handle allegations of research misconduct when they arise
    - work together to strengthen the integrity of research
- We expect all individuals involved with R&D ARIA supports – including researchers, research support staff, research managers and administrators – to abide by the Concordat's research integrity principles and to work with due respect for one another within a supportive and open environment.

Annex 2: Exploring Climate Cooling - Programme Oversight + Governance

Opportunity space: Future Proofing Our Climate and Weather

Programme: Exploring Climate Cooling

Exploring Climate Cooling

This £56.8m programme aims to build a robust evidence base to explore – with independent oversight – if climate cooling approaches could ever be feasible, scalable, safe, and governable.

Programme oversight + governance

We're committed to responsible stewardship, transparency, accountability + good governance. All funded research in this programme must comply with the following governance principles:

- **Deliver valuable + transformational knowledge.** We aim to select and design for research that will address the most pressing critical scientific questions surrounding approaches for actively cooling the climate.
- **Minimise risk.** All experiments should be designed to reduce direct risk as far as possible.
- **Engage with, and respect key communities**.
- **Communicate proactively and be transparent, open, and honest** at both the programme and project level, including around levels and sources of funding, intentions, how the research is conducted, outputs, and impacts.
- **Be cognisant of the broader implications of research + integrate systems thinking** into research on approaches for actively cooling the climate.

- **Learn, adapt and be responsive**. Success will require a willingness to adapt to lessons learned during the programme and to changing circumstances.

Our goal is to build the open scientific knowledge base the world needs to make better-informed decisions. To ensure this, all our funded teams have signed a binding Intellectual Property Pledge. This commitment ensures:

- All experimental data is made public for scrutiny by the global scientific community.
- All patents are free for research. Any team member must provide a royalty-free licence for anyone to use their patents for research purposes.

Oversight Committee

To ensure rigorous and responsible governance, this programme benefits from an independent Oversight Committee composed of international experts and chaired by Piers Forster. The Committee advises ARIA leadership and plays a crucial role in scrutinising outdoor experiment plans, providing expert recommendations, and may advise against funding experiments unless certain modifications are made. While ultimate funding decisions rest with ARIA, the Oversight Committee has the authority to comment publicly and independently on experiment funding decisions and on other matters related to the programme and the wider field.

The committee focuses on:

- Supporting effective oversight of the programme's outdoor experiments and guiding transparent communication of findings.
- Shaping international norms and standards for the responsible governance of such experiments.

- Contributing constructively to the wider international discussion on potential governance mechanisms for climate cooling approaches.

Learn more about the Committee's remit, members, and work here.

Read the Oversight Committee's note on the announcement of the Exploring Climate Cooling projects, published 7 May 2025, here.

Meet the Oversight Committee

Our independent oversight committee brings together international experts in climate science, climate engineering, ethics, and governance. Together, this group is supporting the effective oversight and governance of outdoor experiments, and is helping to shape international norms and responsible global standards for Earth cooling approaches.

Piers Forster

Chair

Piers Forster is a highly cited atmospheric scientist with over 30 years of experience researching the causes and impacts of climate change, as well as mitigation and adaptation approaches and their connection to national and international climate policy. He is founding Director of the Priestley Centre for Climate Futures and Professor of Physical Climate Change at the University of Leeds.

Jessica Seddon

Secretary

Dr. Jessica Seddon’s work on environmental governance focuses on how new sources of data can be used to enable new (more sustainable) ways of interacting with the environment around us. She is currently Senior Fellow and Director of the Deitz Family Initiative on Environment and Global Affairs at the Yale Jackson School of Global Affairs and a co-founder of The Institutional Architecture Lab.

Arunabha Ghosh

Member

Dr Arunabha Ghosh is an internationally recognised public policy expert, author, columnist, and institution builder. He is the founder-CEO of the Council on Energy, Environment and Water, and has led CEEW to the top ranks as one of Asia's leading policy research institutions and among the world’s 20 best climate think-tanks.

Nana Klutse

Member

Prof. Nana Ama Browne Klutse is a distinguished Ghanaian known for her expertise in climate modelling, climate change impacts, adaptation, and mitigation strategies, particularly in Africa. She is a professor, researcher and Head of the Department of Physics at the University of Ghana and contributed to the Intergovernmental Panel on Climate Change (IPCC) as the Vice Chair of the Working Group I.

Jack Stilgoe

Member

Dr Jack Stilgoe is a professor in science and technology studies at University College London, where he researches the governance of emerging technologies.

Shuchi Talati

Member

Dr. Shuchi Talati is a climate technology governance expert and founder of The Alliance for Just Deliberation on Solar Geoengineering (DSG). DSG is a nonprofit organisation working towards just and inclusive deliberation about research and potential use of solar geoengineering.

Jan McDonald

Jan McDonald is Professor of Environmental and Climate Law at the University of Tasmania, Australia. Jan's research explores the legal frameworks required to responsibly govern the research, development and deployment of both solar radiation management and marine carbon dioxide removal technologies.

Annex 3: ARIA Framework Agreement

ARIA Framework Agreement

Introduction and Background

1. Purpose of Document

1.1. The framework document sets out the broad governance framework within which ARIA and DSIT operate. It has been agreed between the Department for Science, Innovation and Technology (DSIT) and the Advanced Research and Invention Agency (ARIA) and has been approved by HM Treasury.

1.2. This framework document is subject to and complements:

- Legal and regulatory requirements, in particular the ARIA Act 2022;
- Government-wide guidance listed in Annex A;
- ARIA's delegation and accounting officer letters; and
- Other instructions issued by DSIT, the Cabinet Office and HM Treasury, where appropriate.

1.3. The document does not convey any legal powers or responsibilities but both parties agree to operate within its terms.

1.4. References to ARIA include all its subsidiaries and joint ventures that are classified to the public sector and central government for national accounts purposes.

1.5. Copies of the document and any subsequent amendments have been placed in the Libraries of both Houses of Parliament and made available to members of the public on ARIA's website.

1.6. This framework document will be reviewed and updated at least every 3 years. The latest date for review and updating of this document is January 2026.

2. Classification

2.1. ARIA is likely to be classified as a central government organisation by the ONS/HM Treasury Classifications team. It has been administratively classified by the Cabinet Office as a Non-Departmental Public Body.

3. Purpose, functions and duties of ARIA

3.1. DSIT and ARIA share the common objective of funding transformational scientific and technological research. To achieve this, ARIA and DSIT will work together in recognition of each other's roles and areas of expertise, providing an effective environment for ARIA to achieve its objectives through the promotion of partnership and trust.

3.2. To support its success, ARIA will have maximum autonomy over its research and project choice; its procedures; and its institutional culture. Decisions on the programme portfolio will be set by ARIA, not ministers, and allocation of funding to research projects will be decided by those with relevant technical expertise. ARIA will be a flagship of the Government's agenda to cut bureaucracy and nothing in this framework document should be interpreted as undermining ARIA's financial and operational freedoms.

3.3. ARIA's statutory functions, powers and duties are set out in the ARIA Act 2022. A summary is included in Annex B.

Role of the Department

4. The responsible Minister

4.1. The Secretary of State's statutory powers in respect of ARIA are set out in the ARIA Act 2022 and summarised in Annex B.

5. The Principal Accounting Officer and Accounting Officer

5.1. The Principal Accounting Officer (PAO) is the Permanent Secretary of DSIT.

5.2. The PAO designates the Chief Executive of ARIA as ARIA's Accounting Officer. The PAO will issue a letter appointing the Accounting Officer (AO), setting out their responsibilities and delegated authorities.

5.3. If deemed appropriate, the PAO may designate another employee of the company as AO.

5.4. The responsibilities of the PAO and AO are set out in *Managing Public Money (MPM)*.[1]

5.5. The PAO is accountable to Parliament for the issue of any grant-in-aid to ARIA.

5.6. The PAO, via the sponsorship team, is also responsible for ensuring arrangements are in place in order to:

- Support ARIA in proactively reporting its performance and highlighting any significant problems within the organisation, allowing the department to make such interventions as are judged necessary;
- Inform ARIA of relevant government policy in a timely manner;
- Bring Ministerial or departmental concerns about the activities of ARIA to the Board's attention, and as appropriate, to the departmental board, requiring explanations and assurances that appropriate action has been taken; and
- Advise Ministers on the exercise of their statutory responsibilities concerning ARIA.

6. The role of the sponsorship team

6.1. The ARIA sponsorship team in DSIT is the primary contact for ARIA and will support the PAO and DSIT Ministers on ARIA matters. The responsible Senior Civil Servant, supporting the PAO, is the Director General for Science, Innovation and Growth. ARIA and the sponsorship team will establish cooperative working practices allowing both to exercise their duties effectively.

7. Resolution of disputes between ARIA and DSIT

7.1. Any disputes between DSIT and ARIA will be resolved in as timely a manner as possible. DSIT and ARIA will seek to resolve any disputes through an informal process in the first instance. If this is not possible, then a formal process, overseen by the Senior Civil Servant with responsibility for ARIA's sponsorship, will be used to resolve the issue, escalating to the Director General for Science, Innovation and Growth, and the PAO. Within ARIA, any issue should be escalated at working level, ultimately to the Chief Executive as AO, or the Chair (as appropriate).

[1] *Managing Public Money*, Chapter 3

8. Transparency arrangements

8.1. In line with the Government's aspirations for transparency in all public bodies,[2] ARIA will:

- Publish information on all recipients of its programme funding, except for those that are sensitive on the grounds of national security;
- Publish transactional information on its operational costs to a reasonable threshold to be determined by the ARIA Board;
- Publish data on the regional distribution of its programme funding; and
- Comply with the Environmental Information Regulations 2004.

8.2. ARIA is exempt from the Freedom of Information Act 2000. Where a request for information is received by DSIT concerning ARIA, DSIT may disclose any information it holds on ARIA in accordance with the Act. ARIA is not expected to provide information to DSIT for the purposes of satisfying an FOI request received by DSIT. DSIT should consult with ARIA where the disclosure of information will affect ARIA in the delivery of its responsibilities.

9. Communications and announcements

9.1. ARIA will maintain an independent communications function and implement an effective communications strategy on the work it funds. Working closely with DSIT as is appropriate, ARIA will endeavour to:

- Provide DSIT with advance sight of announcements involving significant programme funding, or appointments to ARIA's Board, to enable effective joint planning and to give Ministers the opportunity to be involved, if they wish; and
- Work with DSIT on communications materials related to future allocation of ARIA's funding.

9.2. It is an important principle, supported by both ARIA and DSIT, that the direction of and conclusion of ARIA's funding will always be communicated independently, freely and objectively, without political restriction or interference. ARIA will retain control over the timing and content of communications.

10. Reporting on legal risk and litigation

10.1. ARIA shall notify DSIT's ARIA sponsorship team in a timely manner on the existence of any active litigation and any threatened or reasonably anticipated litigation. In the event of a substantial piece of litigation, DSIT and ARIA should agree a litigation protocol for appropriate handling and information sharing.

10.2. Until such a protocol is in place, the parties will ensure that legally privileged documents and information are clearly marked as such, handled appropriately by individual employees, and circulated only as necessary.

[2] *Managing Public Money*, 1.1 Principles

Governance and Structure

11. Governance and accountability

11.1. ARIA shall operate corporate governance arrangements that, so far as practicable, and in light of the other provisions of this framework document, or as otherwise may be mutually agreed, accord with good corporate governance practice and applicable regulatory requirements and expectations. Particularising the requirements outlined in Annex A, ARIA will:

- Comply with the Corporate Governance in Central Government Departments Code of Good Practice[3] (to the extent appropriate with its statutory duties), explain any non-compliance in its annual report and notify DSIT of any material deviations in advance;
- Comply with *MPM*, including Annex 3.1[4] which sets requirements on the annual governance statement; and
- Have regard to the Functional Standards[5] as appropriate.

12. The Chief Executive

Appointment

12.1. The first Chief Executive of ARIA is appointed by the Secretary of State under Schedule 1 of the ARIA Act 2022. Thereafter, executive members including the Chief Executive are to be appointed by the Chair after consultation with the other non-executive members of the ARIA Board.

Responsibilities of ARIA's Chief Executive as Accounting Officer

12.2. The Chief Executive as Accounting Officer is responsible for safeguarding the public funds for which they have charge; for ensuring propriety, regularity, value for money and feasibility in the handling of those public funds; and for the day-to-day operations and management of ARIA, while noting ARIA's statutory responsibility to tolerate a significant risk appetite in its project and programme funding.

12.3. The Chief Executive should follow the advice and direction of the Board, except in very exceptional circumstances with a clear cut and transparent rationale for not doing so. If instructed to carry out a course of action by the Board, that the CEO considers would be inconsistent with their duties as AO, the CEO should reject the course of action, and inform the ARIA sponsorship team in DSIT, the PAO and the Secretary of State. Furthermore, and if agreed with the Secretary of State, the AO must write a letter of justification to the Chair of the Board setting out their rationale for not following the advice and recommendation of the Board and copy that letter to the Treasury Officer of Accounts.

12.4. If the Secretary of State agrees with the Board's proposed course of action, it may be appropriate for the Secretary of State to direct the AO in the manner set out in *MPM* paragraph 3.6.6. onwards.

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3 Corporate Governance Code for Central Government Departments 2017

4 *Managing Public Money*, Annex 3.1

5 Cabinet Office, Functional Standards

Responsibilities for accounting to Parliament and to the Public

12.5. ARIA's Chief Executive is responsible to Parliament. The accountabilities include:

- Signing the accounts and ensuring that proper records are kept relating to the accounts and that the accounts are properly prepared and presented;
- Preparing and signing a Governance Statement covering corporate governance, risk management and oversight of any local responsibilities, for inclusion in the annual report and accounts;
- Ensuring that effective procedures for handling complaints about ARIA are established and made widely known within ARIA;
- Acting in accordance with the terms of *MPM* and other instructions and guidance issued from time to time by DSIT, HM Treasury, and the Cabinet Office, insofar that those terms do not conflict with ARIA's agreed controls arrangements;
- Ensuring that as part of the above compliance, they are familiar with, and act in accordance with, the ARIA Act 2022, this framework document, any delegation and allocation letter issued to ARIA by DSIT, and other relevant instructions;
- Ensuring they have appropriate internal mechanisms for monitoring, governance and external reporting non-compliance with any conditions arising from the above documents; and
- Giving evidence, normally with the PAO, when summoned before the Public Accounts Committee on ARIA's stewardship of public funds.

Responsibilities to DSIT

12.6. ARIA's Chief Executive also holds responsibilities to DSIT. These include:

- Presenting ARIA's 3-year strategy and annual Corporate Plan; and
- Informing the department of progress in ARIA's delivery of its strategic objectives, and in demonstrating how resources are being used to achieve those objectives.

Responsibilities to the ARIA Board

12.7. The ARIA Board is the main channel for accountability and control within ARIA. The Chief Executive's responsibilities include:

- Advising the Board on the discharge of their responsibilities as set out in *MPM*, in the ARIA Act 2022, and in any other relevant instructions and guidance pursuant to ARIA;
- Advising the Board on ARIA's performance compared with its aims and objectives; and
- Ensuring that financial considerations are taken fully into account by the Board at all stages in reaching and executing its decisions, and that financial appraisal techniques are followed.

13. The Chair and the Board

Composition of the Board

13.1. ARIA will have a Board in line with good standards of Corporate Governance and as set out in the ARIA Act 2022 and in guidance as set out in Annex A. Detailed responsibilities will be set out in the Board terms of reference. Remuneration of the Board will be disclosed in line with the guidance in the Government Financial Reporting Manual (FReM).

13.2. As detailed in the ARIA Act 2022 and Annex B, the Board will consist of executive and non-executive members. The non-executive members are: a Chair, the Government Chief

Scientific Advisor (ex officio) and such other members appointed by the Secretary of State. The executive members are the Chief Executive, the Chief Financial Officer, and at least two, but no more than five, other members that have a balance of skills and experience appropriate to directing ARIA's business. This will include as an executive and voting Board member, an appropriately qualified finance director, as per Annex 4.1 of *MPM*.[6]

13.3. The total membership of the Board should not exceed 12 members and the Board must have a majority of non-executive members to ensure that executive members are supported and constructively challenged in their role. A majority non-executive presence should be ensured at Board meetings, as far as practicable.

Board committees

13.4. The Board may set up committees, and sub-committees as in the ARIA Act 2022 and as necessary for it to fulfil its functions. This must include an Audit and Risk Committee chaired by an independent and appropriately qualified non-executive member of the Board, and a Remuneration Committee.

13.5. While the Board may make use of committees to assist its consideration of appointments, succession, audit, risk and remuneration, it retains responsibility for, and endorses, final decisions in all of these areas.

13.6. Beyond these requirements, ARIA may determine its own procedure and the procedure for any committee or sub-committee.

Appointments to the Board

13.7. The responsibilities for appointments to the Board are detailed in Schedule 1 sub-paragraph 3 of the ARIA Act 2022 and summarised in Annex B.

Duties of the Board

13.8. The Board should ensure that effective arrangements are in place to provide assurance over the design and operation of risk management, governance and internal control in line with the ARIA Act 2022, The Orange Book (in particular, *Management of Risk – Principles and Concepts*), and other guidelines in Annex A.

13.9. The Chair will determine the priorities and duties of the Board and ensure that the Secretary of State is informed of the Board's priorities.

14. The Chair's role and responsibilities

14.1. The Chair is responsible for leading the Board in the delivery of its responsibilities as set out in the ARIA Act 2022, the Chair's terms and conditions, this document and the documents and guidance referred to within this document.

14.2. Communications between ARIA's Board and the Secretary of State should normally be through the Chair.

14.3. The Chair is bound by the Code of Conduct for Board Members of Public Bodies, which covers conduct in the role and includes the Nolan Principles of Public Life.

14.4. In addition, the Chair is responsible for:

- Promoting the efficient and effective use of staff and other resources;
- Delivering high standards of regularity and propriety; and
- Representing the views of the Board to the general public.

[6] *Managing Public Money*, 4.1

14.5. The Chair also has an obligation to ensure that:

- The Non-Executives are appointed and understand their roles and responsibilities;
- The responsible minister is advised of ARIA's needs when Board vacancies arise;
- There is a Board Operating Framework in place, setting out the role and responsibilities of the Board consistent with the Government Code of Good Practice for Corporate Governance;
- There is a code of practice for Board members in place, consistent with the Cabinet Office's Code of Conduct for Board Members of Public Bodies;
- There are appropriate and regular communication channels to DSIT's responsible Ministers and Permanent Secretary, and that the Minister and Permanent Secretary have the information they need to discharge their responsibilities to ARIA;
- ARIA has a robust conflict of interest policy;
- Any significant breaches of the Board's or Chief Executive's responsibilities be dealt with in a timely and proportionate manner;
- The work of the Board and its members are reviewed, including ongoing assessment of the performance of individual Board members with a formal annual evaluation and more in-depth assessments of the performance of individual Board members when being considered for re-appointment.

14.6. The performance of the Chair is evaluated annually by the Director General for Science, Innovation and Growth, in consultation with the independent Non-Executives, taking into account the views of relevant stakeholders. The outcome of that evaluation should be made available to the Secretary of State.

15. Individual Board members' responsibilities

15.1. Individual Board members should:

- Comply at all times with the Code of Conduct for Board Members of Public Bodies, which includes the Nolan Principles of Public Life as well as rules relating to the use of public funds and to conflict of interest;[7]
- Demonstrate adherence to the 12 Principles of Governance for all Public Body Non-Executive Directors[8] as appropriate;
- Not misuse information gained in the course of their public service for personal gain or for political profit, not seek to use the opportunity of public service to promote private interests or those of connected persons or organisations;
- Comply with the Board's rules on the acceptance of gifts and hospitality, and business appointments;
- Act in good faith and in the best interests of ARIA;
- Ensure they are familiar with any applicable guidance on the role of the public sector Non-Executive Directors and Boards that may be issued by Cabinet Office, HM Treasury or wider government.

[7] Code of conduct for board members of public bodies

[8] 12 Principles of Governance for all Public Body NEDs

Management and Financial Responsibilities and Controls

16. Business cases and spend control

16.1. ARIA is following a single business case approach, whereby for the duration of ARIA's multi-year settlement announced at the 2020 Spending Review, only one business case for ARIA must be cleared with HM Treasury, and ARIA does not need to clear additional business cases with either DSIT or HM Treasury.

16.2. ARIA's financial freedoms and delegated authorities are set out in the delegation letter. This delegation letter may be updated and superseded by later versions which may be issued by DSIT in agreement with HM Treasury. In line with *MPM Annex 2.2*, these delegations will be reviewed on an annual basis.

16.3. ARIA must seek DSIT and, where appropriate, HM Treasury's, prior approval before undertaking to incur any expenditure that: falls outside the delegations or which is not provided for in ARIA's annual budget; or might be considered novel, contentious or repercussive; or is otherwise contrary to *MPM*.

16.4. It should be noted that ARIA's objective is to pursue high-risk, long-term R&D and is therefore expected to have a significant risk appetite. Investing in novel or contentious research should therefore not constitute novel, contentious or repercussive spending for ARIA.

17. Banking and managing cash

17.1. ARIA should only hold money in Government Banking Service accounts.

17.2. The Accounting Officer is responsible for ensuring ARIA's banking policy is in line with *MPM* and is responsible for ensuring that policy is complied with.

18. Risk management

18.1. ARIA shall ensure that the risks that it faces are dealt with in an appropriate manner, in accordance with the HM Treasury guidance: *Management of Risk: Principles and Concepts*.

18.2. In exercising its functions, ARIA may invest in research that carries a high risk of failure, but that has the potential for significant benefits to be achieved or facilitated. However, other risks such as (but not limited to) legal, operational and information management should assume a more conventional risk profile.

19. Counter fraud

19.1. ARIA should adopt and implement policies and practices to safeguard itself against fraud and theft, both internally and externally.

19.2. ARIA should act in line with guidance as issued by the Counter Fraud Function and in compliance with the procedures and considerations as set out in *MPM Annex 4.9* and the Counter Fraud Functional Standard.[9] ARIA should keep records of, and prepare and forward to DSIT, an annual report on fraud and theft suffered by ARIA and notify DSIT of any unusual or major incidents as soon as possible. ARIA should also report detected loss from fraud, bribery, corruption and error, alongside associated recoveries and prevented losses, to the Counter Fraud Centre of Expertise.

[9] Government Functional Standard GovS 013: Counter Fraud

20. Staff

Broad responsibilities for staff

20.1. ARIA will have responsibility for the recruitment, retention, and motivation of its staff, ensuring:

- The rules for recruitment and management of staff are clearly laid out in robust HR policies, which will be fully compliant with the public sector equality duty under the Equality Act 2010;
- The level and structure of its staffing, including grading and staff numbers, are appropriate to its functions and the requirements of economy, efficiency and effectiveness;
- The performance of its staff at all levels is satisfactorily appraised;
- Its staff are encouraged to acquire the appropriate professional, management and other expertise necessary to achieve ARIA's objectives;
- Proper consultation with staff takes place on key issues affecting them;
- Adequate grievance and disciplinary procedures are in place;
- Whistle-blowing procedures consistent with the Public Interest Disclosure Act are in place;
- A code of conduct for staff is in place based on the Cabinet Office's Model Code for Staff of Executive Non-Departmental Public Bodies; and
- There is an effective and widely communicated policy on conflicts of interest.

Staff costs

20.2. Subject to its delegated authorities, ARIA shall ensure that the creation of any additional posts does not incur forward commitments that will exceed its ability to pay for them.

Pay and conditions of service

20.3. ARIA's staff shall be subject to levels of remuneration and terms and conditions of service (including pensions) within an ARIA pay policy initially approved by DSIT as sponsor department. ARIA may amend these terms and conditions from time to time, subject to the necessary approvals and consultation with ARIA staff.

20.4. ARIA will aim to follow the general principles of public sector pay including the annual pay remit guidance issued by the Cabinet Office.

20.5. Senior Civil Servant equivalents within ARIA are not covered by the Cabinet Office Senior Civil Service Practitioner Guidance, but organisations are encouraged to align their awards to those in the wider organisation.

20.6. All senior remuneration must comply with HM Treasury's guidance for approval of senior pay,[10] unless exempt – see 20.7.

20.7. In September 2022, the Chancellor agreed to grant ARIA delegation for 24 senior roles to exceed HMT senior pay approval thresholds for a period of 10 years. This includes four executive posts (including the position of CEO) and twenty senior roles – programme managers, scientific staff or unit heads.

20.8. ARIA shall provide DSIT with a copy of its HR policies and procedures upon request. The travel expenses of Board members shall be commensurate with the rates allowed to staff. Reasonable actual costs shall be reimbursed.

[10] Guidance for approval of senior pay

Pensions, redundancy, and compensation

20.9. Compensation scheme rules and pension scheme rules should reflect legislative and HM Treasury guidance requirements regarding exit payments.

20.10. ARIA staff shall normally be eligible for a pension provided by its own scheme. Staff may opt out of the occupational pension scheme provided by ARIA, but that employers' contribution to any personal pension arrangement, including stakeholder pension, shall normally be limited to the national insurance rebate level.

20.11. Any proposal by ARIA to move from the existing pension arrangements, or to pay any redundancy or compensation for loss of office, requires the prior approval of the department. Proposals on severance must comply with the rules in chapter 4 of *MPM.*

21. Business plans, financial reporting, and management information

Corporate plans

21.1. As set out in CEO responsibilities, ARIA will publish a 3-year strategy and annual corporate plan. ARIA will have discretion to determine the content and how it is expressed.

Budgeting procedures and grant-in-aid

21.2. Each year, DSIT will send to ARIA a formal statement of the annual budgetary provision allocated by the department; and of any planned change in policies affecting ARIA.

21.3. Any grant-in-aid provided by DSIT for the year in question will be voted in DSIT's Supply Estimate and be subject to Parliamentary control. Grant-in-aid will be paid in instalments following written applications from ARIA. Cash balances accumulated from Exchequer funds shall be kept to a minimum level consistent with the efficient operation of ARIA. Grant-in-aid not drawn down by the end of the financial year shall lapse. Subject to approval by Parliament of the relevant Estimates provision, where grant-in-aid is delayed to avoid excess year-end cash balances, DSIT will make available in the next financial year any such grant-in-aid that is required to meet year-end liabilities.

Annual Report and Accounts

21.4. As required in the ARIA Act 2022, ARIA must publish an annual report of its activities together with its audited accounts after the end of each financial year, covering any entities under its control. ARIA shall provide the department its finalised (audited) accounts by a date notified by DSIT to ARIA each year in order for the accounts to be consolidated within DSIT's. A draft of the report should be submitted to the department two weeks before the proposed publication date. The accounts should be prepared in accordance with the relevant statutes and specific accounts direction issued by the department as well as the *Financial Reporting Manual.*

21.5. ARIA's first Annual Report and Accounts should be published for the 2023-24 financial year. The Annual Report and Accounts must comply with the Treasury's Financial Reporting Manual and, in particular, have regard to the illustrative statements for an NDPB.[11]

21.6. The report and accounts shall be laid by the Secretary of State in Parliament in accordance with the ARIA Act 2022. ARIA must also make these available on their website.

21.7. In accordance with the Agreement on the Independence of ARIA, the completed annual report will be shared with the Devolved Administrations in parallel each year for their information.

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[11] Government Finance Reporting Manual: 2022-23

21.8. As part of its reporting and evaluation, ARIA will evaluate itself against pillar A of the 2021-25 Greening Government Commitments – Mitigating climate change: working towards net zero by 2050. ARIA will have regard to its projects contributing to the UK's climate change targets and environmental goals, without prejudice to ARIA's freedoms set out in section 3 of this document.

Reporting performance to the department

21.9. ARIA shall operate management, information and accounting systems that enable it to review in a timely and effective manner its financial and non-financial performance against the budgets and targets agreed by its Board.

21.10. ARIA shall record financial and non-financial performance, and the achievement of key objectives.

21.11. ARIA's performance shall be formally reviewed, after 10 years of operations. DSIT may choose to initiate periodic reviews, with agreement from ARIA, during this time. In such instances, DSIT's rationale for the review, should be justified in the context of ARIA's intended operational independence.

21.12. The DSIT Secretary of State, and separately, the Director General, Science, Innovation and Growth, will meet the Chair at least twice a year to discuss performance.

22. Protecting research

22.1. Noting Section 2(6) of the ARIA Act 2022, which states that ARIA must have regard for how its research will benefit the UK, ARIA should have particular regard for how intellectual property (IP) assets generated from its research will be of benefit to the UK's prosperity and security.

22.2. ARIA must, in accordance with the ARIA Act 2022, comply with any national security directions issued by the DSIT Secretary of State and provide the DSIT Secretary of State with any information requested on matters of national security. ARIA must comply, and take steps to ensure its partners comply, with the National Security and Investment Act 2021.

22.3. ARIA should also:

- Ensure one executive Board member has responsibility for oversight on matters of security. The Government Chief Scientific Advisor may also identify and explore matters of security;
- Have regard to GovS 007: Security, the Government Functional Standard on Security;[12]
- Employ or contract services from an appropriately qualified and vetted National Security Advisor;
- Engage regularly with government national security networks;
- Promote a high standard of physical, personnel, and cyber security internally and across its collaborators.

22.4. In accordance with Cabinet Office's Guidance for General Grants,[13] and The Centre for the Protection of National Infrastructure's Trusted Research Checklist,[14] ARIA will take steps to ensure:

- National security is considered in the award of research funding; and

[12] Government Functional Standard GovS 007: Security

[13] Guidance for General Grants

[14] The Centre for the Protection of National Infrastructure, Trusted Research checklist

- Proportionate due diligence into collaborators, in particular, noting the risk of sensitive technology being transferred to and misused by a hostile foreign state.

23. Information sharing

23.1. DSIT has the right of access to all records and personnel, as per Section 6 of the ARIA Act 2022.

23.2. ARIA shall provide the department with information monthly enabling the department to monitor:

- ARIA's cash management and forecasts;
- Its draw-down of grant-in-aid;
- Forecast outturn and year-to-date actual expenditure by resource headings; and
- Other areas of required monthly reporting on a schedule agreed with the DSIT sponsors.

24. Audit

Internal audit

24.1. ARIA shall:

- Establish and maintain arrangements for internal audit in accordance with the Public Sector Internal Audit Standards;[15]
- Set up an audit committee of its Board in accordance with the Code of Good Practice for Corporate Governance and the Audit and Risk Assurance Committee Handbook;[16]
- Share with DSIT relevant information identified during internal audits and the Annual Audit Opinion Report (together with any other outputs where the ARIA Chief Executive, Board or Audit Committee believe it impacts on DSIT's responsibilities).

External audit

24.2. ARIA must prepare a statement of accounts in respect of each financial year. These must comply with any directions given by the Secretary of State as to their content and form and the methods and principles to be applied in preparing them.

24.3. The Comptroller & Auditor General (C&AG) will examine, certify, and report on the statement of accounts, and pass the audited accounts to the Secretary of State who will lay the accounts together with the C&AG's report before Parliament.

24.4. ARIA will ensure that the C&AG is appointed auditor of any company subsidiaries that it controls and/or whose accounts are consolidated within its own accounts.

24.5. The C&AG:

- Will consult DSIT and ARIA on whom – the NAO or a commercial auditor – shall undertake the audits on his behalf, though the final decision rests with the C&AG;
- Has a statutory right of access to relevant documents held by another party in receipt of payments or grants from ARIA; and
- Will share with DSIT, information reported in the audit report and other outputs, where issues impact on DSIT's responsibilities in relation to financial systems within ARIA.

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15 Public Sector Internal Audit Standards

16 Audit and risk assurance committee handbook

24.6. The C&AG may carry out examinations into the value for money with which ARIA has used its resources in discharging its functions. For these examinations, the C&AG has statutory access to documents as provided for under section 8 of the National Audit Act 1983. In addition, ARIA shall provide, in conditions to grants and contracts, for the C&AG to exercise such access to documents held by grant recipients and contractors and sub-contractors as may be required for these examinations; and shall use its best endeavours to secure access for the C&AG to any other documents required by the C&AG which are held by other bodies.

25. Devolution and the Devolved Administrations

25.1. ARIA has a UK-wide remit. Engagement between DSIT, ARIA and the Devolved Administrations (DAs) will be guided by the 'Agreement on the Independence of the Advanced Research and Invention Agency', which commits the four administrations of the UK to protecting the principles of strategic autonomy, operational autonomy, and minimal bureaucracy in interactions with ARIA.

25.2. The 'ARIA DA CSA Forum' will meet twice annually to allow the policy priorities of the four administrations to be translated into scientific challenges and communicated directly to ARIA's executive leadership.

25.3. In addition to this, ARIA may engage, via DSIT or independently, with the Devolved Administrations or devolved funding bodies to support collaboration across the UK funding system.

25.4. ARIA will share its completed annual report with the Devolved Administrations in parallel each year for their information.

26. Collaboration and agreements with other organisations

Joint-working between ARIA and UK Research and Innovation (UKRI)

26.1. ARIA will build a mutually beneficial relationship with UKRI (including the research councils and Innovate UK), underpinned by the recognition that:

- UKRI is the predominant UK arms-length body whose purpose is to invest in and facilitate research and innovation activities across the UK;
- ARIA has strategic and operational independence from government;
- ARIA is a smaller and leaner organisation, for whom formalised structures and agreements may prove unduly onerous;
- It is mutually beneficial for ARIA and UKRI to be aware of each other's priorities and major research programmes;
- Working closely and collaboratively with other bodies in the wider research and innovation landscape on areas of shared interest to maximise the benefit to research and innovation is beneficial to both ARIA and UKRI.

26.2. ARIA and UKRI can enter into agreements where necessary to better support their objectives. This includes agreements on shared projects and joint funding.

27. Working with other bodies

27.1. ARIA should work closely and collaboratively with other bodies in the wider research and innovation landscape on areas of shared interest to maximise benefits. ARIA has the authority to make agreements with other such bodies as it sees fit.

28. Reviews and dissolution arrangements

Review of ARIA's status

28.1. ARIA will be formally reviewed every 10 years. The date of the next review will be in 2032. ARIA may be informally reviewed within that time by DSIT as per section 21 of this document.

29. Arrangements if ARIA is dissolved

29.1. As per the provisions in Section 8 of the ARIA Act 2022, regulations to dissolve ARIA may not be made within its first 10 years after the Act is passed. Should these regulations be introduced, DSIT shall put in place arrangements to ensure the orderly winding up of ARIA, ensuring that the assets and liabilities of ARIA are passed to any successor organisation and accounted for properly. If there is no successor organisation, the assets and liabilities should revert to DSIT. DSIT shall have regard to Cabinet Office guidance on winding up of ALBs.[17]

[17] Public Bodies: Guide for Departments, Chapter 10: Dissolving a Public Body

Annex A: Compliance with Government-wide corporate guidance and instructions

ARIA shall comply with the following general guidance documents and instructions, except for where adaptations have been approved:

- Managing Public Money (MPM) and Cabinet Office Controls, other instructions and guidance issued from time to time by DSIT, HM Treasury, and the Cabinet Office insofar that those terms do not conflict with ARIA's agreed controls arrangements;
- Corporate Governance in Central Government Departments: Code of Good Practice
- Code of Conduct for Board Members of Public Bodies
- Code of Practice for Partnerships between Department's and Arm's Length Bodies
- Guidance from the Public Bodies team in Cabinet Office
- Code of Practice for Ministerial Appointments to Public Bodies
- The Nolan Seven Principles of Public Life
- Public Sector Internal Audit Standards
- Orange Book: Management of Risk: Principles and Concepts
- Government Financial Reporting Manual (FReM)
- Relevant 'Dear Accounting Officer' letters
- The Parliamentary and Health Service Ombudsman's Principles of Good Administration
- Consolidation Officer Memorandum, and relevant DCO letters
- Delegation and Allocation letter issued by DSIT (and previously BEIS, in January 2023)
- Transparency in Supply Chains – a Practical Guide
- HM Treasury Guidance on Tackling Fraud
- The Government Fraud, Error and Grant Efficiency Function
- Government Functional Standard GovS 015: Grants
- Government Functional Standard GovS 013: Counter Fraud
- Government Functional Standard GovS 007: Security
- National Cyber Strategy 2022 and Cyber Security Guidance for Business
- Guidance on Senior Pay and Reward
- Public Sector Pay and Terms
- Whistleblowing Guidance and Code of Practice
- The Equalities Act 2010
- Recommendations made by the Public Accounts Committee, or by other Parliamentary authority, that have been accepted by the Government and are relevant to ARIA

Annex B: Summary of ARIA Act 2022

ARIA's functions and duties:

- ARIA may carry out, commission or support others to conduct scientific research; develop and exploit scientific knowledge; collect, share, publish and advance scientific knowledge.
- In exercising its functions, ARIA must have regard to the desirability of doing so for the benefit of the UK, through contributing to economic growth or benefit, promoting scientific innovation and invention, or improving quality of life in the UK.
- In exercising these powers, ARIA has the discretion to take into account the significant benefits that can be achieved through tolerating a high risk of failure. That failure may be a failure of scientific research, or a failure of the development or exploitation of scientific knowledge.

The Secretary of State's statutory powers in respect of ARIA are set out in the ARIA Act 2022. These are:

- To make grants to ARIA, which may be subject to conditions;
- To give ARIA directions as to the exercise of its functions if considered necessary in the interests of national security;
- To make regulations dissolving ARIA, after consulting ARIA and any other persons considered appropriate;
- To appoint the first CEO, and determine their remuneration, pension, and allowances and expenses;
- To refuse consent to the appointment of executive members, or remove an executive member from office, if it is considered necessary or expedient in the interests of national security;
- To appoint the Chair;
- To appoint the other non-executive members, with the exception of the Government Chief Scientific Advisor (GCSA);
- To remove a non-executive member, except the GCSA, from office on grounds considered appropriate;
- To determine remuneration, allowances and expenses for non-executive members (except the GCSA), which ARIA must pay;
- To determine, in special circumstances, compensation that should be paid when a person ceases to be a non-executive member of ARIA;
- To make regulations about procedures to be adopted for dealing with conflicts of interest;
- To give directions as to the content and form of, and the methods and principles applied in, preparing ARIA's statement of accounts;
- To lay before Parliament a report on ARIA's statement of accounts and certified statement from the Comptroller and Auditor General;
- To lay before Parliament ARIA's annual report;

- To make regulations providing for the references to the Government Chief Scientific Advisor on the ARIA Act 2022 to be references to another person; and
- To make property or staff transfer schemes to ARIA.

Appointments to the Board:

The responsibilities for appointments to the ARIA Board are detailed in Schedule 1 of the ARIA Act 2022:

- The Chair is appointed by the Secretary of State under Schedule 1, sub-paragraph 2(3)(a) of the ARIA Act 2022;
- Non-executive members are appointed by the Secretary of State under Schedule 1, sub-paragraph 2(3)(c) of the ARIA Act 2022, with the exception of the Government Chief Scientific Advisor's ex-officio position; and
- The Secretary of State has the statutory duty to exercise their power of appointment, so as to secure that the majority of members are non-executive.

Annex 4: Exploring Climate Cooling programme oversight and governance document

Exploring Climate Cooling

Programme oversight and governance

Updated August 2025

What are ARIA's core principles for governance of this programme?

ARIA will not fund experiments where the activities proposed are prohibited by domestic or international law or that violate indigenous rights, including those outlined in the UN Declaration on the Rights of Indigenous People. Project teams will be required to show how their tests comply with all applicable laws.

The governance measures that ARIA has put in place for this programme have been designed with the following principles in mind:

- **Deliver Valuable & Transformational Knowledge.** We aim to select and design for research that will address the most pressing critical scientific questions surrounding approaches for actively cooling the climate.
- **Minimise Risk.** All experiments should be designed to reduce direct risk as far as possible.
- **Engage With, and Respect Key Communities.**
- **Communicate Proactively and be Transparent, Open, and Honest** at both the programme and project level, including around levels and sources of funding, intentions, how the research is conducted, outputs, and impacts.
- **Be Cognisant of the Broader Implications of Research + Integrate Systems Thinking** into research on approaches for actively cooling the climate.
- **Learn, Adapt and be Responsive.** Success will require a willingness to adapt to lessons learned during the programme and to changing circumstances.

Measures to try and uphold these principles are discussed in the programme **thesis**. In particular, we are:

- Working with and refining a detailed framework for approving funding for outdoor experiments in order to be transparent about our decision-making, ways of minimising risk and engagement with communities (see Figures 1-3 below).
- Opening the funding opportunity to a global pool of researchers in order to support a wider set of perspectives on critical questions.
- Maintaining a policy of transparent reporting of findings and open IP (when applied to climate intervention) in order to ensure that the knowledge gained is available for public benefit.

The programme's independent oversight committee (see below) is a mechanism intended to strengthen governance of the programme.

However, ARIA acknowledges that this is a complex and ethically-challenging research field and that circumstances unforeseen by the proposed governance measures may arise. By applying the principles above, ARIA will continue to iterate and update the programme's governance mechanisms in order to adhere to the principles above.

The role of the oversight committee and its relationship to the project teams

The programme oversight committee will have three main roles prioritised in this order:

1. Supporting ARIA's leadership in the effective oversight and governance of the outdoor experiments conducted as part of this programme, including producing guidance to ensure transparent and objective communication of findings.
2. Shaping the development of internationally-accepted and responsible norms and standards for oversight and governance of outdoor experiments of approaches for actively cooling the Earth.
3. Identifying constructive ways to contribute to the wider international discussion on possible governance mechanisms for these approaches.

The programme oversight committee is a panel of experts (including international members) that is independent of the project teams and the programme director and that makes recommendations directly to ARIA's leadership. Roughly half of the members of the

oversight committee were in place in time to contribute during the selection of projects by ARIA's leadership and the programme team. Additional members will continue to be appointed to the committee at the recommendation of the existing oversight committee members (and with the approval of ARIA's leadership) as the need arises. This flexible intake approach allowed for independent oversight during project selection, whilst also allowing the precise expertise of the committee to be tuned to best suit the projects that have been selected.

The initial members of the committee (see biographies below) were identified by ARIA on the basis of their expertise and international standing across a wide range of areas relevant to climate science and climate engineering. Potential members were then invited to join the committee by ARIA's leadership after meeting with the programme director and ARIA's CEO. These initial members have been appointed for the duration of the programme (5 years). Members appointed subsequently will be appointed for the remaining duration of the programme by invitation from ARIA's leadership, at the recommendation of the existing members of the committee and after consulting with the programme director. At the outset, the committee will have the opportunity to deliberate on and refine its terms of reference, for approval by ARIA's leadership.

Members of the committee will be paid at a fixed rate by ARIA in order to ensure that they can dedicate sufficient time to programme oversight. Remuneration will not be dependent on the progress of the project teams or on the delivery of particular recommendations regarding these teams, supporting the committee's independence. Budget will be available to allow the committee members to join in-person ARIA meetings and workshops.

The names, affiliations and biographies of the current members of the committee, together with information on their specific roles on the committee and any potential conflicts of interest are supplied below.

It is expected that the oversight committee will discuss the development of plans for outdoor experiments with the project teams and programme director, but it will be the responsibility of the project teams to develop suitable technical and non-technical plans. The oversight committee will not be involved in any direct management or day-to-day decision making for any of the projects. This approach is designed to give project teams access to the expertise of the oversight committee members (promoting the development of plans and pre-experiment activities in line with best practice), whilst allowing the oversight committee members to maintain a high level of objectivity regarding individual projects.

Budget and additional expert support services contracted by ARIA will be available to project teams to allow them to design and undertake the necessary pre-experiment public engagement and co-design activities. At the point at which project teams require additional budget in order to actually perform the outdoor tests, they will go through a formal "outdoor experiment funding approval" process, whereby their technical and non-technical plans and pre-experiment activities will be assessed, and approval for release of funds for the outdoor experiment (or series of linked experiments) will be either granted or refused by ARIA's leadership on the basis of the materials that the project teams submit for consideration.

Outdoor experiments will only be funded if they meet the criteria outlined in the programme thesis in the section "A Suggested Framework for Outdoor Experiments". Two key figures from the thesis are reproduced below for ease of access (Figures 1 and 2, which are called Figures 2 and 3 in the programme thesis). Further context on these figures is given in the programme thesis.

All ARIA projects must adhere to all relevant applicable domestic and international laws, and must respect the rights of indigenous peoples. For projects that propose to conduct activities that may require particular permissions, or compliance with particular regulatory or project management practices (e.g. outdoor experiments), ARIA will exercise its adaptive funding mechanism to review specific plans before funding is released for that component of the project.

An overview of the outdoor experiment funding approval process (and the role of the oversight committee in that process) is summarised in Figure 3. The decision trees in Figures 1 and 2 feed directly into this process, by informing which experiment proposals progress as far as seeking funding through the mechanism summarised in Figure 3. This figure also shows the relationship of the oversight committee to ARIA's leadership, the ARIA board committee for ethics and social responsibility (which has visibility across all of ARIA's programmes), the programme director, and to individual project teams. It is important to note that while ARIA's leadership makes the final decision on any given outdoor experiment, no project that violates applicable domestic or international laws or the recognized rights of indigenous peoples would be funded.

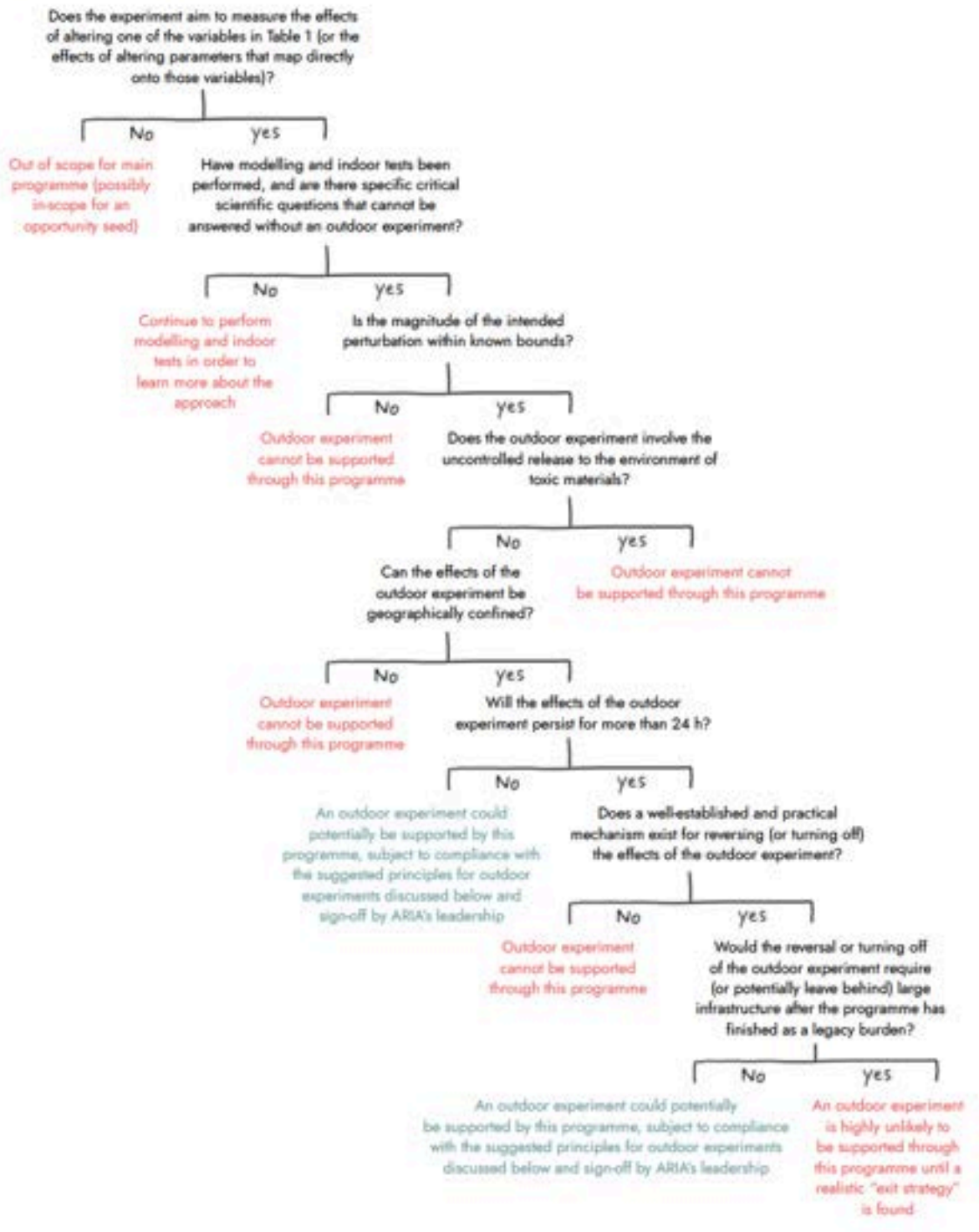


Figure 1: *The suggested outdoor experiment technical consideration decision tree (called "Figure 2" in the programme thesis). Table 1 refers to Table 1 in the Programme Thesis.*

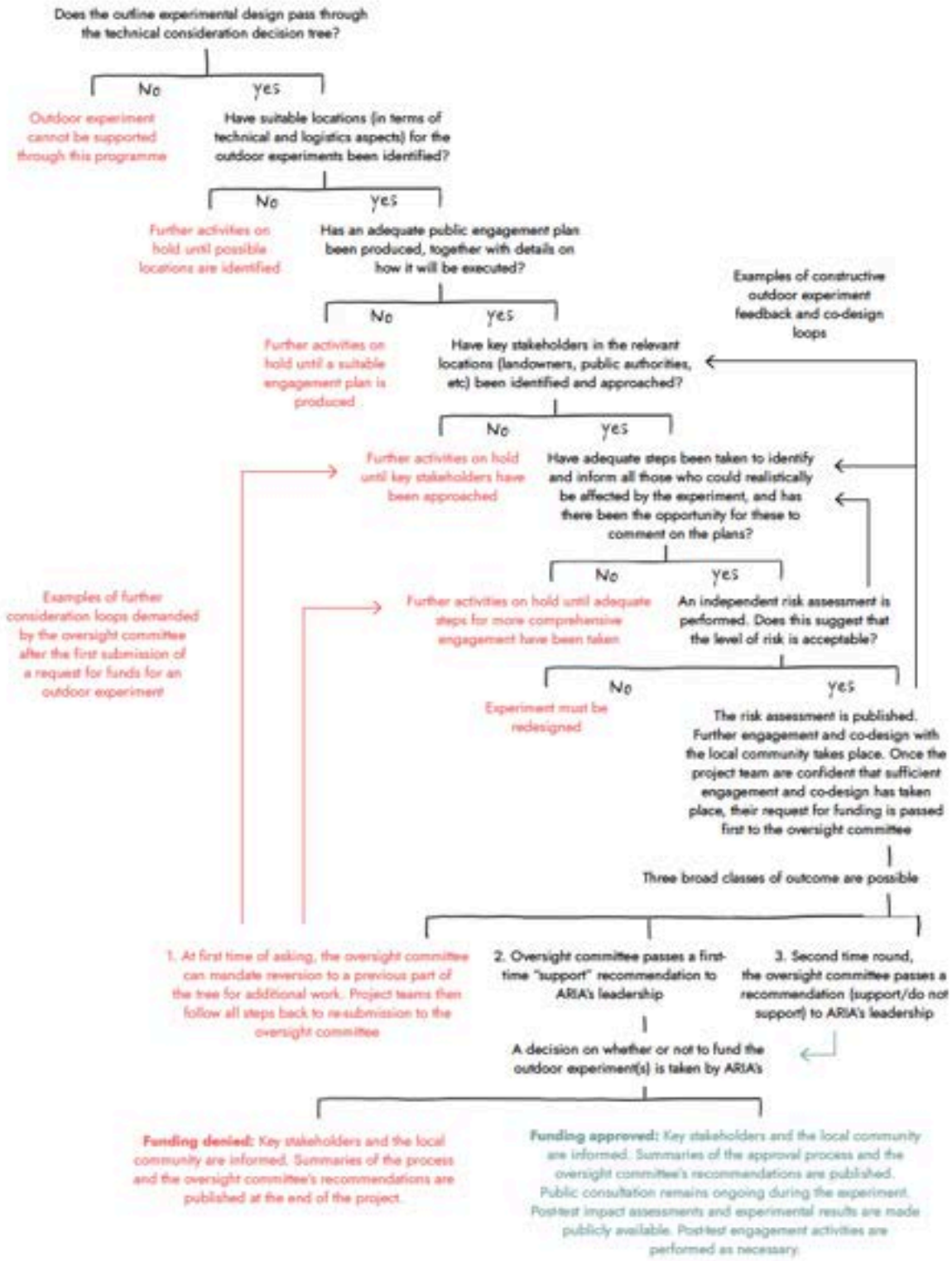


Figure 2: *The suggested outdoor experiment funding approval decision tree (called "Figure 3" in the programme thesis). This figure is to be used in conjunction with Figure 1 above.*

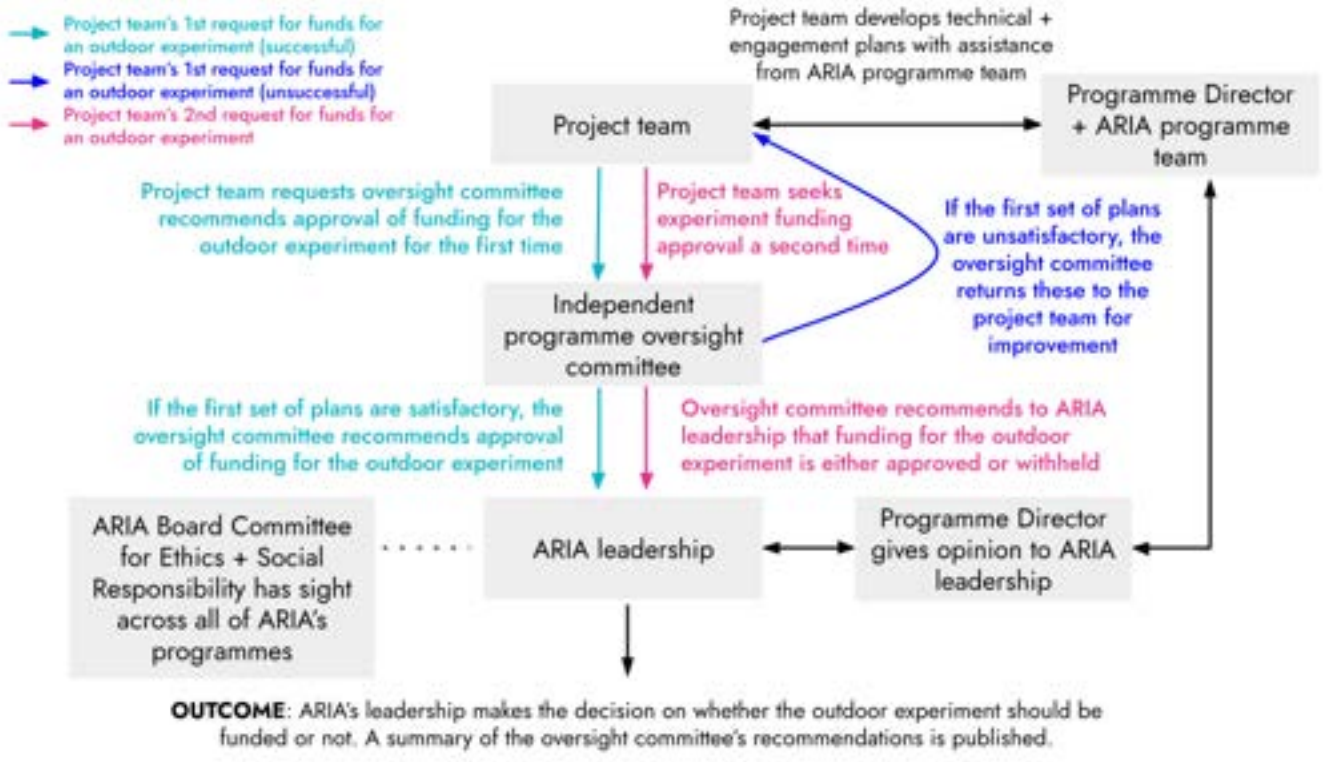


Figure 3: *The relationship of the oversight committee to ARIA's leadership, the ARIA board committee for ethics and social responsibility, the programme director, and to individual project teams, together with an overview of the process by which the oversight committee can insist on alterations to project teams' plans for outdoor experiments, and how subsequent decisions will be taken.*

At the outset of the outdoor experiment funding approval process, project teams will submit materials describing their plans and activities-to-date related to the outdoor experiment to the oversight committee, who will be able to scrutinise both the technical and non-technical aspects of these materials. The programme oversight committee will then make one of three recommendations to ARIA's leadership:

1. If the committee is thoroughly satisfied with the project team's plans and pre-experiment activities, then a recommendation will be made to ARIA's leadership that funding for the outdoor experiment (or series of linked experiments) should be approved (teal arrows in Figure 3).

2. If the committee is mostly satisfied with the project team's plans and pre-experiment activities, then a recommendation can be made to ARIA's leadership that funding for the outdoor experiment should be approved contingent on certain minor clarifications or amendments being made (teal arrows in Figure 3).
3. If the oversight committee is dissatisfied with the project team's plans and pre-experiment activities, then the oversight committee will have the power to refuse funding approval for any outdoor experiment (or series of linked experiments) on its own initiative at the first time of asking. Should this occur, the committee will be able to request alterations to a project team's plans and/or request that additional activities are performed prior to the start of an outdoor experiment (blue arrow in Figure 3). The project team will then be obliged to address these concerns and re-submit their updated materials to the oversight committee, with three outcomes then possible (pink arrows in Figure 3):
    a. The committee is now thoroughly satisfied, and recommends to ARIA's leadership that funding for the outdoor experiment is approved.
    b. The committee is now mostly satisfied, and recommends to ARIA's leadership that funding for the outdoor experiment can be approved contingent on certain minor clarifications or amendments being made.
    c. The committee remains dissatisfied, and recommends to ARIA's leadership that funding approval for the outdoor experiment is not granted.

The ultimate decision as to whether any individual outdoor experiment (or linked series of experiments) can be funded by ARIA therefore rests with ARIA's leadership. A summary of the committee's recommendations on any particular outdoor experiment (or linked series of experiments) will be made public on the ARIA website before the experiment takes place (in the cases where funding approval is ultimately granted), or at the end of the project in cases where funding approval is not granted. This summary will be prepared by the committee members, in consultation with the programme director.

When making recommendations as to whether any individual outdoor experiment (or linked series of experiments) can be funded by ARIA, the oversight committee will consider the following criteria:

- Is there sufficient scientific value in the proposed experiment and in the knowledge that could be gained by performing it to merit an outdoor experiment?
- Does the design of the experiment minimise risk sufficiently (e.g. to experimenters, the local environment and ecosystem, to property, etc)?

- Has sufficient meaningful engagement with the local community and key stakeholders taken place, and is there sufficient evidence of experimental co-design with these groups?
- Has there been sufficient consideration of the potential broader societal ramifications of the experiment?

Current membership of the oversight committee

The following international experts are the current members of the oversight committee. The committee is chaired by Piers Forster. While the current makeup of the committee provides expertise across a range of climate fields and geographies, ARIA and the oversight committee intend to add to the membership of this committee as the programme progresses and additional perspectives are needed.

As of September 2024, committee members are paid for their participation at a rate of £575/day. ARIA expects that participation will be ~1 day/month.

Committee Membership (April 2025)

Piers Forster (Chair)

Piers Forster is a highly cited atmospheric scientist with over 30 years of experience researching the causes and impacts of climate change, as well as mitigation and adaptation approaches and their connection to national and international climate policy. He was principal investigator for some of the first publicly funded research on geoengineering, the UK's Integrated Assessment of Geoengineering Proposals over 2010-2015.

Piers is a fellow of the American Geophysical Union and has played leading roles authoring Intergovernmental Panel on Climate Change (IPCC) reports, including its Special Report on 1.5°C and its latest

IPCC 6th Assessment Report. He has sat on the UK Government's Climate Change Committee since 2018 and has served as the Committee's Interim Chair since 2023.

He is founding Director of the Priestley Centre for Climate Futures and Professor of Physical Climate Change at the University of Leeds.

Declared conflicts of interest: The University of Leeds are recipients of funding from the ARIA call. Piers Forster was not involved in the proposals or funding decisions.

Jessica Seddon (Secretary)

Dr. Jessica Seddon's work on environmental governance focuses on how new sources of data can be leveraged to enable new (and more sustainable) ways of interacting with the environment around us. Her career spans academic, programme leadership, and strategic advisory roles in the U.S., India, and internationally, focused on institutional design for integrating science into policy and social initiatives. Dr. Seddon is currently Senior Fellow and Director of the Deitz Family Initiative on Environment and Global Affairs at the Yale Jackson School of Global Affairs and a co-founder of The Institutional Architecture Lab.

Jessica worked with the ARIA programme team on the initial design of the governance approach including formation of the Oversight Committee, on which she served as Interim Chair. As Secretary, Jessica works as a bridge between the ARIA programme team and the Oversight Committee to facilitate some of the operational aspects of the Committee's relationship with ARIA. This includes, inter-alia: conveying questions and agenda requests from the programme team to the Oversight Committee, consolidating and conveying advice from Oversight Committee to the programme team, and supporting the programme team on governance-related questions as they arise.

Declared conflicts of interest: none

Arunabha Ghosh (ordinary member)

Dr Arunabha Ghosh is an internationally recognised public policy expert, author, columnist, and institution builder. He is the founder-CEO of the Council on Energy, Environment and Water, and has led CEEW to the top ranks as one of Asia's leading policy research institutions and among the world's 20 best climate think-tanks. He played a formative role in creating the International Solar Alliance, and was a founding board member of the Clean Energy Access Network. Co-author/editor of four books and with experience in 54 countries, he previously worked at Princeton, Oxford, UNDP (New York), and WTO (Geneva). The Asia Society honoured him with the 2022 Asia Game Changer Award, for his and CEEW's "incredible work, which is making a real difference for India and for the planet".

Arunabha advises governments, industry, civil society, and international organisations around the world. In October 2024, the Government of India appointed him to the Commission for Air Quality Management. He currently co-chairs the World Economic Forum's Global Future Council on the Energy Nexus (and previously co-chaired the GFC on Clean Air). He served on the Government of India's G20 Finance Track Advisory Group and advised the Sherpa Track for India's G20 Presidency in 2022-23. In 2022, the UN Secretary-General appointed him to the High-level Expert Group on the Credibility and Accountability of Net-Zero Announcements by Non-State Actors. In 2020, the Government of India appointed him Co-Chair of the energy, environment and climate change track for India's Science, Technology and Innovation Policy (STIP2020).

Dr Ghosh has been a member of the UN Committee for Development Policy since 2019 (nominated by the UN Secretary-General; Vice-Chair 2023-25). He co-convened the Our Common Air Commission. He is a member of several international expert advisory groups: Global Commission on the Economics of Water; High-Level Group of Economists, constituted by the French president for the One Planet Lab; and the Senior Consultative Group for the Energy Transition Accelerator.

He writes monthly columns across various platforms. A frequent speaker, he has hosted or featured in several documentaries, and his 2019 TED Talk on air quality (Mission 80-80-80) has crossed 280,000 views. He was a World Economic Forum Young Global Leader. He holds a D.Phil. from Oxford.

Declared conflicts of interest: none

Nana Klutse (ordinary member)

Prof. Nana Ama Browne Klutse is a distinguished Ghanaian known for her expertise in climate modelling, climate change impacts, adaptation, and mitigation strategies, particularly in Africa. She has been involved in various high-profile research projects and has contributed significantly to global climate assessments, including her work with the Intergovernmental Panel on Climate Change (IPCC) as the Vice Chair of the Working Group I. She is a full professor, researcher and the Head of the Department of Physics at the University of Ghana. She focuses on climate variability, climate change modelling, Solar Radiation Management, and the impacts of climate change on society for her research and often addresses how climate change affects sectors such as agriculture, water resources, and health in Africa. Prof. Klutse has also been an advocate for integrating indigenous knowledge systems with scientific research to develop more comprehensive and context-specific climate adaptation and mitigation strategies. Her work aims to inform policy decisions and promote sustainable development in the face of climate change challenges. She has received various awards and recognitions for her contributions to climate science and her efforts to improve understanding and action on climate change in Africa.

Declared conflicts of interest: none

Jack Stilgoe (ordinary member)

Dr Jack Stilgoe is a professor in science and technology studies at University College London, where he researches the governance of emerging technologies. He is part of the UKRI Responsible AI leadership team (www.rai.ac.uk). He worked with EPSRC and ESRC to develop a framework for responsible innovation that is now being used by the Research Councils. Among other publications, he is the author of 'Who's Driving Innovation?' (2020, Palgrave) and 'Experiment Earth: Responsible innovation in geoengineering' (2015, Routledge). He is currently chairing an oversight committee for public dialogue on geoengineering research for the Natural Environment Research Council (NERC). He previously worked in science and technology policy at the Royal Society and the think tank Demos. He is a trustee of the Royal Institution.

Declared conflicts of interest: Jack is an employee of University College London, where one of his colleagues, Cian O'Donovan, is part of The Liminal Space, the consultancy that ARIA has contracted with to support teams funded by the Exploring Climate Cooling programme in developing their public engagement plans. He recused himself from advising ARIA on The Liminal Space's proposal.

Shuchi Talati (ordinary member)

Dr. Shuchi Talati is a climate technology governance expert and founder of The Alliance for Just Deliberation on Solar Geoengineering (DSG). DSG is a nonprofit organisation working towards just and inclusive deliberation about research and potential use of solar geoengineering. She is a contributing author to the American Geophysical Union's Ethical Framework for Climate Intervention Research, Experimentation, and Deployment. Dr. Talati was the

co-chair of the Independent Advisory Committee to oversee SCoPEx, an effort to provide oversight for the proposed solar geoengineering experiment by Harvard University. She most recently served as a Presidential Appointee in the Biden-Harris Administration at the U.S. Department of Energy where she focused on creating just and sustainable frameworks for carbon dioxide removal. Dr. Talati has previously held roles in academia and civil society advising on policy and governance for emerging climate technologies, including as a Visiting Scholar at the Kleinman Center for Energy Policy at the University of Pennsylvania, an AAAS/AIP Congressional Science Fellow in the U.S. Senate and the Fellow on geoengineering research governance and public engagement at the Union of Concerned Scientists. Dr. Talati has a BS in environmental engineering from Northwestern University, an MA in climate and society from Columbia University, and PhD from Carnegie Mellon in engineering and public policy.

Declared conflicts of interest: A member of The Alliance for Just Deliberation on Solar Geoengineering is part of the team for the project entitled "Evidence-based Assessments to Guide Perceptions, Governance, and Ethical Frameworks for South Asia," providing support on policy analysis, ethical framing and stakeholder engagement. Shuchi Talati was not involved in the review of the project proposal and will not be involved in oversight of this component of the project.

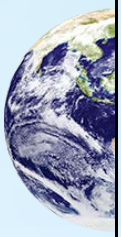
Jan McDonald (ordinary member)

Jan McDonald is Professor of Environmental and Climate Law at the University of Tasmania, Australia. Jan's research explores the legal frameworks required to responsibly govern the research, development and deployment of both solar radiation management and marine carbon dioxide removal technologies. Jan has previously worked for the United Nations Development

Program in the Pacific and consulted on a range of projects to local, state and national governments in Australia, Vanuatu and the Solomon Islands. She is a Fellow of the Australian Academy of Law and co-founder of the Australian Forum for Climate Intervention Governance.

Declared conflicts of interest: none

Annex 5: Exploring Climate Cooling - Funded projects



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Projects will utilise a range of methodologies, including modelling, observations and monitoring, indoor testing and – where strictly necessary and in accordance with our oversight and governance principles – small scale, controlled outdoor experiments.

The programme will also fund projects exploring the broader societal aspects of this scientific research, including methods for public engagement, public attitudes to the field, and governance.

This research explores the crucial governance and ethical dimensions that must accompany any scientific investigation of climate cooling approaches. It includes work on potential governance frameworks, the development of engagement toolkits with Arctic and UK communities, understanding public perceptions in South Asia and the Philippines, and building research capacity across the Global South – all help ensure that this research field evolves inclusively and responsibly.

Strategic Foresight on Climate and Geopolitics: Toward governance of earth cooling approaches

Project Lead: Matthias Honegger, Centre for Future Generations

Award: £1.25 million over 17 months

Key team members and approximate budget breakdown: Matthias Honegger, Cynthia Scharf, Centre for Future Generations (£420k) | Trish Lavery, Australian National University Futures Hub (£150k) | Rafal Kierzenkowski, The Organisation for Economic Co-operation and Development (OECD) (£220k) | Danielle Young, University of Leeds (£460k)

Understanding if and how earth cooling approaches could be responsibly governed is critical in light of accelerating climate impacts and the risk of unwise use. This team will explore how these approaches could be responsibly governed at the global level in various future scenarios. They will start by outlining scenarios variously shaped by growing climate impacts, geopolitical challenges, the need for ongoing mitigation efforts, and the public's views. Their research will survey existing debates in both academic and policy circles, and discuss with policy makers and civil society organisations the risks, benefits and uncertainties they expect. Based on these scenarios, the project aims to develop foundational governance ideas to help ensure future decisions are socially and scientifically informed.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

How to speak about climate cooling? Co-creating an engagement toolkit in the Arctic and the UK

Award: £360k over 45 months

Emerging climate cooling technologies [illegible] and [illegible] meaningful dialogues are therefore a prerequisite for ensuring that research, [illegible] these approaches will be just and inclusive. This is especially true in the Arctic, a region where the voices of people who will be amongst the most impacted are often left out of conversations because of ongoing and historical power imbalances. This team will explore how people want to speak about climate cooling, and how they form and change their views over time. It will move beyond social opinion research by co-designing engagement programmes with local communities and rightsholders across the Arctic and in three UK locations. Beyond the aim of empowering communities to participate more fully in governance, research, and decision-making around these new scientific approaches for cooling the earth, the learnings from these engagements will be captured in a practical, open access toolkit that can be used for future engagement projects around climate cooling.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Evidence-based Assessments to Guide Perceptions, Governance, and Ethical Frameworks for South Asia: Comparing marine cloud brightening strategies vis-à-vis carbon dioxide removal and mitigation efforts

Project Lead: Athar Hussain, COMSATS University

Award: £574k over 3 years

Key team members and approximate budget breakdown: Athar Hussain, COMSATS University (£532k) | Thomas Fischer, University of Liverpool (£5k) | Sajida Kousar, International Islamic University (£8k) | Hassaan Sipra, The Alliance for Just Deliberation on Solar Geoengineering (£9k) | Muhammad Mumtaz, Fatima Jinnah Women University (£20k)

This project provides a comparative analysis of potential climate response pathways – evaluating the implications in South Asia of marine cloud brightening (MCB) against carbon dioxide removal efforts and conventional mitigation approaches. This analysis combines climate science, governance research, direct stakeholder engagement, and policy analysis, deepening our understanding of potential climate cooling technologies within the ethical, governance and social context of South Asia. This work will empower decisionmakers and communities in South Asia to develop inclusive, effective, and locally-grounded climate action strategies.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

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activity in the Philippine context

Project Lead: Lorena Sabino, University of the Philippines Los Baños, College of Forestry and Natural Resources

Award: £148k over 2 years

Key team members and approximate budget breakdown: Lorena Sabino, University of the Philippines Los Baños, College of Forestry and Natural Resources (UPLB-CFNR)

Communities in the Philippines living near volcanoes possess invaluable, real-world experience with atmospheric changes that share similar atmospheric processes to potential climate interventions like stratospheric aerosol injection (SAI). This project centers their unique perspectives, exploring the understanding, ethical viewpoints, and governance concerns surrounding such technologies directly within these communities through focused research. Gathering these insights is crucial for grounding abstract global discussions about SAI in lived reality, and ensuring that the voices of those most vulnerable to both climate change and potential interventions are central to the conversation. This work will help develop ethical, inclusive governance frameworks and foster informed climate leadership in the most affected regions.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Ethics and Governance of Earth Cooling Research: From concepts to implementation

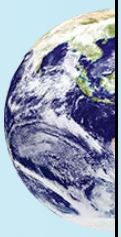
Project Lead: Ignacio Mastroleo, National Scientific and Technical Research Council (CONICET)

Award: £453k over 2 years

Key team members: Ignacio Mastroleo, Timothy Daly, María Inés Carabajal, National Scientific and Technical Research Council (CONICET) + Inter-American Institute for Global Change Research (IAI)

Researching potential Earth cooling approaches raises profound ethical and societal questions that require careful consideration and robust governance frameworks, especially ensuring diverse global perspectives are included. This project focuses on building research capacity and developing ethical frameworks, particularly within the Global South. This project will build a Latin America/Caribbean-UK research network that will address fundamental questions regarding the governance of these approaches, as well as nurturing a new community of experts in the region. The work will explore societal implications, ethics frameworks for managing trade-offs and the breadth of opinions, co-production of knowledge and regional governance, particularly in the Latin America/Caribbean context.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.



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The programme will also fund projects exploring the broader societal aspects of this scientific research, including methods for public engagement, public attitudes to the field, and governance.

Leveraging advanced computer simulations and theoretical models, these projects will investigate the potential effects of various climate cooling approaches on global and regional climate systems, including sensitive areas like the Arctic and monsoon regions. This foundational research is crucial for improving our understanding of the feasibility and potential risks associated with these approaches.

GRID-CC: Global to Regional Impacts Downscaling for Climate Cooling

Project Lead: Andy Parker, The Degrees Initiative

Award: £2m over 3 years

Key team members and approximate budget breakdown: Andy Parker, The Degrees Initiative (£940k) | Babatunde Abiodun, Christopher Lennard, University of Cape Town (£770k) | Daniele Visioni, Cornell University (£290k)

Understanding the potential regional implications of earth cooling approaches is crucial, particularly for communities in the Global South which may be disproportionately affected. Yet, research capacity is often concentrated elsewhere. This project directly addresses this capacity gap by empowering researchers in the Global South. Through computational work, this project will build an open-access repository of detailed Global South climate data that will enable researchers to develop more accurate modelling of the global and regional impacts of these approaches. This project will create new research tools and hold expert convenings to help ensure that researchers in these regions have the evidence base to support scientifically-robust decision-making surrounding potential Earth cooling strategies.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Ecological Impact Assessment of Earth Cooling Experiments in the Arctic (Eco-ICE)

Project Lead: Amanda Burson, British Antarctic Survey

Award: £4.9 million over 4 years

Key team members and approximate budget breakdown: Amanda Burson, Jeremy Wilkinson, Louise Sime, Kate Hendry, Rhiannon Jones, Clara Manno, Florence Atherden, Rachel Cavanagh, Simeon Hill, British

Fragile polar ecosystems are critical to the global clim… …tial ecological consequences of cli… …ention… …ders… …ents and computer modelling, this project will provide an independent im… …tial climate interventions in the Arctic marine environment. The team will develop physical, climate and ecosystem models with direct input from bespoke biogeochemical and biological laboratory experimentation. This independent assessment by experts in modelling and ecology is critical to provide a thorough and balanced evaluation of potential climate interventions in the Arctic. The project will provide best-practice guidance for the ecological risk assessment of future proposed interventions within the polar marine environment.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Investigating the Impacts of Earth Cooling Approaches on the Variability and Wet-Dry Spell Dynamics of the West African Monsoon

Project Lead: Amadou Coulibaly, Institut Polytechnique Rural de Formation et de Recherche Appliquée (IPR-IFRA)

Award: £257k over 3 years

Key team members and approximate budget breakdown: Amadou Coulibaly, Abdoulaye Ballo, Institut Polytechnique Rural de Formation et de Recherche Appliquée (IPR/IFRA) | Sabina Abba Omar, University of Cape Town (at no cost to the project)

The West African Monsoon is a vital climate system supporting agriculture and water resources for millions. Understanding how potential earth cooling approaches might affect this sensitive system is crucial for regional stability and food security. This research directly addresses this need by exploring potential impacts on critical rainfall patterns, including wet and dry spells. Using advanced climate models, observational data, and scenarios from established model intercomparison platforms (such as GeoMIP), the study aims to address critical gaps in understanding how earth cooling approaches might influence regional climate systems and how they might interact with existing climate vulnerabilities. The project will provide actionable insights, helping the region understand how these approaches might mitigate adverse climate impacts while avoiding unintended consequences.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Space Reflector Baseline Survey

Project Lead: Morgan Goodwin, Planetary Sunshade Foundation

Award: £400k over 14 months

(NASA Jet Propulsion Laboratory, California Institute of Technology to the project)

To make informed choices about potential climate cooling strategies, society needs a clear understanding of possible options, including less-studied approaches like space-based reflectors. This theoretical study brings together leading space engineering teams with expert climate modellers to address a critical knowledge gap. This team will model six different conceptual designs for space reflector approaches and then use climate models to simulate their potential climate impacts (including atmospheric dynamics, chemistry, and ocean/ice feedbacks). The goal is not to deploy this technology, but to provide an initial assessment of which concepts might warrant further study based on their modelled efficiency, scalability, and potential side effects, fostering collaboration between the space engineering and climate modelling communities.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

An assessment of the feasibility of a space-based solar reflector

Project Lead: Colin McInnes, University of Glasgow

Award: £342k over 1 year

Key team members and approximate budget breakdown: Colin McInnes, Matteo Ceriotti, University of Glasgow (£161k) | Onur Çelik, Delft University of Technology (£156k) | Derek Bennet, AAC Clyde Space (£25k)

Highly speculative technologies like space-based solar reflectors require careful, early-stage assessment. This team is exploring the technical feasibility of space-based approaches to cooling the earth. This project is a desk-based study exploring the initial engineering steps and challenges involved in a hypothetical small-scale space mission to test the feasibility of a space-based sunlight reflector. This purely conceptual work is aimed at understanding the requirements for such a mission. Its purpose is to inform whether, and how, further research into this specific Earth cooling approach might proceed, ensuring resources are directed effectively based on sound engineering principles.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Towards Robust and Unbiased validation of SAI Simulations (TRUSS)

Project Lead: Heri Kuswanto, Institut Teknologi Sepuluh Nopember, Indonesia

Award: £345k over 3 years

outputs, this project looks to ensure that impact predictions, especially crucial regional assessments, are robust and unbiased. This foundational modelling work is vital for building confidence in the science and enabling genuinely informed decision-making by policymakers and the public.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Simulating the effects of earth cooling approaches on the Dynamics and Thermodynamics of Monsoon and Precipitation Extremes

Project Lead: Byju Pookkandy, The Energy and Resources Institute

Award: £140k over 2 years

Key team members: Byju Pookkandy, Kaagita Venkatramana, The Energy and Resources Institute (TERI)

Stable and predictable rainfall is fundamental to societies in both India and the UK, underpinning agriculture, water security, and protecting communities from floods and droughts. This research provides essential foresight into how proposals for earth cooling could potentially disrupt these vital precipitation patterns – affecting everything from the timing of seasonal rains in India to the intensity of precipitation extremes. By analysing detailed climate simulations from established model intercomparison platforms (such as GeoMIP) specifically designed for earth cooling scenarios, the study will pinpoint why these changes might occur, disentangling the complex factors driving rainfall. This computational analysis will deliver crucial, regionally-specific evidence to help evaluate the potential risks these approaches may pose to indispensable water cycles and resources.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Defining the minimum scale of an SAI test: A fundamental first step towards an outdoor experiment

Project Lead: Doug MacMartin

Award: £445k over 2 years

Key team members: Doug MacMartin, Daniele Visioni, Cornell University

these predictions. This project addresses this critical l heoretical modelling and analysis, as it aims to determine the minimum scale fo erimental that could provide the real-world data needed to substantially reduce this uncertainty. Identifying this minimum threshold is essential foundational work. It paves the way for designing any future research in the most responsible, efficient, and low-impact manner possible. Understanding this scale is also crucial for proactively developing the appropriate governance and oversight frameworks that would be necessary before any such small-scale atmospheric research were to take place.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Previous funding calls in this programme

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Exploring Climate Cooling | Proposals

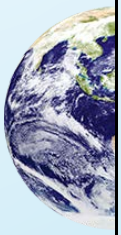
Oversight + Governance

Meet the Oversight Committee and understand how we ensure rigorous governance across the programme

Learn more

FAQs

Check out the most frequently asked questions around this programme



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These projects focus on gathering crucial real-world data about existing atmospheric processes, such as how soot affects clouds and how particles released in volcanic eruptions behave in the atmosphere. The goal is to enhance our ability to study the climate safely and effectively, and to ensure that we have the tools to understand both natural phenomena and the potential impacts that climate cooling approaches might have.

De-risking cirrus modification

Project Lead: Sebastian Eastham, Imperial College London

Award: £3.6m over 36 months

Key team members and approximate budget breakdown: Sebastian Eastham, Marc Stettler, Ed Gryspeerdt, Imperial College London (£740k) | Benjamin Murray, University of Leeds (£1.4m) | Blaž Gasparini, University of Vienna (£310k) | Takemasa Miyoshi, RIKEN (£270k)

High-altitude cirrus clouds have an overall warming effect on our climate, but how their formation is influenced by existing atmospheric particles (like dust or soot) remains a significant uncertainty in climate science. Improving our understanding of these natural processes is crucial for refining climate models and for establishing the knowledge needed to assess the potential risks and benefits of any future proposals to deliberately modify cirrus clouds. This project aims to gather vital real-world data on these natural cirrus cloud processes and how they are already being affected by the presence of aircraft engine soot.

The team will use a combination of computer modelling and analysis of existing satellite data. They will also conduct observational flights using research aircraft to directly measure how particles already present in the atmosphere, and the additional effects of aircraft engine soot, currently affect cirrus cloud properties. By observing and measuring these existing atmospheric processes, the team are looking to improve our fundamental understanding of cirrus cloud formation, providing essential baseline knowledge to help us understand if deliberately thinning cirrus clouds could ever offer a safe, predictable mechanism for cooling.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Ice-Nucleating Particles in the Upper Troposphere: Advancing Cirrus Control and Experimental Science Strength "INPUT:ACCESS"

Project lead: Thomas Whale, University of Leeds

Alexandre Baron, Cooperative Institute for Research in [illegible] (CIRES), University of Colorado Boulder (USA) | Joshua Schwarz, [illegible] (NOAA) Chemical Sciences Laboratory (at no cost to the project) | Sebastian Eastham, Imperial College London (£63k)

Cirrus clouds have a significant impact on Earth's temperature, yet prediction and modelling of their formation is challenging and constitutes a key uncertainty in climate models and projections. Lack of knowledge of the concentration and nature of the tiny particles suspended in the atmosphere on which cirrus clouds form, known as ice nucleating particles (INPs), is a major contributor to this uncertainty. This project aims to address this knowledge gap by developing new methods to observe and analyse these naturally occurring INPs high in the atmosphere.

Operating out of Colorado, USA, the team will develop and operate a specialised balloon-borne collector designed to gather naturally present INPs from the upper troposphere where cirrus clouds form. These collected samples will then be brought back for detailed laboratory analysis in the UK. This focused monitoring and observation work will generate critical information about the types and concentrations of particles involved in natural cirrus formation. This data is essential for improving the accuracy of climate projections and enhancing our ability to monitor natural atmospheric processes, providing a crucial baseline for climate science.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

StratoGuard - Global Monitoring of Climate Engineering using Micro High-Altitude Balloons

Project lead: Steve Tate, Voltitude

Award: £600k over 33 months

Key team members and approximate budget breakdown: Steve Tate, Richard Nash, Paul Stevens, Voltitude Ltd (£575k) | Chris Stopford, University of Hertfordshire (£25k)

Improving our ability to monitor the Earth's climate, particularly in remote regions, and developing the tools needed to safely observe and measure potential future climate interventions are crucial needs for both climate science and the responsible assessment of climate cooling approaches.

Project StratoGuard focuses on creating low-cost, lightweight micro-balloons (under 4kg, <5m diameter) equipped with sensors, capable of navigating the stratosphere above 55,000 feet for up to 30 days. This capability would support affordable, detailed, and sustained climate data collection across the globe. It would also enhance the capability for sophisticated and cost-effective monitoring of any future outdoor climate intervention activities. With test launches planned from 2026 and potential global launch capabilities (subject to local approvals), this project seeks to miniaturise core technologies for global sensing using small, safe balloons, operating in full compliance with existing regulatory frameworks. The overarching goal is to provide a vital new tool for comprehensive climate observation, as well as providing a monitoring capability essential for responsible research and assessment of potential climate interventions.

Monitoring Aerosol Climate Engineering (MACE)

Project lead: Matt Watson, University of Bristol

Award: £4.3m over 48 months

Key team members: Matt Watson, Arthur Richards, Tom Richardson, University of Bristol

Natural events, particularly volcanic eruptions, release tiny particles (aerosols) into the atmosphere and offer invaluable real-world opportunities to study processes relevant to climate science and potential climate interventions, such as how aerosols affect clouds and the Earth's energy balance. However, safely and rapidly collecting data from these events is challenging. This project aims to address this by developing advanced, automated drone technology specifically designed for observing and analysing emissions from active volcanoes.

The team will design, build, and test lightweight, easily operationalised drones capable of flying safely at high altitudes (10 km). Following initial test flights in the first year, the plan is to use the drones to study emissions from selected, regularly erupting volcanoes – Volcán de Fuego (Guatemala), Soufrière Hills (Montserrat), and Lascar (Chile). The team have flown in all three countries in the past under suitable permits. By analysing these natural volcanic emissions in situ, the research will investigate how tiny cloud droplets form and how natural aerosol layers affect radiation. A key goal is to develop a rapid-response capability using these drones, enabling the scientific community to safely gather crucial data from future significant volcanic eruptions, thereby improving our understanding of natural climate processes.

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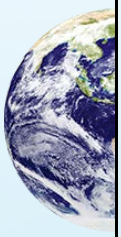

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The programme will also fund projects exploring the broader societal aspects of this scientific research, including methods for public engagement, public attitudes to the field, and governance.

In cases where essential scientific questions cannot be answered by modelling or indoor experiments alone, these five projects will undertake carefully controlled outdoor experiments, allowing crucial real-world data to be gathered responsibly. These experiments will only proceed if ARIA's stringent governance requirements are met in full. An environmental impact assessment will be performed and made publicly available before any experiment starts, and experiments will have to be developed through engagement with local communities. All funded experiments will be time-bound and limited in size, scale so their effects dissipate within 24 hours or are fully reversible.

Re-Thickening Arctic Sea Ice (RASi)

Project Lead: Shaun Fitzgerald, Centre for Climate Repair

Award: £9.9m over 42 months

Key team members and approximate budget breakdown: Shaun Fitzgerald, University of Cambridge (£1.4m) | Geoff Evatt, University of Manchester (£0.63m) | Michel Tsamados, University College London (£0.63m) | Einar Ólason, Nansen Environmental and Remote Sensing Center (£0.4m) | Andrea Ceccolini, Real Ice (£3.5m) | Fonger Ypma, Arctic Reflections (£3.3m) | Edward Blanchard, University of Washington (£90k) | Steven Desch, Arizona State University (~£10k travel costs funded from Real Ice's share)

The Arctic is warming much faster than the global average, leading to dangerous sea ice loss with far-reaching consequences. This project investigates whether deliberately thickening sea ice during winter could be a viable way to slow summer melt, reduce Arctic warming, and mitigate further ice loss. The research aims to provide critical data on the feasibility, scalability, potential ecological impacts, and overall effectiveness of this approach, which involves accelerating natural freezing processes using seawater from underneath the ice.

Researchers will conduct controlled, small-scale experiments in Canada across three winter seasons (2025-26 to 2027-28). The process involves pumping seawater from beneath existing ice and spreading it on top, where the frigid air freezes it quickly, creating thicker ice patches. Over the course of the project (and if the early experiments suggest the approach is ecologically sound), later experiments will aim to cover areas up to 1 km^2 per experiment site. The key questions are whether this thicker ice lasts longer into the summer, how it might affect ice movement, and what the local ecological impacts are. These experiments will be conducted in close collaboration with local communities and under ARIA's stringent governance framework, prioritising safety and environmental monitoring. The goal is to gather essential real-world data to rigorously assess if this intervention warrants further consideration.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Project lead: Daniel Harrison, Southern Cross University

Award: £1m (potentially rising to £5m with matched funding) over 5 years, contingent upon security an additional £10m of funding from other sources

Key team members: Southern Cross University | Commonwealth Science and Industrial Research Organisation | University of New South Wales | Freie Universität Berlin | Queensland University of Technology | Shaun Fitzgerald, University of Cambridge (contributing and funded via the REFLECT project)

This project investigates Marine Cloud Brightening (MCB), a potential way to cool specific areas by enhancing cloud reflectivity using a spray of seawater. Building on their experience conducting previous small-scale outdoor experiments in partnership with local communities around the Great Barrier Reef, Australia, this team seeks to deepen our understanding of MCB. While the concept could potentially protect vulnerable ecosystems like coral reefs from heat stress, its real-world effectiveness remains uncertain. This research aims to address this critical knowledge gap by investigating the complex atmospheric dynamics and microphysical processes involved, moving beyond basic principles to assess if, and how, MCB could work safely and effectively.

The research combines advanced computer modelling with the development and indoor testing of sea salt sprayers. If these findings suggest promise, and subject to meeting ARIA's governance requirements, the project plans to conduct small-scale, controlled outdoor experiments over the Great Barrier Reef in years 3 and 4 of the 5-year project. These outdoor experiments are strictly contingent on prior results, rigorous independent safety reviews, regulatory approvals, and continued co-design and partnership with Traditional Owner groups, local stakeholders, and the broader community of the Great Barrier Reef Marine Park. If approved, these controlled experiments could involve brightening clouds within areas up to 10 km × 10 km, with seawater spraying taking place over 5-6 weeks, for 6 to 8 hours per day. All activities will fully adhere to ARIA's robust governance framework, emphasising transparency, environmental risk minimisation by design, and community engagement. The overall goal is to generate crucial real-world data to determine the effectiveness and risks of MCB, and its potential for protecting vulnerable ecosystems at a regional scale.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

A REsponsible innovation Framework for assessing noveL spray tEChnology research To examine local albedo changes from marine brightening and its multi-scale impacts (REFLECT)

Project Lead: Hugh Coe, University of Manchester

Award: £6.1m over 3 years (initial phase)

(£22k) | Sami Romakkaniemi, Finnish Meteorological I
*Finnish Meteorological Institute are contributing to th this proposal and are not involved in any outdoor experimentation

Marine Cloud Brightening (MCB) and Marine Sky Brightening (MSB) – ideas for cooling the Earth by increasing the reflectivity of clouds or the sky using tiny droplets of seawater – depend critically on having the right technology to generate sprays of these droplets effectively. However, the technical feasibility and optimal methods for doing so are poorly understood. This project aims to address this gap by developing and responsibly testing the necessary spray technologies to determine if these approaches could be viable.

Over an initial three-year period, the team will undertake computer modelling, build bespoke sprayers based on the modelling results, and conduct indoor tests. A crucial part of this phase involves beginning collaborative engagement with local communities to co-design potential future outdoor experiments. Any small-scale, controlled outdoor experiments to test sprayer performance would only occur after this initial phase, contingent on further funding, successful co-design demonstrating community engagement and support, and strict adherence to ARIA's safety and governance protocols. These potential tests are expected to be undertaken in the UK (location to be determined). Initial tests, if approved, would be very limited, lasting only a few seconds and creating small plumes of seawater spray just a few hundred metres in size. Only if these initial tests prove successful and safe might later experiments explore brightening larger cloud areas, potentially up to 10 km long and a few hundred metres wide. These tests are inherently benign, replicating natural processes that generate sea spray over the ocean developing spray systems such as those that are already employed to cool crowds with fine mists of water and dampen construction sites to suppress pollution. The overall goal is to establish a robust and responsible experimental framework to assess the technical feasibility and optimal methods for MCB and MSB.

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

BrightSpark – Cloud brightening with electric charge

Project Lead: Giles Harrison, University of Reading

Award: £2m over 36 months

Key team members and approximate budget breakdown: Giles Harrison, Maarten Ambaum, Keri Nicoll, University of Reading (£1.75m) | John Mooney, Menapia Ltd (£170k)

Finding ways to influence cloud reflectivity is a key research challenge. This project investigates using controlled electric charge, a natural atmospheric phenomenon, to influence water droplets in fogs and clouds as an alternative to spraying seawater. The research aims to determine if carefully managed electrical charges could offer a safe and effective method for enhancing cloud reflectivity.

The team will investigate the fundamental science of how artificial charge release affects cloud and fog droplets. The project includes plans for very small-scale (on the order of 100 m × 100 m), controlled outdoor experiments in the UK during the third year of the project. These experiments are strictly conditional on

Natural Materials for Stratospheric Aerosol Injection

Project Lead: Hugh Hunt, University of Cambridge

Award: £5.5m over 36 months

Key team members and approximate budget breakdown: Hugh Hunt, University of Cambridge (£2.5m) | Frank Keutsch, Harvard University (£2.5m) | Sebastian Eastham, Imperial College London (£0.54m)

Stratospheric Aerosol Injection (SAI) is a widely discussed potential climate cooling method, but the most commonly proposed materials (sulfates) carry significant hazards in this context, including potential ozone depletion and toxicity. Addressing whether safer, alternative materials could ever be feasible or effective for SAI is therefore a critical, unanswered scientific question. This project will undertake fundamental research to investigate the properties and behaviour of innovative, non-toxic, non-sulfate materials in a very controlled manner.

The research combines laboratory studies and computational modelling with unique and contained material exposure experiments. In these experiments, tiny (milligram) amounts of materials that occur in natural mineral dust (such as limestone, dolomite, or corundum) will be secured onto supports inside the gondolas of specially adapted weather balloons. These balloons are likely to be launched from sites in the USA and/or the UK; the specific site will be determined in line with ARIA's requirements for community engagement. The balloons will carry the samples into the stratosphere for exposure periods ranging from hours to weeks before performing controlled descent for recovery. **Crucially, no materials will be released into the stratosphere**; this approach effectively brings the stratosphere to the samples. Studying the recovered samples will reveal how stratospheric conditions affect their properties over time. This foundational science is essential to advance understanding of the potential impacts of SAI and for determining if less harmful alternatives to sulfates might exist (and if they might warrant further study in the context of SAI).

View the full grant agreement for this project, which outlines its objectives, milestones, and deliverables here.

Previous funding calls in this programme

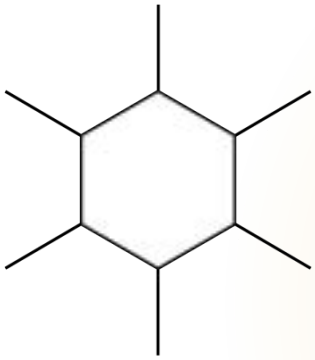
The projects we are funding have been selected from teams and individuals who applied to our previous funding calls for this programme. You can read more about these calls below.

Annex 6: ARIA - How we work

How we work

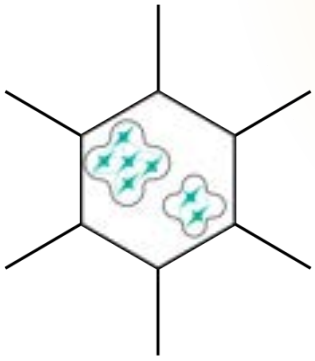
We seek out exceptional scientists and engineers with the curiosity to explore uncharted territory, then empower them with the resources and autonomy to turn their ideas into reality.

Our research model



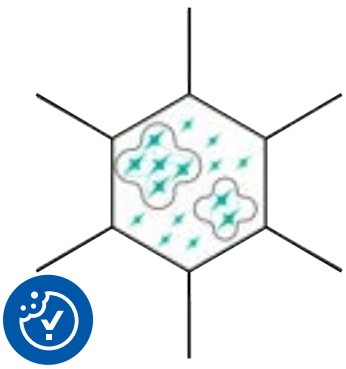
Opportunity spaces

Opportunity spaces are areas we believe is likely to yield breakthroughs. An ARIA opportunity space must be highly consequential for society, under-explored relative to its potential impact, and ripe for new talent, perspectives, or resources to change what's possible.



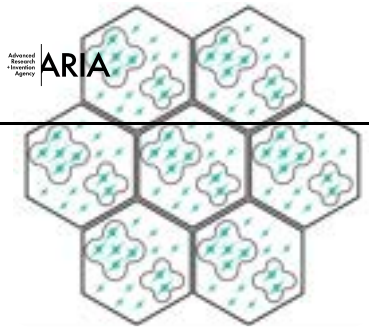
Programmes

Within opportunity spaces, we build multi-year R&D programmes designed to advance complex, large-scale ideas that require coordinated investment and management across disciplines and institutions.



Opportunity seeds

Outside of programmes, we award seed funding to individuals or teams pursuing research aligned with their opportunity space. With smaller budgets and less structure than programmes, seeds support researchers to uncover new pathways that might otherwise fall through the cracks.



Activation Partners

Activation Partners inject entrepreneurial talent, capital, and ideas to help propel our research – and the UK – to impact.

What our Programme Directors do

Our Programme Directors are tasked with defining opportunity spaces, building programmes and allocating funding within those spaces.

Learn more

We fund differently to change what's possible.

We do our best to maximise the chance of breakthroughs by aligning the research we fund with viable paths to deployment and minimising barriers to scale. This means:

- We fund the best ideas and talent, across professional backgrounds, types of organisations and geographies
- We do not retain IP rights to the work we fund
- We generally do not require match funding
- We do not take any equity ourselves and place a cap on the equity that organisations we fund can hold in spinouts commercialising ARIA-funded IP
- We take an active role in managing projects and foster connectivity between them

at is an ARIA Creator?

ARIA funds and supports research teams, known as Creators, to achieve breakthroughs. They could be anyone, from individuals doing their own research and PhD students at a university, to startups and large organisations. You can meet the Creators we're funding on our opportunity seed and programme pages.

“Our funding terms are designed to encourage inventor-led start-ups and provide a stimulus for science entrepreneurship in the UK.”

Antonia Jenkinson

Chief Financial and Operations Officer

Funding opportunities

Learn more about how we fund and explore our current and past funding opportunities.