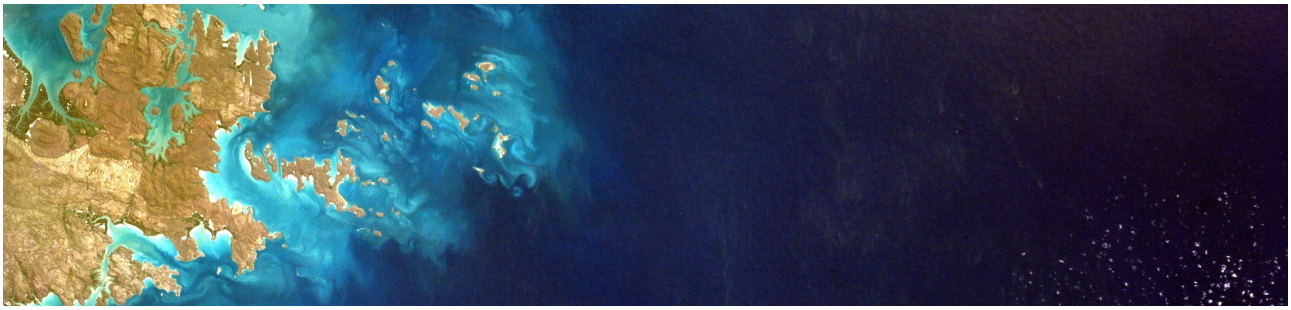

CODE OF CONDUCT FOR RESPONSIBLE GEOENGINEERING RESEARCH

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Executive Summary

This document is an interim report of the Geoengineering Research Governance Project (GRGP). It is structured in three sections: first, it lays out the rationale for developing guidance on the conduct of geoengineering research; second, it details a 'Code of Conduct for Responsible Geoengineering Research' that has been developed in the course of the project; and, third, it provides ancillary materials exploring issues relating to the Code of Conduct and how it has been developed.

This document aims to stimulate further discussion about the need for, and potential form and content of, regulatory and governance frameworks for geoengineering research. It has been developed and refined through a process of engagement involving expert peer review, semi-structured interviews with national and international policymakers on the need for, and potential effectiveness of, a code of conduct, an open call for comment, and stakeholder workshops. This document is itself a further element of the ongoing process of engagement: we welcome your thoughts and comments to develop it further. Additional information about the GRGP and the process of developing this document can be found at our project website: http://ucalgary.ca/grgproject/.

This Code of Conduct aims to provide practical guidance on the responsible conduct of geoengineering research. It is designed as a voluntary instrument, though one that is based upon existing legal sources, including general principles, rules of customary international law, treaty-based rules, regulations, international decisions, and policy documents. The guidance in this Code of Conduct is global in scope, and is directed at various State, sub-State and non-State actors involved in the development of regulatory and governance frameworks for geoengineering and their implementation.

Introduction

The 2015 Paris Agreement charts a new course in global efforts to combat anthropogenic climate change. It aspires to the collective goal of holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C. Some experts have expressed serious doubts about whether conventional forms of mitigation and adaptation alone will be sufficient to avert serious climate change risks this century.

Geoengineering measures – commonly defined as intentional large-scale interventions in the environment to address anthropogenic climate change[1] – stand apart as amongst the more 'radical' in the spectrum of proposed climate measures.[2] Geoengineering is an umbrella term that covers a diverse set of proposed techniques which either seek to remove carbon dioxide and other greenhouse gases from the atmosphere and sequester them (greenhouse gas removal), or reduce the amount of sunlight absorbed by Earth in order to cool the planet's surface (solar radiation management). These two categories are often associated on the basis of intent and the scale of the environmental intervention.[3]

Proponents of geoengineering research argue that scientific understanding is insufficient to inform responsible decision-making in the face of grave climate risks, and that further targeted research needs to be conducted to understand the efficacy, benefits, and risks of individual geoengineering proposals. This has sparked debate amongst experts and broader civil society about whether the current patchwork of laws and regulations at different levels is sufficient to address the complex interplay of environmental, ethical, social, and legal concerns associated with geoengineering research, development, and possible deployment. Discussion about the need for effective oversight of research has intensified with field experiments on the horizon for 2018 and beyond.

Several studies on geoengineering have called for the consideration of the regulation and governance of geoengineering research activities.[4] Studies of the existing legal and institutional landscape indicate that, while there are existing laws and mechanisms that regulate aspects of different proposed geoengineering techniques, there are also gaps and overlaps in existing frameworks.[5] Early efforts on governance – which include the Oxford Principles and the Asilomar Principles – have been general and high-level in nature.

The aim of this 'Code of Conduct for Responsible Geoengineering Research' is to provide further practical guidance on the responsible conduct of geoengineering research and development, in particular, for outdoor experiments on geoengineering. It is designed as a voluntary instrument, though one that is based upon existing legal sources, including general principles, rules of customary international law, treaty-based rules, regulations, decisions and international policy documents. The guidance in this Code of Conduct is global in scope, and is directed at various State, sub-State and non-State actors involved in the development of regulatory and governance frameworks for geoengineering and their implementation. It seeks to balance three main functions of geoengineering research governance: to prevent and minimise the risk of environmental and other harms; to promote responsible geoengineering research with a view to better understanding the potential efficacy, benefits, and risks of proposed techniques; and to enhance legitimacy.[6] The intent of this document is not to frame a broader policy for geoengineering research, but rather govern conditions once a decision is taken to conduct research.

The guidance comprises four parts as well as two appendices, guidance on the assessment process for outdoor experiments on geoengineering and a Glossary of Key Terms.

Code of Conduct for Responsible Geoengineering Research

PART A – NATURE, SCOPE AND OBJECTIVE

Article 1 – Nature and Scope

1. This Code of Conduct is voluntary. However, certain parts of it are based on relevant legal principles and rules of international law. It also contains provisions that may be binding amongst the States Parties to specific legal instruments.[7]

2. This Code of Conduct is global in scope, and is directed at States and international organisations, as well as sub-State and non-State actors, including research funding bodies and other governmental authorities, scientific academies and institutions, individual scientists, non-governmental organisations, businesses, private foundations and other relevant actors.[8]

Article 2 – Objective

Recognising the need for safe, effective and progressive responses to the urgent threat of climate change and that more transdisciplinary research and sharing of knowledge is needed to better understand the potential efficacy, benefits, and adverse effects of geoengineering,[9] this Code of Conduct aims to promote the responsible conduct of geoengineering research for the benefit of present and future generations of humankind. In particular, it seeks to provide principles and procedures for the responsible conduct of outdoor experiments on geoengineering.

PART B – GENERAL PRINCIPLES

Article 3 – General Principles

This Code of Conduct should be interpreted and applied in light of the following general principles:

1. Climate change is a common concern of humankind.[10] States shall protect the climate system for the benefit of present and future generations of humankind, within the broader context of the international community's commitment to sustainable development, on the basis of equity, and in accordance with their common but differentiated responsibilities and respective capabilities.[11]

2. States have an obligation to cooperate with each other and with relevant international organisations in good faith for the protection of the global environment.[12]

3. States have the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or to areas beyond the limits of national jurisdiction.[13] States shall take all appropriate measures to prevent significant transboundary harm or at any event to minimise the risk thereof.[14]

4. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[15]

5. States shall provide prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect and shall consult with those States at an early stage and in good faith.[16]

6. Environmental issues are best handled with participation of all concerned citizens, at the relevant level. At the national level, each individual shall have appropriate access to information concerning the environment that is held by public authorities, including information on hazardous materials and activities in their communities, and the opportunity to participate in decision-making processes. States shall facilitate and encourage public awareness and participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided.[17]

PART C – GUIDANCE ON GEOENGINEERING RESEARCH

Article 4 – Use of Geoengineering

1. In view of the lack of science-based, global, transparent and effective control and regulatory mechanisms for geoengineering, and in accordance with the precautionary approach and requirements for environmental impact assessment, no geoengineering activities should take place, until there is an adequate scientific basis on which to justify such activities and appropriate consideration of environmental and other effects.[18]

2. An exception to paragraph 1 can be made for responsible geoengineering research conducted in accordance with all applicable laws and regulations and on the basis of the guidance in this Code of Conduct.[19]

3. Geoengineering should not be promoted or used as a substitute for measures that anticipate, prevent or minimise the causes of climate change, especially through effective measures to reduce greenhouse gas emissions, and to minimise the adverse effects of climate change through the adoption of suitable adaptation measures.[20]

Article 5 – Cooperation on Geoengineering Research

1. States and international organisations, as well as sub-State and non-State actors should cooperate in good faith to promote the responsible conduct of geoengineering research in accordance with international law and on the basis of the guidance in this Code of Conduct.

2. To this end, in accordance with respective capabilities, efforts should be made:

   (a) to cooperate, through appropriate mechanisms, in the establishment and implementation of laws, measures or policies and their harmonisation for the responsible conduct of geoengineering research;

   (b) to gather new knowledge through the fullest possible cooperation and coordination of geoengineering research in order to understand and assess the potential efficacy, benefits, and adverse effects of geoengineering and to support decision-making;

   (c) to promote and cooperate in the full, open, and prompt exchange of relevant information on geoengineering;[21]

   (d) on the basis of equity, to cooperate to assist and strengthen the capabilities and capacities of those in developing countries to participate in geoengineering research and to support decision-making through, *inter alia*, joint programmes to provide education and training of scientific and technical personnel.[22]

Article 6 – Principles and Practices for Responsible Geoengineering Research

1. Geoengineering research should be conducted in a responsible manner, including in accordance with all applicable laws and regulations and on the basis of the guidance in this Code of Conduct.

2. All appropriate and effective measures should be taken to prevent and minimise the risk of harm from outdoor experiments on geoengineering and to maximise the benefits of such experiments.[23] Such measures include, with respect to outdoor experiments on geoengineering and on the basis of the guidance in this Code of Conduct, the establishment of an assessment procedure that permits public participation, the preparation of assessment documentation as described in Appendix I, the establishment of post-project monitoring measures, and the publication and dissemination of information about the geoengineering research.

3. Geoengineering research should be conducted taking a prudent, step-by-step approach.[24] As far as practicable, the nature, scale, duration, and intensity of an outdoor experiment on geoengineering should be proportionate to the current state of knowledge about the potential adverse effects taking into account the precautionary approach.

4. Outdoor experiments on geoengineering should be conducted using the best scientific methods and means that are reasonably available.[25] Research methods should be designed to match the site-specific characteristics and use minimally-intrusive approaches.[26]

5. In the conduct of outdoor experiments on geoengineering, care should be taken to avoid activities which could disturb the experiments and observations of other scientists as well as other legitimate activities. This requires that those who plan to conduct outdoor experiments on geoengineering familiarise themselves with the status of current and planned experiments, observations and other activities in the area, and that they duly publicise their own research plans and activities in a timely manner.[27]

Article 7 – Assessment of Outdoor Experiments on Geoengineering

1. Prior to the authorisation or conduct of a proposed outdoor experiment on geoengineering, the experiment should be assessed, at an early stage, in accordance with international law and domestic laws and requirements and on the basis of the guidance in Appendix I this Code of Conduct.

2. Proposed outdoor experiment on geoengineering should be assessed on a case-by-case basis at the project level.[28] To the extent appropriate, policies, plans and programmes on geoengineering research should also be assessed.[29]

3. The proposed outdoor experiment on geoengineering should be reassessed where there is a change to the proposed experiment, if it is plausible that the change may result in potential adverse effects which were not considered previously.[30]

4. The proposed outdoor experiment should be assessed based on the best available scientific information and with a degree of detail proportionate to the potential for adverse effects taking into account the precautionary approach.[31]

5. The information provided as part of the assessment of a proposed outdoor experiment on geoengineering should be subject to an arm's length review prior to a decision to authorise or conduct the proposed experiment.[32]

6. Before a decision is made to authorise or conduct an outdoor experiment on geoengineering, the interested public should be informed, either by public notice or individually as appropriate, early in an decision-making procedure, and in an adequate, timely and effective manner, on the basis of the guidance in Appendix I.[33]

7. A decision as to whether a proposed outdoor experiment on geoengineering should be authorised or conducted should not be taken until an appropriate period has elapsed to consider comments.[34]

8. If upon completion of an initial environmental assessment there is uncertainty regarding possible effects or any gaps in knowledge and uncertainties, these may be addressed by seeking further information on the specific issues of concern.

9. Any knowledge gaps, uncertainties, and assumptions relating to the proposed outdoor experiment should be identified and assessed.[35] Lack of scientific knowledge should not necessarily be interpreted as indicating a particular level of risk, an absence of risk, or an acceptable risk.[36] Any knowledge gaps, uncertainties, and assumptions should be used for planning, assessing and monitoring future geoengineering research and for improving legal and institutional frameworks and decision-making.[37]

10. A decision to authorise or conduct an outdoor experiment should not be taken before all steps of the assessment are completed[38] and due account is taken of all relevant information, including, where available, the results of the assessment, consultation, and information from previous assessments and monitoring relevant to the proposed outdoor experiment.[39]

11. The decision on a proposed outdoor experiment on geoengineering subject to an assessment should be in writing, state the reasons therefore and include the conditions to prevent, reduce or mitigate adverse effects. The written decision should be made available in a timely manner to interested persons or groups in accordance with Article 10 of this Code of Conduct.[40] It should include a brief, non-technical summary of the information and should be also made publicly available in accordance with Article 10 of this Code of Conduct.

Article 8 – Public Participation

Environmental issues are best handled with the participation of the interested public at the relevant levels. To the extent practicable, the interested public should be provided with timely access to all relevant information pertaining to geoengineering research, especially all outdoor experiments on geoengineering, and be given notice and the opportunity to comment, at appropriate stages and while options are still open, concerning decision-making about such research.

Article 9 – Post-Project Monitoring of Outdoor Experiments on Geoengineering

1. Post-project monitoring of the proposed outdoor experiment on geoengineering should be carried out, to the extent practicable, taking into account the possible adverse effects of the proposed experiment for which an assessment has been undertaken on the basis of this Code of Conduct.[41] Post-project monitoring should include the surveillance of the activity and determination of any adverse effects and with a view to achieving the objectives listed in Appendix I.

2. The results of post-project monitoring should be used to inform future assessments, laws, measures and policies, and decision-making on geoengineering.[42]

Article 10 – Access to Information

1. In order to facilitate the scientific process, to promote cooperation and coordination of geoengineering and its governance, and to support informed decision-making and public deliberation on geoengineering, there should be timely, complete and reliable access to information on geoengineering research. The confidentiality of any information may be protected where such confidentiality is protected by law.[43]

2. Those involved in the planning and conduct of geoengineering research should notify and make publicly available information about that research through appropriate channels and to the extent practicable, including:

    (a) research plans, programmes, and their objectives and methodologies;

    (b) information and data relevant to determining environmental baselines;

    (c) the results of peer review;

    (d) the results of assessment;[44]

    (e) the results of the authorisation or decision to conduct an outdoor experiment on geoengineering;

    (f) the results of monitoring;[45]

    (g) the results of research, data and information, including observational data, model results and other analysis tools, and any null and adverse environmental effects;

    (h) compliance reporting;

    (i) a brief, non-technical summary in the local language and English of the information provided under the above headings;[46] and

    (j) any other relevant information.[47]

3. Efforts should be made to facilitate and promote access to information on geoengineering research, including through the establishment of a centralised clearing-house mechanism that is publicly accessible.

PART D – INTERPRETATION AND APPLICATION OF THIS CODE OF CONDUCT

Article 11 – Interpretation and Application

1. This Code of Conduct should be interpreted and applied in conformity with the relevant principles and rules of international law. Nothing in this Code of Conduct shall prejudice the jurisdiction, rights and duties of States under international law.[48]

2. This Code of Conduct should be interpreted and applied in its entirety.

3. This Code of Conduct should be interpreted and applied in a mutually-supportive manner with other relevant international law in accordance with the interrelationship and integration principle which reflects the interdependence of social, economic, financial, environmental and human rights aspects of principles and rules of international law relating to sustainable development as well as of the interdependence of the needs of current and future generations of humankind..[49]

4. This Code of Conduct should be applied taking a flexible and adaptive approach in the light of new information and by drawing upon the work of and involving, as appropriate, existing institutional bodies, experts and civil society.[50]

5. Efforts should be made to facilitate the implementation of and promote compliance with this Code of Conduct.

6. The guidance provided in this Code of Conduct should be reviewed periodically, as necessary, in the light of new knowledge and public participation. This review should take into consideration the work of and involve, as appropriate, institutional bodies, experts and civil society.[51]

APPENDIX I – GUIDANCE ON THE ASSESSMENT OF OUTDOOR EXPERIMENTS ON GEOENGINEERING

INTRODUCTION

The assessment process outlined in this 'Code of Conduct for Responsible Geoengineering Research' provides a mechanism to ensure that the environmental effects as well as ethical, social, and legal consequences of proposed outdoor experiments on geoengineering are evaluated and taken into account before the experiment is authorised or conducted. Assessment and monitoring are elements of due diligence, which is expressed in the principle in this Code of Conduct that all appropriate and effective measures should be taken to prevent and minimise the risk of harm from proposed outdoor experiments on geoengineering and that efforts should be made to maximise the benefits of such experiments.

The requirements for the assessment of projects or plans differ between countries and across different international agreements. The guidance in the Code of Conduct is without prejudice to any laws and regulations that may be applicable to the proposed outdoor experiment on geoengineering, including under international law with regard to activities having or likely to have a risk of transboundary harm or regarding application of domestic laws and requirements. Project proponents must ensure that their research plans comply with local, national and international laws and decision-making processes. However, given that existing laws and regulations at all levels may be inadequate for addressing the particular risks of geoengineering research, this Code of Conduct aims at providing general principles and a common process for assessment of outdoor experiments.

This guidance has been prepared to provide a description of basic principles and methodology for identifying, predicting and communicating the possible environmental and other consequences of a proposed geoengineering experiment. This guidance is general in recognition that individual geoengineering experiments are likely to be unique in terms of their purpose, scale, duration and intensity, and that they may involve large uncertainties due to the novelty of the research activity. Importantly, even where there is a low likelihood of direct, physical impacts from a proposed experiment, the assessment process is linked to public participation and transparency provisions to enable informed decision-making and encourage public deliberation on geoengineering more broadly. This recommendation draws attention to the need to incorporate into the research and innovation process more effective communication amongst stakeholders and the public at large, and as well as information about stakeholder preferences and values. Finally, it is noted that the assessment process is typically based on existing knowledge and analogies from previous experience of similar projects. Outdoor experiments on geoengineering may involve various degrees of uncertainty. Hence, post-project monitoring is recommended as an integral part of the assessment process for the reasons outlined below.

Assessment should be seen as an integral part of the research planning process, by identifying potential impacts at an early stage and throughout the planning processes, and by including public participation as much as possible. A general description of the contents and steps in the preparation of the assessment document are outlined in this guidance.

SCREENING

The first step in the assessment process is to determine whether the proposed experiment constitutes an 'outdoor experiment on geoengineering'. The screening mechanism employed in this Code of Conduct refers to the purpose and nature of the research (and not its effects). It relies on expert and common-sense judgment to make this determination. The assessment process in this

Code of Conduct is limited to outdoor experiments on geoengineering. The provisions on assessment do not target other kinds of research activities that do not concern geoengineering, nor are they triggered by geoengineering desk studies or laboratory research.

'Geoengineering' remains a contested term and one that is likely to evolve as scientific and societal understandings change over time. Given that geoengineering research is at an early stage, this instrument favours a more inclusive approach, rather than binding the definition of geoengineering narrowly to the technical characteristics of the experiments being proposed. The disadvantage of adopting a broad definition of geoengineering in this Code of Conduct is that it provides less certainty to those undertaking geoengineering research. The advantages are however that opening-up the conversation about the meaning and scope of the term geoengineering facilitates expert and public debate about the implications of the promise of the technology that is being investigated. This exercise in public deliberation and reasoning is valuable for determining the boundaries of the concept and enhancing the effectiveness, fairness, and legitimacy of governance over time. Moreover, it is argued here that an inclusive approach is not particularly onerous given that the principles and assessment process outlined in this Code of Conduct take a relatively light touch and are subject to the principle of proportionality. Finally, a more inclusive definition that covers 'unencapsulated' or 'open air research' on greenhouse gas removal or solar radiation management is more likely to capture potentially harmful research activities, and moreover is in keeping with best scientific practices and procedures for other kinds of perturbative field research or disruptive observational studies have been adopted in other contexts. This Code of Conduct follows in the vein of these instruments, which aim to prevent and minimise harms in accordance with a precautionary approach and increase the benefits of research.

Intent is a typical basis in the law for distinguishing scientific research from other activities and as a basis for defining the meaning of geoengineering. As a matter of good practice and to engender public trust in the science, researchers are called upon to be transparent about the purposes of their research plans and to act in good faith on their declared intentions. If the proponents of an outdoor experiment intend to conduct research on geoengineering or conduct research for multiple purposes, including to investigate geoengineering, this Code of Conduct urges them to be forthright in declaring their intentions. If the proponents of an outdoor experiment intend to carry out research that may be reasonably viewed as relating to geoengineering, but is carried out for some other purpose, the greatest encumbrance is that they may be called upon to justify their intentions at some stage, but the consequences of this would be minimal and could be demonstrated *post hoc* based on their publication record.

A more challenging situation arises at the screening stage where an independent authority is attempting to apply the guidance in the Code of Conduct. For example, given that early research on geoengineering may be dual-purpose and may not be distinguishable from other kinds of basic or applied research that does not pertain to geoengineering. In such circumstances, it may be difficult to make an independent determination about whether an experiment pertains to geoengineering research. Again, as a matter of best practice, researchers involved in the conduct of outdoor experiments on geoengineering are encouraged to be transparent about their intentions with third parties.

There is no accepted definition of an 'outdoor experiment'. The term should be viewed as encompassing all intentional, experimental perturbations of natural processes, ecosystems, habitats, and species. As mentioned above, the use of the term in this Code of Conduct is not intended to cover desk studies (modelling, social science research etc.), nor is it meant to include laboratory experiments. Other principles and processes outlined in this Code of Conduct may nonetheless be

relevant to such activities as indicted by the more generic term 'geoengineering research'. Observational studies (e.g., *in situ* measurements of natural analogues) may be justifiably excluded from the scope of the assessment requirement in some circumstances, but the principles and processes in the Code of Conduct may still be relevant.

If it is determined that the proposed outdoor experiment constitutes geoengineering research, then an assessment should be undertaken prior to taking a decision to authorise or conduct the proposed outdoor experiment on geoengineering. The role and function of the assessment process is to contribute to decision-making by focusing on the relevant issues and ensuring that all potential environmental effects as well as social, ethical and legal implications are considered in a thorough and systematic manner.

SCOPE & CONTENT OF THE ASSESSMENT REPORT

The purpose of the scoping stage is to identify the most important issues related to the proposed outdoor experiment on geoengineering with a view to their further study. Ideally, the level of detail regarding scope and content of the assessment document should be proportionate to the potential for harm. The purpose of the proportionality requirement is to achieve an appropriate balance between the comprehensiveness of the assessment document and the need for efficiency to ensure that research activities are not unduly hampered by expensive and time consuming assessment process. Ideally, the interested public should be consulted on the terms of reference of the assessment report.

The scope and content of the assessment should include (1) an assessment for proper scientific attributes, and (2) an environmental assessment. It may also take into account (3) the wider social, ethical and legal implications of the proposed research activity. Each of these elements are laid out in further detail below.

(1) Assessment for proper scientific attributes

The proposed experiment should be assessed to determine whether it exhibits proper scientific attributes. The purpose of this recommendation is to evaluate the scientific quality of the research proposal in terms of whether the proposed experiment will advance scientific understanding and will enable informed decision-making on the efficacy, benefits, and risks of geoengineering.

An assessment of whether the experiment has proper scientific attributes should include a description of the following:

- Whether the proposed experiment has defined and achievable objectives that aim to contribute to the existing body of knowledge
- Whether the proposed experiment uses the best scientific methods and means that are reasonably available
- Whether the proponents of the proposed experiment commit to an independent peer review at appropriate stages
- Whether the proponents of the proposed experiment commit to make data and outcomes publicly available in a timely manner
- Whether the proponents of the proposed experiment commit to the publication of results in peer-reviewed publications in a timely manner
- The names of the principals of the research team and their affiliations and qualifications

- A list of funding sources and any potential conflicts of interest
- The names and addresses of individuals or organisations that prepared the environmental assessment

(2) Environmental assessment

All proposed outdoor experiments involving geoengineering should undergo an environmental assessment, which involves a description of the following:

- A description of the proposed outdoor experiment, including the purpose, location, duration and intensity of the perturbation
- Whether the design of proposed experiment is scientifically justified at that time within the context of the wider research and development process, taking into account the need for a prudent, step-by-step approach in accordance with the precautionary principle
- Consideration of alternatives to the proposed outdoor experiment, including a scientific justification for why the objectives of the proposed study cannot be achieved by other, less invasive methods or means
- A description of the initial environmental reference state, including information on specific experimental baseline conditions and information on baseline conditions collected over a longer period of time which is relevant to the environmental assessment, including data on natural variability
- An estimation of the nature, extent, duration, and intensity of the likely direct or indirect adverse environmental effects of the proposed outdoor experiment
- Consideration of cumulative adverse environmental effects of the proposed outdoor experiment in light of other planned activities in the area including other outdoor experiments
- A description of potential benefits of the proposed experiment, including research that seeks to fill-in gaps in the existing body of knowledge to:
    - Gain fundamental knowledge about, *inter alia*, ecosystems, habitats, species and environmental processes
    - Understand the potential adverse effects of geoengineering, including adverse environmental effects
    - Understand the potential efficacy of geoengineering to counteract the adverse environmental effects of climate change
    - Develop technological and engineering strategies
    - Improve regulatory, governance and institutional frameworks
- An indication of whether the environment of any other State or of areas beyond national jurisdiction is likely to be affected by the proposed experiment
- An identification of gaps in knowledge and uncertainties
- A description of the methods and means to be used
- A description of the installations and equipment to be used

- A justification that the scale, duration and intensity of the proposed outdoor experiment is proportionate to achieving its objectives in the light of the current state of knowledge and taking into account the precautionary principle
- A justification that the location of the proposed outdoor experiment is appropriate to meet the experimental objectives
- An identification of plans and measures, including monitoring and emergency response plans, which could be implemented to minimise adverse effects of the proposed outdoor experiment, detect unforeseen adverse effects, provide early warning of any adverse effects, and deal promptly and effectively with accidents
- Any other information necessary to make prior assessments of, and informed judgements about the proposed experiment, including information from previous assessments and monitoring that are relevant

(3) Consideration of the wider social, ethical and legal implications of the proposed research

This guidance document also recommends that the wider social, ethical and legal implications of the proposed research project be evaluated and taken into account. This determination could include, for example, a literature review or other study which may include the following:

- Information and studies of past relevant examples of innovations for understanding and anticipating societal response to the proposed research project
- Information about key research and innovation trends in the field, major research participants and their roles, organisational structures and relations
- Information from public engagement studies and related sources to understand public attitudes and responses to the proposed outdoor experiment
- Information about all relevant laws and regulations at various levels which potentially apply to the proposed outdoor experiment

IMPACT ANALYSIS & ASSESSMENT REPORT PREPARATION

After the scoping stage, it is necessary to prepare a detailed report outlining the substance of the assessment. The assessment report should describe the purpose and need for the proposed outdoor experiment on geoengineering, describe the affected environment, and provide a thorough examination of the environmental and other consequences of the proposed outdoor experiment as well as potential benefits, and identify less invasive alternatives to the action including mitigation measures.[52]

Depending on the relevant legal requirements, the assessment document may be prepared by:

- The government agency overseeing or authorising the research project
- An independent party
- The body or individual proposing the outdoor experiment on geoengineering

It may be that the applicable laws and regulations impose no prior authorisation requirement for the proposed outdoor experiment (e.g., where a small-scale outdoor experiment falls below physical risk thresholds that trigger domestic legislative requirements). In such cases, to eliminate possible bias when a project proponent prepares an assessment document, it is preferable that the oversight of

the assessment process is provided by an arms-length, independent body with no interest in the research project. However, particularly where there is no independent oversight of the assessment, it is important as a matter of good practice that the assessment document is published at an early stage, well before the experiment is conducted, to allow for public review.

PUBLIC NOTIFICATION & CONSULTATION

This Code of Conduct recommends as a best practice that government agencies, research councils and academies, ethical review bodies, experts in relevant disciplines, interested groups, and members of the general public be allowed appropriate opportunity to participate at an early stage of the research planning process. At a minimum, they should make diligent efforts to allow for public consultation and provide an opportunity to comment on the completed assessment report. The form and extent of public consultation may depend on the potential for environmental and other adverse consequences. Comments should be taken into account in decision-making on whether to authorise or conduct the proposed outdoor experiment on geoengineering.

This process requires that such parties have access to sufficient information and are publicly notified about proposed outdoor experiments and their potential effects in an adequate, timely, and effective manner. Public notification of a proposed outdoor experiment on geoengineering should include the following:[53]

- Information about the proposed experiment, including a non-technical summary in the local language and English, and any application on which a decision will be taken
- The nature of possible decisions or draft decisions to authorise or conduct the proposed experiment and the relevant timelines regarding when a decision will be taken
- Information about the public authority or other body or person responsible for making the decision to authorise or conduct the proposed experiment
- The envisaged decision-making procedure including:
    - The commencement of the procedure
    - Opportunities for the public to participate
    - Time and venue of any envisaged public hearing
    - An indication of the public authority or contact person from which relevant information can be obtained
    - An indication of the relevant public authority or contact person to which comments or questions can be submitted and of the time schedule for transmittal of comments or questions
    - An indication of what environmental information relevant to the proposed activity is available
- Whether the proposed experiment is subject to a national or transboundary environmental impact assessment procedure

The assessment document should be made publicly available and allow sufficient time for expert and public input and review prior to the authorisation or conduct of the outdoor experiment. A decision as to whether a proposed outdoor experiment should be authorised or conducted should not be undertaken until an appropriate period has elapsed to consider comments.

FINAL DECISION

A final decision to authorise or conduct an outdoor experiment should not be taken before all steps of the assessment are completed, and due account is taken of all relevant information, including, where available, the results of the assessment, consultation and public comments, and information from previous assessments and monitoring relevant to the proposed outdoor experiment. It may also include *ex ante* conditions for a monitoring plan and its implementation.

A final decision may entail proceeding with, modifying, or rejecting the proposed research proposal. Any decision on a proposed outdoor experiment should be in writing, state the reasons for the decision, and should be made publicly available in a timely manner to interested persons or groups. It should include a brief, non-technical summary of the information. A key purpose of these transparency requirements is to make the assessment process as discursive as possible, promoting justification for decisions in light of evidence and raised concerns.

FOLLOW-UP

Assessment is based on predictions and may be based on incomplete information. Post-project monitoring and a re-evaluation of the assessment is advocated in this Code of Conduct as integral to the overall assessment process and part of an adaptive management approach. Project proponents should determine whether and to what extent post-project analysis should be carried out, taking into account the possible effects of the activity under the assessment process.

Monitoring procedures should be designed to provide a regular and verifiable record of the geoengineering research, including to:

- Monitor key environmental indicators and baselines to test assumptions about adverse effects, including potential long-term cumulative effects
- Verify compliance with the objectives and any conditions related to the authorisation of the proposed outdoor experiment
- Review the effectiveness of mitigation measures
- Verify past predictions to transfer experiences to future geoengineering research of the same type, including to inform future assessments, monitoring requirements, and decisions on authorisation

The results of monitoring should be taken into account in future assessments of outdoor experiments on geoengineering.

PUBLICATION AND DISSEMINATION OF RESULTS

Timely, complete and reliable access to information about geoengineering is integral to a number of important governance objectives including to facilitate the scientific process, promote cooperation and coordination of research and governance and support informed decision-making and public deliberation on geoengineering. Project proponents should commit to making the results and outcomes of outdoor research on geoengineering publicly available in accordance with Article 10 of the Code of Conduct.

Appendix II – Glossary of Key Terms

Term	Explanation
Adverse effect	Changes in the physical environment or biota which have deleterious effects on the composition, resilience or productivity of natural and managed ecosystems, on the operation of socio-economic systems, or on human health and welfare.
Climate change	A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is, in addition to natural climate variability, observed over comparable time periods
Climate system	The totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions
Emissions	The release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time
Geoengineering	Deliberate large-scale intervention in the environment, in order to moderate climate change
Greenhouse gases	Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation
Greenhouse gas removal	Measures that aim to remove greenhouse gases from the atmosphere.
Solar radiation management	Measures that aim to reduce the amount of solar radiation absorbed by the Earth or enhance the amount of thermal radiation emitted from the Earth's surface to space.

About the Geoengineering Research Governance Project

Due to concerns about potential environmental, social, ethical and legal implications of geoengineering technologies, it is argued that there is a need for effective oversight of geoengineering research and experimentation. The Royal Society, in its influential 2009 report on geoengineering, recommended the development of 'a code of practice for geoengineering research' that would 'provide recommendations to the international scientific community for a voluntary research governance framework'.[54]

In 2015, legal scholars Anna-Maria Hubert and David Reichwein published a working paper exploring elements for a code of conduct for geoengineering research with accompanying legal commentaries to examine elements for a governance framework for research activities.[55] The working paper was jointly published by the Institute of Advanced Sustainability Studies (IASS-Potsdam) and the University of Oxford's Institute for Science Innovation and Society (InSIS). Focusing on the near-term prospect of research conducted in the open environment, the working paper discussed salient legal concepts, principles and procedures relevant to geoengineering.

Against this backdrop, the Geoengineering Research Governance Project (GRGP) is a joint initiative of the University of Calgary, IASS-Potsdam, and InSIS. The project was initiated at a kick-off meeting held in Oxford in February 2016 and will continue until the end of 2017.

The principal investigator of the project is Anna-Maria Hubert, an Assistant Professor of Law at the University of Calgary. She is supported by project co-investigators Tim Kruger, manager of the Oxford Geoengineering Programme at the Oxford Martin School, University of Oxford and Miranda Böttcher, Project Scientist at the IASS-Potsdam.

The GRGP's Advisory Board provides expert advice to the project. Its members are:

- Professor Neil Craik, Professor of Law, School of Environment, Enterprise and Development, University of Waterloo
- Professor Thomas Hale, Associate Professor in Public Policy (Global Public Policy), Blavatnik School of Government, University of Oxford
- Professor Steve Larter, Canada Research Chair in Petroleum Geology, Department of Geology, University of Calgary; Fellow of the Royal Society
- Professor Steve Rayner, James Martin Professor of Science and Civilisation; Director, Institute for Science, Innovation and Society (InSIS); Co-Director, Oxford Martin Geoengineering Programme, University of Oxford
- Professor Catherine Redgwell, Chichele Professor of Public International Law, Faculty of Law; Co-Director, Oxford Martin Geoengineering Programme, University of Oxford
- Dr Stefan Schäfer, Research group leader, Climate Engineering in Science, Society, and Politics, Institute of Advanced Sustainability Studies (IASS-Potsdam)
- Dr Chris Vivian, Co-Chair of GESAMP Working Group on Marine Geoengineering

The overarching aim of the GRGP is to clarify and promote a deeper understanding of geoengineering governance issues through engagement and cross-disciplinary exchange. Specifically, the project has explored options to promote near-term governance of scientific research

and innovation on geoengineering through the development of a draft voluntary 'Code of Conduct for Responsible Geoengineering Research' to guide decision-making in this field. The GRGP was launched in January 2016 will to run until December 2017.

The aims of the GRGP include:

- To pursue further research on the regulation and governance of research and innovation on geoengineering and other emerging technologies, drawing upon different disciplinary perspectives
- To apply this research to further develop a text for a draft Code of Conduct with the aim of informing the design of effective, fair and legitimate regulatory and governance frameworks for research and innovation on geoengineering
- To use this research to engage with governments, intergovernmental and non-governmental organisations, academics and policy experts, industry members, and the general public and to seek their views and to integrate this broad feedback into the draft Code of Conduct
- To contribute to the development of interdisciplinary methods for conducting legal research

To achieve these aims, the GRGP includes several elements that are broadly aimed at stakeholder engagement on the topic of geoengineering research governance:

- **Expert peer review of the Code of Conduct by legal scholars**: A range of legal scholars with expertise in areas including international, environmental and human rights law were invited to peer review the draft text, to evaluate whether it included all salient legal concepts, principles and procedures relevant to geoengineering research.
- **Open online call for comments on the draft Code of Conduct**: An open online call for comments on the Code of Conduct was put out to solicit feedback and input from interested experts, stakeholders and members of the general public. This process aimed to ensure transparency and broad participation in the revision of the text.
- **Semi-structured interviews with policy experts**: A range of policy experts were interviewed on the potential effectiveness and need for a Code of Conduct for geoengineering research. Drawing on the idea that governance emerges within a specific discursive context, these interviews aim to help develop a more appropriate governance mechanism by understanding the context into which the draft Code of Conduct is being introduced.
- **Stakeholder workshop**: The purpose of the workshop was broadly to clarify and promote a deeper understanding of issues related to the regulation and governance of geoengineering science and innovation through cross-disciplinary exchange. The workshop involved 42 experts from around the globe, including academics from different disciplines, international and national policy experts, and members of civil society. Overall, the goal was to evaluate the adequacy of existing regimes and doctrines relevant to geoengineering research and innovation, and to explore options for new regulatory and governance approaches in this space. Specifically, the format of the workshop examined the potential role of a draft Code of Conduct by interpreting and applying its provisions to three separate hypothetical (though plausible) geoengineering field experiments. Analysis of issues related to jurisdiction and the interpretation and application of international or domestic regulations to research activities is highly fact-sensitive. Relevant circumstances include the nature of the geoengineering intervention, location, duration and scale of the experiment, environmental risks and uncertainties, and other potential consequences (e.g., on other established activities in the

area). Hence, each hypothetical experimental scenario included details about the nature and purpose of the field experiment, the project proponents, the environmental risks and uncertainties, the possible progression of the research programme, and a brief (though not exhaustive) description of existing regulatory and governance frameworks relevant to the circumstances. Our aim was that, by working through these different scenarios, we would gain a richer and more nuanced understanding of the specific issues and interests at stake. We established interdisciplinary working groups to grapple with each scenario. For each case, groups sought to reconcile legal issues raised by current conceptions of geoengineering research and innovation with existing legal orders and doctrines, drawing upon a range of disciplinary perspectives. This exercise was ultimately about imagining specific interactions between existing law, science and society, and exploring their constitutive roles in the development of new regulatory and governance arrangements for geoengineering.

This document is an interim report of the Geoengineering Research Governance Project (GRGP). The report is itself a further element of the ongoing process of engagement: we welcome your thoughts and comments to develop it further. Additional information about the GRGP and the process of developing this document can be found at our project website: http://ucalgary.ca/grgproject/.

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Finally, thank you to all who have provided comments and feedback on the text of the Code of Conduct and to those who have participated in the interview process led by Miranda Böttcher, IASS-Potsdam.

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[3] Intergovernmental Panel on Climate Change (IPCC), 'Climate Change 2013: The Physical Science Basis. Contribution of Working Group I in T F Stocker and others (eds) Fifth Assessment Report of the IPCC (Cambridge University Press 2013) (IPCC AR5 WG1), Annex III Glossary, 1454.

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[6] See Daniel Bodansky, 'The who, what, and where of geoengineering governance' (2013) 121 *Climatic Change* 539.

[7] Food and Agriculture Organisation of the United Nations (FAO), 'FAO Code of Conduct for Responsible Fisheries' 28th Session of the FAO Conference (31 October 1995), art 1.1.

[8] FAO Code of Conduct for Responsible Fisheries, art 1.2.

[9] See Convention on Biological Diversity (CBD), Decision XIII/14, 'Climate-Related Geoengineering' (8 December 2016) UN Doc CBD/COP/DEC/XIII/14.

[10] UNGA, 'Protection of the global climate for present and future generations of mankind' (6 December 1988) UN Doc A/RES/43/53; UNFCCC, preamble; Paris Agreement, preamble.

[11] See UNFCCC, 'Report of the Conference of the Parties on its seventeenth session' (Durban, 28 November –11 December 2011) FCCC /CP/2011/9/Add.1 (Durban Platform for Enhanced Action); UNFCCC, preamble and art 2; Paris Agreement, art 4.

[12] See Stockholm Declaration, principle 24; Rio Declaration, principle 7.

[13] See, e.g., Stockholm Declaration, principle 2; Rio Declaration, principle 2. Affirmed as reflecting customary international law by the ICJ in *The Legality of the Threat or Use of Nuclear Weapons* (Advisory Opinion), para 29, and cited with approval in the *Iron Rhine Case*, para. 222.

[14] ILC Draft Articles on the Prevention of Transboundary Harm, art 3. Affirmed as customary international law by the arbitral tribunal in the *Iron Rhine Case*, paras 59 and 222 and later by the ICJ in the *Pulp Mills Case*, paras 101 and 197. Cf Stockholm Declaration, Principles 6, 7, 15, 18 and 24; Rio Declaration, Principle 11; United Nations Convention on the Law of the Sea (adopted 10 December 1982, entered into force 16 November 1994) 1833 UNTS 3 (LOSC), arts 194(1) and (2), 195, 192, 196, 204, 207–212; UN Agreement Relating to the Conservation and Management of Straddling Fish Stocks and Migratory Fish Stocks (1995) 34 ILM 1542 (UN Fish Stocks Agreement), art 5; OSPAR Convention, art 2; London Convention, arts I, II and VII(2); London Protocol, art 2; Protocol Relating to the Convention for the Prevention of Pollution from Ships (1978) 17 ILM 246 (MARPOL 73/78), Preamble and Art. 1(1); Madrid Protocol, Annex IV; Convention on the Regulation of Antarctic Mineral Resource Activities (1988) 27 ILM 859, Art 7(5); Helsinki Water Convention, art 2(1); Convention on the Law of the Non-Navigational Uses of International Watercourses (1997) 36 ILM 719, art 21; Helsinki Water Convention, art 2(1); Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water (adopted 5 August 1963, entered into force 10 October 1963) (1963) 480 UNTS (Nuclear Test Ban Treaty), art 1(1); Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (adopted 18 May 1977, entered into force 5 October 1978) (1977) 1108 UNTS 151 (ENMOD Convention), art 1(1); UNFCCC, art 3(3); LRTAP, art 2; Vienna Convention for the Protection of the Ozone Layer, art 2; 1987 Montreal Protocol, preamble; Convention on the Transboundary Effects of Industrial Accidents, (1992) 31 ILM 1330, art 3(1); Espoo Convention, preamble and art 2(1); EU Directive No 18/2011 on the deliberate release into the environment of genetically modified organisms [2011] OJ L106/1, preamble; ILC Draft Articles on the Prevention of Transboundary Harm, art 3.

[15] Rio Declaration, principle 15. The 'precautionary principle' or 'precautionary approach' is expressly adopted many treaties including the Vienna Convention for the Protection of the Ozone Layer, Preamble; Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1991) 30 ILM 773, art 4; Treaty on the European Union (Treaty of Maastricht) [1992] OJ 191/01, art. 130(r); UNFCCC, art 3(3); CBD, preamble; Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1996) 36 ILM 7, art 3(1). According to David Freestone, 'Satya Nandan's Contribution to the Development of the Precautionary Approach in International Law' in Michael W Lodge and Myron H Nordquist (eds) Peaceful Order in the World's Oceans: Essays in Honour of Satya N Nandan (Brill 2014) 313, precaution has also been accepted implicitly or operationally in a many different existing international instruments including the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971) 996 UNTS 245 (Ramsar Convention); Convention on the Conservation of Migratory Species of Wild Animals (1979) 19 ILM 15; Convention on the Conservation of European Wildlife and Natural Habitats (1979) UKTS 56; as well as the decisions of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) 11 ILM 1358 (London Convention, LC); Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matters (adopted 7 November 1996) 36 ILM 1 (1997) (London Protocol, LP), International Whaling Commission and CITES.

[16] Rio Declaration, principle 19.

[17] Rio Declaration, principle 10. Cf OSPAR Convention, art 9; Convention on Civil Liability for Damage resulting from Activities Dangerous to the Environment (adopted 21 June 1993, not in force) (1993) 32 ILM 1228 (Lugano Convention), ch III; ILC Draft Articles on the Prevention of Transboundary Harm, art 13; Aarhus Convention, arts 1, 2(3), 4 and 5; UNFCCC, art 4(1)(i) and 6; FAO Code of Conduct for Responsible Fisheries, art 11.3.2.

[18] Language is based on, but not identical to Convention on Biological Diversity (CBD), Decision X/33, 'Biodiversity and Climate Change' (19 December 2010) UN Doc UNEP/CBD/COP/10/27, reaffirmed in CBD Decision XI/20, 'Climate-related Geoengineering' (5 December 2012) UN Doc UNEP/CBD/COP/DEC/XI/20. The Contracting Parties to the LC/LP adopted a similar approach to the regulation of ocean fertilisation.

[19] Language is based on, but not identical to CBD Decision X/33 (n 18) reaffirmed in CBD Decision XI/20, 'Climate-related Geoengineering' (5 December 2012) UN Doc UNEP/CBD/COP/DEC/XI/20. The Contracting Parties to the LC/LP adopted a similar approach to the regulation of ocean fertilisation.

[20] Cf Resolution LP.4(8), preamble, 'emphasising that ocean fertilisation and other types of marine geoengineering should not be considered as a substitute for mitigation measures to reduce carbon dioxide emissions.'

[21] See, e.g., UNFCCC, art 4(1)(h); LOSC, art 204 and 205.

[22] See, e.g., LOSC, art 244.

[23] See LC/LP, 'Assessment Framework for Scientific Research Involving Ocean Fertilisation' (London, 11–15 October 2010) Resolution LC-LP.2 (2010) (Ocean Fertilisation Assessment Framework), paras 3.6.1 and 4.1; InterRidge, InterRidge Statement of Commitment to Responsible Research Practices at Deep-Sea Hydrothermal Vents (2006) <http://www.interridge.org/IRStatement> accessed 7 September 2014 (InterRidge Code of Conduct), paras 1–4; Irish Department of the Environment, Heritage and Local Government, Code of Practice of Marine Scientific Research at Irish Coral Reef Special Areas of Conservation (September 2006) <http://www.npws.ie/media/npws/publications/marine/media,5171,en.pdf> accessed 7 September 2014 ('Irish Code of Practice'), 11, para 18; International Whaling Commission (IWC) 'Resolution on Scientific Permits' 37th Report (1987) 25. Recommendation 4; IWC 'Resolution on Scientific Research Programmes' 38th Report (1988) 27, Recommendation 4. See also *Whaling in the Antarctic Case*, para 85.

[24] See EU Directive on the deliberate release into the environment of GMOs, preamble in which the step-by-step principle in the context of the release into the environment of GMOs refers to 'the containment of GMOs is reduced and the scale of release increased gradually, step by step but only if the evaluation of the earlier steps in terms of protection of human health and the environment indicates that the next step can be taken.'

[25] See LOSC, art 240(b); OSPAR Code of Conduct for Responsible Marine Research, para 19.

[26] OSPAR Commission, OSPAR Code of Conduct for Responsible Marine Research in the Deep Seas and High Seas of the OSPAR Maritime Area (2008) OSPAR 08.24/1, Annex 6 (2008) ('OSPAR Code of Conduct for Responsible Marine Research') <www.ospar.org> accessed 7 September 2014, para 19(a).

[27] OSPAR Code of Conduct for Responsible Marine Research (n 26) para 17.

[28] See, e.g., Espoo Convention, art 2(3); Cartagena Protocol on Biosafety, Annex III, art 6; EU Directive on the deliberate release into the environment of GMOs, preamble. See also 1987 UNEP Goals and Principles of EIA, principle 1.

[29] Regarding strategic environmental assessment (SEA) requirements in international law see, e.g., Espoo Convention, art 2(7); Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment in a Transboundary Context (adopted 21 May 2003, entered into force 11 July 2010) UN Doc ECE/MP.EIA/2003/2 (Kiev SEA Protocol to the Espoo Convention). See also CBD decision VI/7, 'Identification, monitoring, indicators and assessments' (2002), Annex 'Guidelines for incorporating biodiversity-related issues into environmental impact assessment legislation and/or process and in strategic environmental assessment' <www.cbd.int/decision/cop/?id=7181> accessed 5 February 2015.

[30] See, e.g., Espoo Convention, art 1(v); EU Directive on the deliberate release into the environment of GMOs, art 8.

[31] See, e.g., Ocean Fertilisation Assessment Framework, paras 1.6, 3.5.13.2; Cartagena Protocol on Biosafety, Annex III, art 6; EU Directive on the deliberate release into the environment of GMOs, preamble; Madrid Protocol, art 3(2)(c). See also 1987 UNEP Goals and Principles of EIA, principle 5.

[32] See 1987 UNEP Goals and Principles of EIA, principle 6.

[33] See 1987 UNEP Goals and Principles of EIA, principle 7.

[34] See 1987 UNEP Goals and Principles of EIA, principle 8.

[35] See, e.g., Espoo Convention, Appendix II(g); Ocean Fertilisation Assessment Framework, para 3.4.2.3.

[36] See Cartagena Protocol on Biosafety, Annex III, art 4.

[37] See Ocean Fertilisation Assessment Framework, para 3.5.13.2.

[38] See, e.g., Madrid Protocol, Annex I, art 4; Ocean Fertilisation Assessment Framework, para 4.1; Resolution LP. 4(8), Annex 5, paras 20, 26 and 28; 1987 UNEP Goals and Principles of EIA, principle 5.

[39] See Cartagena Protocol on Biosafety, art 10; See 1987 UNEP Goals and Principles of EIA, principle 9.

[40] See 1987 UNEP Goals and Principles of EIA, principle 9.

[41] See, e.g., Espoo Convention, Annex V; Madrid Protocol, Annex I, art 5(1); Resolution LP.4(8), Annex 5, paras 23–25; Ocean Fertilisation Assessment Framework, para 3.6.6.

[42] See, e.g., Ocean Fertilisation Assessment Framework, para 5.2.

[43] Articles 3(c) and 4 of the Aarhus Convention stipulate the grounds subject to which States Parties may refuse the disclosure of environmental information. Art 4(4) states with regard to a confidentiality exemption that 'the grounds for refusal shall be interpreted in a restrictive way, taking into account the public interest served by disclosure and taking into account whether the information requested relates to emissions into the environment.'

[44] See, e.g., Ocean Fertilisation Assessment Framework, para 1.10.

[45] See, e.g., EU Directive on the deliberate release into the environment of GMOs, art 20(4).

[46] See, e.g., 1987 UNEP Goals and Principles of EIA, principle 5(h); Ocean Fertilisation Assessment Framework, para 1.10.

[47] See, e.g., Ocean Fertilisation Assessment Framework, para 1.9; Madrid Protocol, Annex I, art 3(3).

[48] FAO Code of Conduct for Responsible Fisheries, art 1.1. See also Declaration of the UN Conference on the Human Environment (Stockholm) UN Doc A/CONF/48/14/REV.1 (Stockholm Declaration), Principle 21; Rio Declaration, Principle 2.

[49] See ILA New Delhi Principles on Sustainable Development, principle 7.1; ILA, 'Legal Principles relating to Climate Change' (7–11 April 2014) 76th Conference of the ILA Resolution 2/2014 <http://www.ila-hq.org/en/committees/index.cfm/cid/1029> accessed 30 August 2014, arts 1 and 10.

[50] See Cartagena Protocol on Biosafety, arts 2 and 12; EU Directive on the deliberate release into the environment of GMOs, preamble.

[51] See Cartagena Protocol on Biosafety, arts 2, 35.

[52] Neil Craik, *The International Law of Environmental Impact Assessment Process, Substance and Integration* (Cambridge University Press 2010) 30.

[53] See Aarhus Convention, art 6(2).

[54] The Royal Society Report on Geoengineering (n 1) 61.

[55] Anna-Maria Hubert and David Reichwein, 'An exploration of a code of conduct for responsible scientific research involving geoengineering.' IASS Working Paper, InSIS Occasional Paper No 1. Potsdam & Oxford.<http://www.insis.ox.ac.uk/sites/default/files/insis/documents/media/an_exploration_of_a_code_of_conduct.pdf> accessed 9 October 2017.