

UK Department for Environment, Food and Rural Affairs

Response to CBD Notification 203-102 - Follow-up to decisions X/33 and XI/20 in relation to climate-related geoengineering

Further to CBD notification 203-102 *Follow-up to decisions X/33 and XI/20 in relation to climate related geoengineering*, the United Kingdom replies with information as follows:

- A. The regulatory framework for geoengineering proposals in the UK;
- B. Actions taken by the UK Government relevant to geoengineering;
- C. Supplementary information provided by Research Councils UK, including a list of recent and current UK research projects that are contributing to the understanding of climate related geoengineering.

A. The Regulatory Framework for Geoengineering Proposals in the UK

Within the UK there are several regimes regulating activities which may have potential effects on the environment. For example projects involving construction and other operations in, on, over or under land require planning permission. Activities such as the deposit of a substance/object in the sea or on/under the seabed within the UK marine licensing area (or from a British vessel beyond that area) would generally require a marine licence.

Projects likely to have a significant effect on the environment may require assessment, pursuant to European Council Directive 2011/92/EU, known as the Environmental Impact Assessment Directive, for individual projects; or European Council Directive 2001/42/EC known as the Strategic Environmental Assessment Directive for public plans or programmes. Environmental assessment ensures that the environmental implications of projects or programmes are taken into account before permitting decisions are made. Consultation with the public is a key feature of environmental assessment procedures.

The UK follows international instruments to which it is a Contracting Party and their recommendations and/or guidance as regards climate related geoengineering, specifically the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972, (as regards activities in the marine environment within the scope of the Protocol) and the Convention on Biological Diversity. The obligations and commitments under these instruments would form part of the policy framework within which regulatory and funding decisions would be taken.

B. Actions Taken by the UK Government Relevant to Geoengineering

In 2010, the UK House of Commons Science and Technology Select Committee published its report into the national and international regulation of geo-engineering in coordination with a parallel inquiry by the US House of Representatives Science and Technology Committee. The Select Committee report

<http://www.publications.parliament.uk/pa/cm200910/cmselect/cmsctech/221/221.pdf>

concluded there are three reasons why regulation of geoengineering is needed:

1. In the future some geoengineering techniques may allow a single country unilaterally to affect the climate.
2. Some, albeit very small scale, geoengineering testing is already underway.

3. Geoengineering may be needed as a “Plan B” if, in the event of the failure of “Plan A”, the reduction of greenhouse gases, resulting in highly disruptive climate change. Therefore the technological, environmental, political and regulatory issues need to be explored fully.

The Committee envisaged the United Nations being the route by which the regulatory framework would operate.

The UK Government response to the Select Committee’s report concluded that the Government’s priority is and must be to tackle climate change at source by reducing emissions of greenhouse gases from human activities and to push for strong concerted international action. Whilst recognising, however, that geoengineering might have a possible role to play in aiding our mitigation efforts in the future, significant international effort from a wide range of disciplines will be required to improve understanding of the scientific, technological, societal and legal implications of both geoengineering research and deployment.

It also concluded that there is a need for international regulation to ensure that any geoengineering research and deployment activities are pursued responsibly, in particular for those technologies that have trans-boundary implications.

<http://www.official-documents.gov.uk/document/cm79/7936/7936.pdf>.

A UK cross Government meeting with UK experts, jointly organised by the UK Department for Energy and Climate Change and Oxford University, was held in March 2011 to discuss the science, governance and technology issues relating to geo-engineering research and deployment, and ensure a common understanding of these issues across the UK Government.

In September 2012, the UK Government published a statement of its view of geoengineering research: That based on the evidence currently available, it is premature to consider geoengineering as a viable option for addressing climate change, and that mitigation of climate change, by reducing emissions and protecting natural carbon sinks, remains the surest way of increasing our chances of avoiding dangerous climate change in the future.

The UK statement went on to say that the international regulation of geoengineering is currently inadequate. A specific international legal instrument to regulate geo-engineering is not currently available, and work is underway to examine how existing instruments could be used. Therefore the UK Government has supported the Convention on Biological Diversity (CBD) in their review of existing regulatory instruments, and has contributed to work under the London Protocol on the prevention of marine pollution by dumping of wastes and other matter to regulate ocean fertilisation research and develop a framework to assess its potential impacts on the marine environment.

However, the statement acknowledges that a thorough understanding, including knowledge of the risks and benefits of geoengineering techniques will be needed should it be necessary to deploy geoengineering techniques in the future; and that this understanding can only be developed through relevant, careful and responsible multi-disciplinary research. Research and ongoing dialogue with the public and other key stakeholders, is vital to inform future policy and decision-making. The conduct of research does not imply an intention to deploy geo-engineering.

https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/120688/Government_view_on_geo-engineering_research.pdf

In October 2013 the Contracting Parties to the London Protocol adopted Resolution LP.4(8) on the Amendment to the London Protocol to Regulate Placement of Matter for Ocean Fertilisation and other Marine Geoengineering Activities. The amendment to this international instrument will create a legally binding regime for Contracting Parties to regulate ocean fertilisation. The amendment is also structured to allow other marine geoengineering activities to be brought within the regulatory framework, if they fall within the scope of the London Protocol and have the potential to cause harm to the marine environment.

C. Supplementary information provided by Research Councils UK (RCUK)

Listed below are recent and current UK research projects that are contributing to the understanding of climate geoengineering and its environmental impacts.

This list has been compiled by the Research Councils UK (RCUK), as the main funders of national research, with assistance of the Living with Environmental Change partnership (LWEC). Some non-RCUK projects are also included, based on available information; however, RCUK does not have any responsibility for such work.

The Research Councils expect research to be conducted in accordance with the highest standards of research integrity and research methodology. The Research Organisation is responsible for ensuring that ethical issues relating to the research project are identified and brought to the attention of the relevant approval or regulatory body. Approval to undertake the research must be granted before any work requiring approval begins. Ethical issues should be interpreted broadly and may encompass, among other things, relevant codes of practice, the involvement of human participants, tissue or data in research, the use of animals, research that may result in damage to the environment and the use of sensitive economic, social or personal data.

The "[Oxford Principles](#)" on the conduct of geoengineering research were developed by the UK research community. They are widely known and acknowledged, on a non-statutory basis and in 2009 were submitted to the UK House of Commons Science and Technology Select Committee on "The Regulation of Geoengineering". The Committee endorsed the principles and in its official response, to the Committee's report, the UK Government likewise endorsed the principles.

In 2011, the Natural Environment Research Council (NERC) conducted a public dialogue about geoengineering to assess public opinion on how future research relating to the subject should be directed, conducted and communicated. The report is available here: <http://www.nerc.ac.uk/about/consult/geoengineering-dialogue-final-report.pdf>

In 2013, LWEC published a strategic framework for geoengineering research, with focus on climate physics and biogeochemistry '[A forward look for UK research on climate impacts of geoengineering](#)'.

1. Multi-approach projects, including governance

	Title	Main funders (Funding £k; UK total)	Relevance to geoengineering	Lead research organisations	Dates
1.1	Integrated assessment of geoengineering proposals (IAGP)	EPSRC, NERC (1,729)	Development of an evaluation framework to allow in-depth comparison of all major geoengineering proposals. The project combines Earth system modelling and deliberative engagement with stakeholders and the wider public. Details: www.iagp.ac.uk	Leeds Univ, Oxford Univ, Lancaster Univ, Cardiff Univ, Bristol Univ, UK Met Office	2010 - 2014
1.2	Climate geoengineering governance	ESRC, AHRC (1,048)	Project includes i) study of ethical, legal, social and geopolitical implications of range of geoengineering approaches; ii) development of guidelines on governance and regulation; iii) stakeholder dialogue on possible role of geoengineering in relation to climate change mitigation and adaptation. Details: http://geoengineering-governance-research.org/	Oxford Univ, Sussex Univ, Univ College London	2012 - 2014
1.3	Geoengineering – a systems engineering analysis	EPSRC Training Award	This project will use a low order climate model to determine formal observability, controllability and closed-loop stability properties and to devise new concepts for geoengineering to reduce the scale of interventions required.	Strathclyde Univ	2013 - 2016
1.4	Climate engineering research: responsible innovation	EPSRC/ESRC	This project involves i) stakeholder mapping and engagement around the RCUK funded SPICE project and the wider context of Solar Radiation Management (SRM) ; and ii) a critical review of the wider risk uncertainties, ethical, legal. governance and social issues associated with the project and SRM more generally.	Exeter Univ, Univ College London	2012- 2014
1.5	The Responsible Innovation Framework: scoping study and science -policy seminar	EPSRC/ESRC	Project to develop a framework for responsible innovation to support research policy development at EPSRC, See http://www.epsrc.ac.uk/research/framework/Pages/framework.aspx	Exeter Univ	2011- 2012
1.6	Regulating geoengineering research through strategic environmental assessment	ESRC Training Award	Focus on legal aspects: how authority might be justly exercised in the absence of democratic legitimacy.	Bristol Univ	2013 - 2016
1.7	Should we geoengineer our future climate?	NERC Training Award	Model-based analysis of effectiveness of different geoengineering options	Bristol Univ	2009 - 2012
1.8	Public participation in the social appraisal of climate geoengineering proposals	Private sector Training Award	Research on the expert, stakeholder and public social appraisal of climate geoengineering proposals; using a novel and innovative participatory research method (Deliberative Mapping). Close links with IAGP project (#1.1)	Univ of East Anglia	2010 - 2013
1.9	European trans-disciplinary assessment of climate engineering (EuTRACE)	EC (266k €)	Project addresses the potentials, implications, risks and uncertainties of climate engineering (geoengineering), including stakeholder dialogue and policy development. Details: http://www.eutrace.org/	Tyndall Centre/ Univ of East Anglia; Exeter Univ, Bristol Univ, Edinburgh Univ	2011- 2013
1.10	Oxford geoengineering programme (OGP)	Oxford Martin School (688)	Provides complementary 'internal' university support to extend the scope of external awards, also for pilot studies that include assessing proposals for cloud modification, and the engineering and resource constraints of CDR	Oxford Univ	2010 - 2014

2. Solar radiation management, also known as sunlight reduction methods (SRM)

	Title	Main funders (Funding £k; UK total)	Relevance to geoengineering	Lead research organisations	Dates
2.1	Stratospheric particle injection for climate change (SPICE)	EPSRC, NERC, STFC (1,609)	Addresses issues relating to the effectiveness of stratospheric particle injection as an SRM technique: i) how much, of what, might need to be injected where into the atmosphere to effectively and safely manage the climate system; ii) what techniques might be used to deliver it there; and iii) what might be the impacts. A field component was originally planned (involving water aerosol from a tethered balloon) but was not carried out.	Bristol Univ, Oxford Univ, Cambridge Univ, Edinburgh Univ	2010 - 2014
2.2	Geoengineering model intercomparison project (GeoMIP)	Met Office/ Hadley Centre Climate Programme	GeoMIP is an international model comparison exercise, endorsed by the World Climate research Programme (WCRP). It prescribes the experiments which all participating climate models will perform. Initial focus on stratospheric SO ₂ injection and generic SRM; subsequent studies on sea spray geoengineering, including marine cloud brightening.	UK Met Office	2010 -
2.3	Marine cloud brightening using an atmosphere-only climate model	EPSRC Training Award	Model-based assessment of effect of seeding patches or all marine stratocumulus clouds	NCAS/Leeds Univ	2006 - 2010
2.4	Climate impacts of marine cloud brightening	Carnegie Inst, U.S.A.	Use of HadGEM Earth System Model to examine effect of marine cloud brightening on the Earth's climate system, targetting optimal regions for seeding	NCAS/Leeds Univ	2009 - 2013
2.5	Designer ice nuclei for geoengineering of clouds	NERC Training Award	Laboratory experiments to identify materials that could be efficiently, safely and cost-effectively used to promote ice nucleation (in cirrus clouds)	Leeds Univ	2013 - 2016
2.6	Global and regional sea level response to geoengineering by 2100	NERC Training Award	Model projections of response of sea level components (e.g. ocean heat content, ice sheet and glacier melting) to SRM geoengineering	NOC, Liverpool Univ	2013 - 2016

3. Greenhouse gas removal, also known as carbon dioxide removal or negative emission techniques (GGR, CDR and NETs)

	Title	Main funders (Funding £k UK total)	Relevance to geoengineering	Lead research organisations	Dates
3.1	Ocean carbon-climate feedbacks and geoengineering potential	NERC Training Award	Study of how ocean uptake of CO ₂ is affected by climate in context of ocean-based CDR geoengineering (nutrient pipes, fertilization and ocean liming)	Southampton Univ	2013 - 2016
3.2	Biochar and biotrophic carbon storage in temperate soils (AGRIFOOD)	NERC Training Award	Study of biochar treatment effects on faunal and microbial soil communities and associated impacts, including rates of C and N cycling, greenhouse gas emissions (CO ₂ , CH ₄ , N ₂ O); and climate resilience of soil organic matter. <i>Project involves small scale field trials</i>	Edinburgh Univ, CEH	2010 - 2014
3.3	Capture of atmospheric CO ₂ by mineral-plant reactions	NERC Training Award	Study of role of plants in precipitating soil carbonate (from CO ₂ / bicarbonate interacting with Ca ions) and potential enhancement of such carbon sequestration by addition of calcium silicates to soils	Newcastle Univ	2009 - 2012

Additional notes

- There is still considerable debate about the definition of climate geoengineering. It is considered here as “A deliberate intervention in the planetary environment of a nature and scale intended to counteract anthropogenic climate change and its impacts” (CBD Technical Report 66; 2012). RCUK is aware that other definitions could be used.
- Research activities are listed in three groups: 1) multi-technique approach, including governance; 2) solar radiation management, also known as sunlight reduction methods (SRM); and 3) greenhouse gas removal, also known as carbon dioxide removal or negative emission techniques (GGR, CDR and NETs).
- Carbon capture and storage (CCS) from power plants is excluded from the definition given above. The RCUK Energy Programme has a portfolio (£68m) of CCS projects and has set up the UK CCS Research Centre¹.
- Research on bioenergy and soil carbon management can also provide understanding that is relevant to geoengineering, but projects on those topics are not included here.
- There are many other recent/current UK studies that could also be considered relevant to climate geoengineering (e.g. on the mitigation of climate change, climate dynamics, the carbon cycle, biogeochemical processes, and human impacts on biodiversity and ecosystems), since they provide important underpinning knowledge. However, unless they fully or partly contribute to improved understanding of the techniques, consequences (intended and unintended), acceptability or governance of purposeful climate remediation, they are not included here.
- Project information given here is primarily from Envirobase (www.envirobase.info); entries are limited to those with end-dates in 2010 or later.
- Funding information in the table relates to the total project award. Such information is not given where only part of the project is considered geoengineering-relevant.

Acronyms: AHRC, Arts and Humanities Research Council; BBSRC, Biotechnology and Biological Sciences Research Council; BECCS, Bioenergy with carbon capture and storage; BGS, British Geological Survey; CEH, Centre for Ecology and Hydrology; CCS, carbon capture and storage; DECC, Department of Energy and Climate Change; EC, European Commission; EPSRC, Engineering and Physical Sciences Research Council; ESRC, Economic and Social Research Council; NCAS, National Centre for Atmospheric Science; NERC, Natural Environment Research Council; NOC, National Oceanography Centre; PML, Plymouth Marine Laboratory; STFC, Science and Technologies Facilities Council

¹ See <http://www.ukccsrc.ac.uk/>