

**Department of Energy &
Climate Change**

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REDACTED REDACTED

Via email address: request- REDACTED REDACTED REDACTED

Our ref: 12/0862

4 July 2012

Dear Mr REDACTED

RE: Freedom of Information request - Geoengineering

Thank you for your email of 4 June 2012 where you requested information on the following:

1. Cloud Seeding
2. Cloud Spraying of Oxides/Metallic Substances
3. What Department is Authorized to do this?
4. What is the purpose of cloud seeding/spraying?
5. What studies have there been into the Geo-Engineering by DECC and other authorities?

Regarding (1), (2), (3) and (5) above, we have considered your request in accordance with the Environmental Information Regulations 2004 (EIRs) as the information you sought disclosure of does in our view fall within the definition of 'environmental information' as stated in the EIRs.

Under the EIRs you have the right to:

- know whether we hold the information you have requested; and
- be provided with that information (subject to any exceptions under the EIRs which may apply).

Following a search of our paper and electronic records, I have established that the Department of Energy and Climate Change (DECC) holds the following information on "cloud seeding" or "cloud spraying of oxides/metallic substances":

- Latham et al. (2008): Global temperature stabilization via controlled albedo enhancement of low-level maritime clouds. *Philosophical Transactions of the Royal Society A*, 366, 3969-3987, doi:10.1098/rsta.2008.0137.
- Response to Written Parliamentary Question 8978. Available at <http://www.publications.parliament.uk/pa/cm201011/cmhansrd/cm100719/text/100719w0003.htm#10071937000006>
- Email dated 22 June 2011 (pdf attached) regarding a meeting with the Presidency of Meteorology and Environment of Saudi Arabia. This email has been redacted to remove information that is out of scope of your request. The names of officials have also been redacted as regulation 12(3) of the EIRs provides an absolute exemption for personal data, which then falls to be dealt with under the Data Protection Act (DPA). Personal data of third parties can only be disclosed in accordance with the data protection principles. In particular, the first data protection principle requires that

disclosure must be fair and lawful and must comply with one of the conditions in Schedule 2 of the DPA. We do not think that it is fair to release the names of DECC staff and do not think that any of the relevant conditions in Schedule 2 of the DPA apply. As a result, the names of DECC staff have not been provided.

We do not hold any information regarding authorisation for Government Departments to perform cloud seeding or cloud spraying of oxides or metallic substances.

Regarding your request for information on studies into geo-engineering by DECC and other authorities in (5), please find attached a list of such studies held by this Department.

Regarding (4), we have considered this as an enquiry as it is not a request for recorded information and therefore does not fall within the scope of the EIRs. Cloud seeding has been proposed as a possible means of modifying local weather to increase or decrease rainfall on a small scale. Spraying sea salt (rather than oxides or metallic substances) to brighten clouds has also been proposed as a possible geo-engineering technique for reducing global average temperature. However, understanding of the risks, feasibility and efficacy of this technique is currently at a low level. DECC has funded some computer modelling studies at the Met Office Hadley Centre to increase understanding of the environmental impacts of this technique and these studies are listed below.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within two months of the date of receipt of the response to your original letter and should be addressed to the Department.

Please remember to quote the reference number above in any future communications.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision. The Information Commissioner can be contacted at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF.

Yours sincerely,

Climate and Energy: Science and Analysis
Department of Energy and Climate Change

Studies on geo-engineering by DECC and other authorities

Please find below the information held by the Department of Energy and Climate Change in scope of your request for information on “What studies have there been into the Geo-Engineering by DECC and other authorities?” Where available, links to the relevant reports or websites have been provided. A copy of the Defra/DECC discussion paper is attached.

Note that we define geoengineering to include both carbon dioxide removal and solar radiation management techniques in accordance with the definition given by the Royal Society in their 2009 report, *Geoengineering the climate*.

As you have requested information on studies into geo-engineering by other authorities, we have interpreted ‘other authorities’ as including other Government Institutes and UN organisations.

DECC studies on geo-engineering

1. Defra/DECC discussion paper (2009): *Geo-engineering options for mitigating global warming*.
2. Defra and DIUS evidence submitted to the House of Commons Innovation, Universities, Science and Skills (IUSS) Select Committee inquiry into geoengineering as part of a wider inquiry on “*Engineering: Turning ideas into reality*”.
<http://www.publications.parliament.uk/pa/cm200809/cmselect/cmdius/50/50w3e27.htm>
3. Government response to the House of Commons Innovation, Universities, Science and Skills Select Committee report: *Engineering: Turning ideas into reality*.
<http://www.publications.parliament.uk/pa/cm200809/cmselect/cmdius/759/75904.htm>
4. Computer modelling studies on the environmental consequences of geoengineering: DECC has commissioned two studies within the DECC/Defra-funded Met Office Hadley Centre Climate programme on geoengineering:
 - a. Computer modelling study of the environmental consequences of encouraging low-level cloud develop to increase regional reflectivity.
 - b. Computer modelling study of the environmental consequences of injecting sulphur into the stratosphere.

The Met Office Hadley Centre has published its key findings in peer-reviewed journals as listed below:

- Haywood, J., Jones, A. and Boucher, O. (2008): Geoengineering stratocumulus clouds could trigger La Niña/El Niño-like climate response. Submitted to *Nature*.
- Woodhouse, M. T., Mann, G. W., Carslaw, K. S., Boucher, O. (2008): New directions: the impact of oceanic iron fertilization on cloud condensation nuclei. *Atmospheric Environment*, 42, 5728-5730.
- Boucher, O., Lowe, J. and Jones, C. D. (2009): Constraints on the carbon cycle of timescales of climate-engineering options. *Climatic change*, 92, 261-273, doi:10.1007/s10584-008-9489-7.
- Jones, A., Haywood, J. and Boucher, O. (2009): Climate impacts of geoengineering marine stratocumulus clouds. *Journal of Geophysical Research*, D10106, doi:10.1029/2008JD011450.
- Jones, A., Haywood, J., Boucher, O., Kravitz, B. and Robock, A. (2009): Geoengineering by stratospheric SO₂ injection: results from the Met Office HadGEM2 climate model and comparison with the Goddard Institute for Space Studies ModelE. *Atmospheric Chemistry and Physics*, 10, 13, 5999-6606.
- Kravitz, B., Robock, A., Boucher, O., Schmidt, H., Taylor, K., Stenchikov, G. and Schulz, M. (2010): The Geoengineering Model Intercomparison Project (GeoMIP). Submitted to *Atmospheric Science Letters*.

- Jones, A., Haywood, J. and Boucher, O. (2010): A comparison of the climate impacts of geoengineering by stratospheric SO₂ injection and by brightening of marine stratocumulus cloud. Submitted to *Atmospheric Science Letters*.
- 5. Written and oral evidence to the House of Commons Science and Technology Committee inquiry on the international and UK regulation of geoengineering
<http://www.parliament.uk/business/committees/committees-archive/science-technology/>.
- 6. Research as part of the DECC/Defra-funded Avoiding Dangerous Climate Change Programme.
McGlashan, N., Shah, N. and Workman, M.(2010): The potential for the deployment of negative emissions technologies in the UK. AVOID report AV/WS2/R18/D1, DECC/Defra contract GA0215/GASRF123. www.avoid.uk.net
- 7. HM Government 2050 Pathways Analysis, Chapter Q on Negative Emissions.
www.decc.gov.uk.
- 8. Government response to the House of Commons Science and Technology Committee report on the regulation of geoengineering. Command paper 7936: Government response to the House of Commons Science and Technology Select Committee 5th report of session 2009-10: the regulation of geoengineering. www.official-documents.gov.uk.

Studies by other authorities

We hold copies of papers on the geo-engineering studies by other authorities listed below. These are available to the public and links to the relevant websites have been provided. For further information on these studies, please contact the relevant authority.

1. Natural Environment Research Council (NERC)/Sciencewise public dialogue exercise on geoengineering: *Experiment Earth? A report on a public dialogue on Geoengineering*.
www.nerc.ac.uk.
2. Joint NERC and Engineering and Physical Sciences Research Council (EPSRC) projects:
 - a. Integrated Assessment of Geo-engineering Proposals (IAGP), <http://www.iagp.ac.uk/>
 - b. Stratospheric Particle Injection for Climate Engineering (SPICE),
<http://www2.eng.cam.ac.uk/~hemh/SPICE/SPICE.htm>
3. NASA Ames Research Center (2007): *Workshop Report on Managing Solar Radiation*. NASA/CP-2007-214558. <http://event.arc.nasa.gov/main/home/reports/SolarRadiationCP.pdf>
4. Convention on Biological Diversity (2012): *Impacts of climate-related geoengineering on biological diversity*. UNEP/CBD/SBSTTA/16/INF/28, 5 April 2012.
<http://www.cbd.int/doc/meetings/sbstta/sbstta-16/information/sbstta-16-inf-28-en.pdf>
5. Convention on Biological Diversity (2012): *Regulatory framework for climate-related geoengineering relevant to the Convention on Biological Diversity*. UNEP/CBD/SBSTTA/16/INF/29, 2 April 2012.
<http://www.cbd.int/doc/meetings/sbstta/sbstta-16/information/sbstta-16-inf-29-en.pdf>.
6. Convention on Biological Diversity (2012): *Impacts of climate-related geoengineering on biodiversity: Views and experiences of indigenous and local communities and stakeholders*. UNEP/CBD/SBSTTA/16/INF/30, 17 April 2012.
<http://www.cbd.int/doc/meetings/sbstta/sbstta-16/information/sbstta-16-inf-30-en.pdf>.

