PENDING EC APPROVAL

Co-CREATE

Conditions for Responsible Research on SRM

Draft deliverable D2.2: Scoping note on applicable legal frameworks



Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

This work was co-funded by UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee [No. 10123643 – Climate Strategies; No. 10094614 – Trilateral Research Limited; No. 10098060 – University College London; Grant No. 10114521 – University of Manchester].

Document information

Information sheet

Work package	WP2 (Interdisciplinary scoping)
Deliverable	D2.2
Dissemination level	Public (PU)
Document nature	Report (R)
Due date	M8 (30 August 2024)
First submission date	M8 (30 August 2024)
Last revision date	M31 (30 July 2026)
Lead beneficiary	Trilateral Research UK (TRI UK)
Contributors	Trilateral Research IE (TRI IE), University of Lapland (ULAP)
Authors	Julie Vinders (TRI UK), Nicole Santiago (TRI IE), Alaleh Eghbali (TRI IE), Timo Koivurova (ULAP)
Reviewers	Nicola Labanca (TRI IE), Jesse Reynolds (Divided Sky), Matthias Honegger (Perspectives Climate Research – PCR)
Release	François Pougel (PCR) and Inés J. Rodríguez (Climate Strategies)

Pending EC approval

Revision history

Version	Date	Author(s)	Description
0.1	31 Mar. 2024	Julie Vinders (TRI UK)	Outline
0.2	21 Jun. 2024	Julie Vinders, Nicole Santiago (TRI IE), Alaleh Eghbali (TRI IE), Timo Koivurova (ULAP)	Initial draft for contributions
0.3	09 Jul. 2024	Julie Vinders, Nicole Santiago, Alaleh Eghbali, Timo Koivurova	First version for internal review
0.4	15 Jul. 2024	Julie Vinders, Nicole Santiago, Alaleh Eghbali, Timo Koivurova	Draft for QA
0.5	30 Aug. 2024	Julie Vinders, Nicole Santiago, Alaleh Eghbali, Timo Koivurova	Originally submitted draft (pending EC approval)
0.6	30 Jul. 2026	Julie Vinders, Nicole Santiago	First revised draft following EC comments
0.7	16 Nov. 2026	Julie Vinders, Nicole Santiago	Second revised draft following EC comments

Pending EC approval

About this deliverable

The Co-CREATE project

Experimental research on solar radiation modification (SRM) is controversial and feared to distract from climate change mitigation or lead to dangerous SRM use. It is not clear whether and under which conditions and governance arrangements experimental SRM research may be desirable for reducing uncertainties and lowering the probability of problematic outcomes including unilateral deployment elsewhere. Co-CREATE seeks to help structure this decision problem through co-creative scoping, analysis and engagement for the development of principles and guidelines.

Deliverable description

At least one scoping note on the current legal landscape summarising insights on the current legal landscape and support further examination of legal aspects in WP4.

This note draws on task 2.2 which maps existing legal frameworks and their governance implications at the international and EU level – including in the European Research Area (ERA) – of relevance for SRM (future potential deployment and potential SRM research). This work builds on legal analysis carried out in the TechEthos project and includes examination of how environmental legal frameworks and principles, such as the precautionary principle and the no-harm rule, conceptualise SRM and how they suggest defining experimental SRM research. A first scoping of the legal permissibility, such as within the UN Convention on Biological Diversity (CBD), other international governance mechanisms, and provisions of EU or state-level governance contexts (e.g. environmental impact assessment) in the ERA presently. Varying involvement of individual nations in international governance institutions (e.g. Russia or the US) is also considered toward examining governance effectiveness. Key definitional issues are thus outlined from a legal perspective including the delineation between research versus deployment.

Keywords

Solar radiation modification; SRM; solar geoengineering; albedo modification; international law; European Union law; national law; human rights law; indigenous rights law; environmental law; climate change law;

Pending EC approval

law of the sea; space law; polar law; intellectual property law; rules on State responsibility; civil and criminal liability law.

Suggested citation

Vinders, J., Santiago, N., Eghbali, A. and Koivurova, T. (2026) *Draft deliverable D2.2: Scoping note on applicable legal frameworks*. Co-CREATE project. Available at: https://co-create-project.eu/publications/.

Funding

Project co-funded by the European Commission within the Horizon Europe Programme [Grant Agreement No. 101137642] and UKRI under the UK government's Horizon Europe funding guarantee [No. 10123643 – Climate Strategies; No. 10114521 – University of Manchester; No. 10094614 – Trilateral Research Limited; No. 10098060 – University College London].

Disclaimer and scope

Views and opinions expressed are those of the author(s) and do not necessarily reflect those of other individual members of the Co-CREATE consortium or of the project's funders, who cannot be held responsible for them. This report is intended to inform deliberation on the governance of solar radiation modification (SRM) research rather than prescribing specific policies. It does not represent an endorsement of, or a recommendation for, any specific SRM research activity or the deployment of SRM.

Licence

© 2026 Co-CREATE project. This deliverable is made available under the Creative Commons Attribution 4.0 International Licence (CC BY 4.0). You are free to share and adapt the material for any purpose, provided appropriate credit is given, a link to the licence is provided and any changes are indicated. Third-party material (including figures and data attributed to other sources) is excluded from this licence and remains subject to its own terms. Licence: CC BY 4.0 — https://creativecommons.org/licenses/by/4.0/

Cover photograph by Thomas Koukas on Unsplash.

Pending EC approval

Table of contents

Document information 2

About this deliverable 4

List of tables and glossary 7

1. Introduction 9

1.1. Legal research methodology 9

1.2. Outline of the scoping note 12

2. Legal issues pertaining to SRM 12

3. Scoping of applicable legal frameworks 17

3.1. Human rights law 17

3.2. Indigenous law and indigenous rights law 18

3.3. Environmental law 18

3.4. Climate change law 23

3.5. Location-specific legal frameworks 24

3.6. Intellectual property (IP) rights law 25

3.7. Rules on responsibility and liability 26

4. Next steps 27

Pending EC approval

List of tables and glossary

List of tables

Table 1. Legal frameworks, governance levels and corresponding issues pertaining to SRM. Page 15

Glossary

ATS	Antarctic Treaty System
BBNJ	Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction
CBD	United Nations Convention on Biological Diversity
COP	Conference of the Parties
DoA	Description of Action
EC	European Commission
EEZ	Exclusive economic zone
EIA	Environmental impact assessment
ENMOD	Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques
ERA	European Research Area
EU	European Union
GHG	Greenhouse gas
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICJ	International Court of Justice
ILO	International Labour Organization
IP	Intellectual property
IPCC	Intergovernmental Panel on Climate Change
ITLOS	International Tribunal for the Law of the Sea
LC/LP	London Convention / London Protocol

Pending EC approval

MCB	Marine cloud brightening
SAI	Stratospheric aerosol injection
SFDR	Sustainable Finance Disclosures Regulation
SRM	Solar radiation modification
UDHR	Universal Declaration of Human Rights
UN	United Nations
UNCED	UN Conference on Environment and Development
UNCLOS	UN Convention on the Law of the Sea
UNFCCC	UN Framework Convention on Climate Change
WP	Work Package
WTO	World Trade Organization

Pending EC approval

1. Introduction

Solar radiation modification (SRM) raises a broad range of governance challenges. Legal frameworks are an important element in the broader governance context, which in our understanding also includes informal processes and decisions that steer outcomes. As such, the extent to which legal issues and considerations already pertain to SRM research or where there might be potential to remedy any gaps is an important consideration for the Co-CREATE project.

As of July 2024, there are no binding laws specific to the governance of SRM and SRM research. Nevertheless, many existing norms, including legal frameworks and principles, are applicable and likely to have significant implications for the governance of SRM research. This scoping note outlines relevant legal issues and applicable legal frameworks, predominantly at the international and European Union (EU) level. It examines how existing legal frameworks and principles conceptualise SRM and its research and identifies legal issues that deserve further consideration and analysis. This scoping note provides the basis for an in-depth analysis of legal aspects planned under the Co-CREATE work package 4 (Legal and Ethical Analysis).

1.1. Legal research methodology

1.1.1. Methodology and search terms

The scoping note is intended to offer a short introduction to the legal issues and relevant legal frameworks pertaining to the governance of SRM research. Its aim is to scope out the legal issues and relevant legal frameworks in relation to SRM for a lay audience in a brief and accessible format. It is the first step in the IRAC (issue, rule, application, conclusion) legal research methodology and is intentionally kept at a high level to set the basis for the in-depth legal analysis of Co-CREATE WP4 (D4.2 specifically). It is not intended to analyse the legal issues identified, or draw any premature conclusions or implications from those, but rather focus on raising these issues and identifying relevant legal frameworks as the starting point for deeper legal analysis.

The scoping of legal issues and applicable legal frameworks involved a desk-based scanning of relevant primary and secondary sources of law, including legislation, policies, academic papers, scientific journal articles,

Pending EC approval

legal literature, Conference of the Parties (COP) discussions and decisions, and news or forum articles.

The Intergovernmental Panel on Climate Change (IPCC) defines SRM as referring to "a range of radiation modification measures not related to greenhouse gas (GHG) mitigation that seek to limit global warming". The Horizon Europe Work Programme 2023–2024, through which the Co-CREATE project is funded, defines SRM as "an approach to reduce solar radiative forcing through means other than through the reduction of net greenhouse gas emissions". Other terms used for SRM include solar radiation management, solar geoengineering, climate engineering, climate intervention, and albedo modification. SRM may also be described as techniques that modify or reduce incoming solar radiation to counteract climate change.

1.1.2. Identifying legal issues

To identify the legal issues pertaining to SRM research, a broad spectrum of questions was considered. Roughly following the TAPP approach (things, actions, people, places) for identifying legal issues, we considered how different aspects of SRM may give rise to legal issues and therefore trigger certain legal frameworks:

Things: Firstly, we considered what constitutes SRM and what aspects of an SRM activity may give rise to certain legal issues. There is no legal definition of SRM at the international or EU level, and there are several working definitions, such as by the IPCC and the EU. Things to consider include:

- Intent, effect and scale: It is important to consider whether an activity can be considered SRM based on its intended purpose or its (un)intended effect. The scale of the activity may also become relevant, if SRM is defined as an activity that has an impact on slowing down global temperature increase.
- Research type: different types of SRM research activities may be associated with different levels of risk and might range from indoor modelling to small-scale field tests or large outdoor experiments.
- Research versus deployment: Furthermore, it is important to delineate between SRM research and SRM deployment, since different laws may apply to an activity that is considered 'research for peaceful purposes'.
- Materials used: The specific characteristics of an SRM proposal or research activity may also give rise to distinct legal issues and trigger

Pending EC approval

certain legal frameworks, such as the type of chemicals used as reflective aerosols.

Actions: The manner in which an SRM research activity is carried out may give rise to certain legal issues. Actions to consider include:

- For example, the degree of transparency and consultation of a proposed activity may trigger certain procedural laws to apply.
- Furthermore, the risks associated with an SRM activity may trigger legal frameworks related to due diligence, environmental assessment and precaution.

People: It is important to consider the people involved in an SRM activity. People to consider include:

- Those who carry out the activity;
- Those who might be affected by it;
- Those who govern or control the activity;
- Those who fund it;
- Those who own the rights and interests arising out of the activity;
- Those who might be responsible or liable if things go wrong and in the event of harm.

Places: It is relevant to consider the various places where an SRM research activity may take place or affect, since this may trigger certain location-specific legal frameworks. Places to consider include:

- An SRM activity may be land-based, air-based, water-based, ice-based or space-based.
- Furthermore, the activity may take place within the national territory of a State, or in one of the areas beyond national jurisdiction, such as international waters, Antarctica, or space.
- It is important to not only consider where the activity takes place, but also where the activity may have an effect, which if transboundary, would trigger various international laws.

This first identification of issues points to important questions on the 'what, who, how and where' of potential SRM activities, which will be relevant to analysing the legality of those activities. Therefore, it is not possible to make generalised or blanket statements on the legality of all SRM research and deployment activities.

Pending EC approval

1.1.3. Scope and limitations

This legal scoping note predominantly focuses on relevant legal frameworks at the international, multilateral and EU level. Where relevant, national law is considered in general terms (non-country specific). This legal scoping note does not consider policy statements or documents, independent expert recommendations, or academic positions. Those are the object of analysis in other parts of the Co-CREATE project.

Nothing in the scoping note is intended or should be read as a recommendation of legal interpretation from the Co-CREATE project, nor should it be interpreted as a position either for or against SRM research or deployment. Rather, the purpose of the scoping note is to identify legal issues and to provide a high-level overview of relevant legal frameworks for a lay audience.

This legal scoping note covers SRM broadly, including research and deployment. We note that some cases allow a bright-line distinction between research and deployment activities, whereas in other cases such differentiation is more ambiguous. Where relevant and possible, the distinction between research and deployment is made.

1.2. Outline of the scoping note

Section 2 outlines the legal frameworks and corresponding issues pertaining to SRM. Section 3 examines the current legal landscape and identifies the relevant legal frameworks at the international and EU level for the governance of SRM. Section 4 concludes with some key considerations for the in-depth legal analysis planned in WP4 of the Co-CREATE project.

2. Legal issues pertaining to SRM

The first scoping analysis of legal issues encountered five overarching challenges and considerations that cut across the legal issues identified in this section. Each of these challenges complicates the analysis of SRM governance and will require further attention in the in-depth legal analysis under WP4.

Ambiguities and conflicts among definitions: A key challenge concerns the absence of an agreed definition for SRM research. No binding international or EU instrument defines SRM, SRM research or SRM deployment. Several working definitions exist, such as those of the IPCC and Horizon Europe

Pending EC approval

Work Programme, but these carry no legal force. The closest approximation to an authoritative definition in international law is found in Decision X/33, adopted by the Conference of the Parties to the UN Convention on Biological Diversity (CBD) in 2010, which addresses geoengineering in the context of biodiversity. It broadly defines SRM as "any technologies that deliberately reduce solar insolation". This decision is regarded as significant soft law carrying authoritative weight in the geoengineering governance debate. However, as a decision, it is not legally binding, and its application is confined to the states party to the CBD. Beyond the definition of SRM itself, definitional ambiguities exist around the delineation between SRM research and SRM deployment, particularly where different rules may apply to govern research activities. Further questions arise at the boundaries between SRM and adjacent activities, such as weather modification and climate adaptation. Furthermore, an outdoor SRM research experiment may resemble other atmospheric physics research with different purposes. There is no legal definition of SRM research as such, leaving ambiguity as to the precise scope of an SRM research governance framework, the specific legal frameworks it may trigger, which actors bear what obligations, and what governance gaps exist.

Room for interpretation among existing laws and legal principles: Even where relevant legal frameworks exist, they frequently leave significant room for interpretation in their application to SRM. Key principles of international environmental law, such as the precautionary principle and the no-harm rule, have been formulated in multiple ways across different instruments and jurisdictions, and their application to SRM is unclear and subject to much debate. This interpretative room means that legal analysis cannot produce definitive conclusions about the permissibility of SRM activities *ipso facto*. Instead, these laws provide interpretative guidance through decision-making processes, which can have a range of governance implications.

Limitations in the suitability of existing legal frameworks for the governance of SRM: Many of the legal frameworks identified in this scoping note were not developed with SRM in mind, and do not map neatly onto its characteristics. SRM presents governance challenges that existing frameworks were not designed to address: the effects of SRM are potentially transboundary in nature and scale. Furthermore, potential harms caused by SRM may be difficult to attribute to a specific actor or State, which is often a requirement for establishing liability. Frameworks developed for more localised environmental harms, such as Environmental

Pending EC approval

Impact Assessment (EIA), public participation, or national liability regimes, may struggle to accommodate activities whose impacts may be widely dispersed, and affect populations far beyond the jurisdiction in which the activity takes place. The gap between what existing law requires and what effective SRM research governance would look like is a key consideration for the development of any future research governance framework.

The adequacy of governance mechanisms and their effectiveness: The adequacy and effectiveness of governance mechanisms often depend on factors that vary significantly across the international system. Varying levels of participation in relevant international instruments, such as the absence of major actors such as the United States and Russia in key international treaties, limits the universal applicability of existing legal frameworks. Furthermore, the effectiveness of soft law instruments in influencing State behaviour, such as the CBD Decision X/33 mentioned above, is inherently uncertain. At the EU level, governance mechanisms are generally more developed, but SRM research conducted outside the EU but funded through the EU or impacting EU territory, still raises questions about the reach of EU law.

Tensions between countervailing risks of climate change and of SRM: A final cross-cutting challenge concerns the framing of SRM within legal and governance discourse. Existing environmental law is largely oriented towards preventing harm and protecting the status quo of the natural environment. SRM, however, is proposed precisely because the status quo, a rapidly warming climate, is itself understood to be harmful. This creates a fundamental tension between frameworks aimed at preventing environmental modification and SRM research activities aimed at preventing harms through climate change, as exemplified by the precautionary principle in section 3.3.1. More broadly, the legal analysis of SRM must grapple with the question of how existing law weighs the risks of acting against the risks of not acting.

Table 1 provides an overview of legal frameworks that were identified as potentially relevant to SRM, organised by the legal issues they raise.

Pending EC approval

Table 1. Legal frameworks, governance levels and corresponding issues pertaining to SRM.

Legal framework	Governance level	Legal issues
Human rights law	International /regional /national	Freedom of scientific research Right to access benefits of science Right to moral and material interests of scientific research Rights of research participants Right to information Right to participate in public affairs Right to access legal remedies Right to life Right to privacy and private life Right to a healthy environment Right to health Right to food Right to water Right to property Protection of vulnerable people and groups
Indigenous rights law	International /regional /national	Right to the conservation and protection of indigenous land, territories and resources Free, prior and informed consent Representation of and consultation with indigenous peoples
Environmental law	International /regional /national	Precautionary principle No-harm rule Environmental protection; biodiversity and protected areas Pollution regulation Protection of the ozone layer Environmental management including (hazardous) wastes and chemicals Environmental impact assessments

Pending EC approval

		Access to information, public participation and access to justice in environmental matters Corporate disclosure and sustainable finance Environmental modification
Climate change law	International /regional /national	Global temperature goals Balance between emissions by sources and removals by sinks Climate mitigation Climate adaptation Technology transfer
Outer space law	International /national	State responsibilities in outer space Exploitation and mining of space resources Research activities in outer space
Law of the sea	International	Prevention, reduction and control pollution of the marine environment Territorial waters, exclusive economic zone (EEZ) Activities in the high seas Research activities in the high seas Ocean dumping
Polar law	International /regional /national	Arctic governance Antarctic governance; freedom of scientific investigation, environmental protection Research activities in the Arctic and Antarctic
Intellectual property law	International /regional /national	IP regulation of SRM
Civil and criminal liability under national law	National	Civil liability Criminal liability

Pending EC approval

3. Scoping of applicable legal frameworks

The legal issues identified in section 2 relate to a broad range of legal frameworks that are applicable to SRM research. Only a handful of legal frameworks specifically address SRM. The majority of the relevant legal frameworks contain non-technology specific provisions that seek to protect certain general interests, such as human rights or the environment. These frameworks were not developed with SRM in mind, nor do they explicitly mention SRM. Yet, they are nonetheless relevant in the analysis of the current legal landscape pertaining to SRM.

3.1. Human rights law

Human rights are the rights inherent to all human beings. They are enshrined in multiple treaties at the international and regional level, as well as in national law. Human rights, specifically relevant in the context of SRM research, can be grouped into three categories: rights related to scientific research, procedural rights, and substantive rights.

Rights related to scientific research refer to the freedom of researchers to carry out scientific research activities, the rights of research participants, and everyone's right to benefit from scientific progress. Procedural human rights relate to ensuring the processes are in place to guarantee the protection of other rights; procedural human rights include the right to information, public participation, and access to legal remedies. Substantive human rights include the right to life, the right to health (including the right to food, and the right to water), and the right to a healthy environment, to name a few.

While human rights law does not explicitly address SRM, human rights are relevant given the profound implications SRM may have on human beings. SRM has the potential to both enhance and interfere with the enjoyment of human rights. Human rights are indivisible and interdependent, but have to be balanced against one another, so that the enjoyment of one right does not infringe or limit the enjoyment of other rights. This means that researchers engaged in SRM research may have the right to scientific freedom, but the exercise of that right should not interfere with the protection of other procedural and substantive human rights. The practical implementation of certain human rights by States, such as to ensure that no scientific experimentation takes place without the consent of research participants, may become particularly challenging in the context of SRM

Pending EC approval

research, where a significant number of individuals may be impacted by the SRM research activity.

3.2. Indigenous law and indigenous rights law

Indigenous law is a collective term that refers to the legal traditions (rules, customs, code of conduct, etc.) of diverse Indigenous Peoples around the world. Indigenous law is distinct from the national laws of modern nation states. In many indigenous communities, indigenous law is applied in addition or instead of national law. At the international level, indigenous rights are recognised in the UN Declaration on the Rights of Indigenous Peoples and the legally binding International Labour Organization (ILO) Convention 169 for Indigenous and Tribal Peoples. Together, these provide the framework to ensure Indigenous Peoples have the right to full enjoyment of internationally recognised human rights as a collective or as individuals, including rights to information, consultation, and consent on environmental projects that impact indigenous land and resources.

SRM activities that take place in or affect indigenous land or communities may be subject to local and international indigenous law, including requirements to provide information, consult, and obtain consent for projects that impact the environment or resources on indigenous land. In fact, at least one planned SRM research activity was halted because of strong opposition from an indigenous group with concerns about lack of consultation and potential environmental harm.

3.3. Environmental law

International and EU environmental law is concerned with the protection of the environment and human health. The development of international environmental law started in the 1960s and has evolved into a sophisticated body of law that covers a broad range of environmental matters. The 1992 Rio Declaration, adopted at the UN Conference on Environment and Development (UNCED), is regarded as the most significant universally endorsed statement of rights and obligations related to the environment. Whilst the declaration is not legally binding, it contains many principles of international environmental law, including the precautionary principle, and statements of customary international law. Today, international environmental law is comprised of international and multilateral environmental agreements and treaties, principles of environmental law, customary international law, and international case law.

Pending EC approval

3.3.1. The precautionary principle

When applied in the context of the environment, this principle states that, in case of a risk of significant or irreversible harm, States should take a precautionary approach to protect the environment. Furthermore, the Rio Declaration states that the lack of full scientific certainty should not be used to postpone cost-effective measures to prevent environmental degradation in the case of threats of serious or irreversible damage. However, the principle has been formulated in numerous ways, and many different interpretations can be found in different jurisdictions and broader literature.

The precautionary principle has been discussed in the context of climate change, as well as in the context of SRM. The precautionary principle raises the question as to what appropriate measures should be taken to prevent harm to the environment due to climate change. Proponents of SRM research argue that conducting such research could be seen as a precautionary measure against the risk of failing to stabilise global temperatures through mitigation alone. However, due to the risks of SRM and SRM research, it is argued that the precautionary principle can also be invoked to restrict such activities. The operationalisation of the principle often remains ambiguous, as the principle is not intended to prescribe a specific outcome, but rather guide the decision-making process around any precautionary measures to be taken in a risk environment.

3.3.2. The no-harm rule

The no-harm rule is considered a general principle of customary international law, where States have an obligation to prevent, reduce and control the risk of environmental harm to other States. A State is required to act with due diligence, using all means at its disposal to prevent significant transboundary harm to the environment. This duty applies in relation to direct activities by the State, as well as private actors within the State's jurisdiction and control. The International Court of Justice (ICJ) has applied the 'no-harm' rule in several legal cases concerning environmental damage, providing a source of context and legal interpretation of the principle.

In the context of SRM, the no-harm rule means that States have an obligation to take all means at their disposal to prevent significant transboundary harm to the environment that may be caused by SRM activities. Any SRM activity that involves such a risk of significant transboundary environmental harm therefore puts an obligation on the relevant State to take measures to prevent such harm. In doing so, States

Pending Endorsement

must take appropriate steps to assess the risk of a proposed activity, and exercise due diligence by exerting all reasonable efforts to reduce the risk of transboundary harm.

3.3.3. Environmental protection, biodiversity and conservation

Most of environmental law is concerned with the protection of the environment, biodiversity, and human health. There are many overarching treaties and legal frameworks that are specifically aimed at environmental protection, such as biodiversity, ecosystem conservation, or habitat protection. Key examples include the Stockholm Declaration, the Rio Declaration, the UN Convention on Biological Diversity (CBD) at the international level, the Bern Convention on the Conservation of European Wildlife and Natural Habitats under the auspices of the Council of Europe, and the EU Habitats Directive at the EU level.

Any SRM activity that has an expected impact on environmental protection and conservation may trigger such laws at the international, regional or EU level. Citing the precautionary principle, the parties to the CBD explicitly addressed geoengineering in Decision X/33 in 2010 (and various subsequent decisions), stating that no geoengineering activities that may affect biodiversity should take place in the absence of science-based, global, transparent and effective control and regulatory mechanisms. Some exceptions apply to small-scale scientific research studies. However, any SRM research experiment at a scale that could impact biodiversity may not be permissible unless there are strict controls and oversight in place, and only in the absence of adverse effects on biodiversity and natural habitats.

3.3.4. Pollution regulation

A key component of international and EU environmental law is the prevention of pollution. Such laws often relate to the prevention of air, soil, water or noise pollution, and often come with a pollution type-specific treaty or legal framework, such as the 1979 Convention on Long-Range Transboundary Air Pollution (LRTAP). Liability for environmental damage caused by pollution is based on the 'polluter-pays' principle, also recognised in the 1992 Rio Declaration.

Various stages of SRM activities may be associated with a risk of environmental pollution, or a degree of scientific uncertainty as to the potential risks of pollution. States have a responsibility under international law to take appropriate measures to prevent harm associated with pollution, including those caused by SRM activities under their control or

Pending EC approval

within their jurisdiction. SRM activities may be subject to specific international laws regulating emissions, such as the Helsinki, Oslo and Gothenburg Protocols to the LRTAP, which set legally binding sulphur dioxide (SO_2) emission ceilings. Pollution caused by an SRM activity may result in State responsibility under international law or liability for environmental harm under EU law and national law.

3.3.5. Protection of the ozone layer

The most prominent treaty at the international level is the Vienna Convention on the Protection of the Ozone Layer and the subsequent Montreal Protocol, which contain rules for State Parties to take appropriate measures to protect human health and the environment against the adverse effects of human activities that may modify the ozone layer.

Depending on the type of SRM activity and the materials used, laws related to the protection of the ozone layer may apply. For example, SRM activities that modify the ozone layer, such as the use of certain chemicals in stratospheric aerosol injection (SAI) activities or marine cloud brightening (MCB) field tests, may trigger laws related to the protection of the ozone layer.

3.3.6. Environmental management including (hazardous) wastes and chemicals

Legal frameworks concerned with environmental management are often closely related to those addressing pollution. International and EU waste management frameworks regulate the disposal of hazardous materials and wastes to ensure such materials are taken care of in an environmentally sound manner. Chemicals frameworks regulate certain chemicals and emissions that may have a negative impact on the environment and/or human health.

Some SRM activities may fall within the scope of these environmental management regimes. For example, SRM activities, involving the use of certain chemicals, such as MCB using regulated chemical as reflective material, may trigger specific laws on the use of those chemicals. Furthermore, waste frameworks may apply to certain SRM research activities if the placement of certain chemicals can be considered as 'disposal of wastes' within the meaning of relevant laws related to waste management.

Pending EC approval

3.3.7. Environmental impact assessment

Environmental impact assessments (EIA) are intended to evaluate the likely impact of a proposed activity on the environment. EIAs seek to inform decision-makers about the possible environmental impacts of a proposed project and inform other States of possible transboundary impacts. Related to EIAs are Strategic Environmental Assessments (SEAs), which seek to evaluate the environmental impacts of proposed plans, policies or programmes. Where EIAs may be carried out by research teams directly, SEAs generally take place at a higher programme level, and may be carried out by research funders, governments or other authorities. The key instrument at the international level is the Espoo Convention, which has been implemented at the EU level through the EIA and SEA Directives, setting out the specific requirements for EIAs and SEAs in the EU.

Rules related to EIAs and SEAs would likely apply to SRM research programmes and SRM research activities (particularly outdoor experiments) due to their intended impact on the environment. EIA law would require SRM activities to comply with rules related to the planning stage of a proposed activity, consultation requirements, and the consideration of steps to mitigate adverse environmental impacts.

3.3.8. Access to information, public participation and access to justice

The Aarhus Convention is the leading international environmental treaty on environmental democracy. It obliges States to protect the right of access to information, public participation, and access to justice in environmental matters that may have a significant environmental impact.

The Aarhus Convention may apply to an outdoor SRM activity due to the intended impact of SRM on the environment. As such, States have an obligation to take appropriate steps to facilitate access to information, public participation and access to justice in proposed or existing SRM activities. A challenge in applying the Aarhus Convention to SRM might be in determining the appropriateness of the existing obligations of States and the extent to which States can access to information, public participation and access to justice, particularly when SRM activities may have a transboundary and potentially global impact.

3.3.9. EU Taxonomy and the 'do no significant harm' principle

Private actors may play an important role in many aspects of environmental governance. The EU has adopted various laws with a view to promoting

Pending EC approval

transparency, access to information and public participation in the context of environmental matters.

The EU Green Deal recognises the importance of transitioning private sector investment towards sustainable finance. The EU Taxonomy Regulation is the cornerstone for the EU's sustainable finance framework and provides a classification system for economic activities to align with the EU's net-zero by 2050 target and broader environmental goals.

Privately funded SRM activities may be subject to EU laws related to corporate disclosure, such as the Sustainable Finance Disclosures Regulation (SFDR). Any SRM activity involving private investment and claiming to be 'environmentally sustainable', would need to demonstrate its contribution to the six environmental objectives outlined in the Taxonomy Regulation, and comply with the principle of 'do no significant harm'.

3.3.10. Environmental modification

The international legal framework on environmental modification is the 1976 UN Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD). The Convention defines environmental modification as "any technique for changing – through deliberate manipulation of natural processes – the dynamics, composition or structure of the earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space".

SRM is likely to fall within the definition of environmental modification as defined by ENMOD, meaning that the military or hostile use of SRM is prohibited. Peaceful uses of SRM would not be prohibited. In fact, State Parties are encouraged to exchange scientific and technical information on the use of environmental modification techniques for peaceful purposes and to contribute to the international economic and scientific cooperation in the preservation, improvement and peaceful utilisation of the environment, whilst considering the needs of developing areas of the world.

3.4. Climate change law

Climate law refers to the regulatory regime to address climate change. It generally relates to States' obligations to balance sources of greenhouse gas (GHG) emissions with removals by sinks, and to adapt to an inevitably changing climate (i.e. adaptation). Climate law is based on the United Nations Framework Convention on Climate Change (UNFCCC) and subsequent agreements, including the 2015 Paris Agreement to limit global

Pending EC approval

warming. Additionally, there are frameworks at the regional (e.g. European Climate Law), national, and local levels to support achievement of the internationally agreed goals and objectives.

SRM is not explicitly referenced in climate law. The overall goal of the UNFCCC is to stabilise greenhouse gas emissions, to which SRM can only indirectly contribute by protecting the Earth system's CO_2 absorption capacities. SRM could contribute to keeping global temperatures low, as stipulated in the Paris Agreement. However, SRM does not reduce emissions or remove GHGs, and therefore falls outside the scope of the provisions of existing climate law frameworks.

3.5. Location-specific legal frameworks

SRM activities may take place in areas governed by additional international legal frameworks only relevant in that specific location. These areas include outer space, marine environments, and the polar regions. The related location-specific legal frameworks apply in addition to any relevant international, regional, and/or national laws.

3.5.1. Outer space law

Outer space law is comprised of five international treaties that govern the activities of States in outer space. Collectively, the treaties guarantee open access to explore space including for scientific investigation, provide a framework for liability, and address some concerns related to environmental protection.

SRM is not explicitly referenced in any outer space law treaty. SRM activities in outer space would likely be subject to existing obligations within this framework. For example, States may be required to register any space-based object used for SRM or supervise the activities of private companies conducting space-based SRM research.

3.5.2. Law of the sea

Any activity in the world's oceans and seas is governed by a body of law called law of the sea. The primary international legal treaty is the United Nations Convention on the Law of the Sea (UNCLOS), which applies to all oceans and seas, including international waters (or the high seas). UNCLOS includes many provisions on marine environmental protection. Subsequent international and regional agreements create further obligations related to environmental protection and transboundary harm, including the London Convention and London Protocol (LC/LP) for the deliberate disposal of

Pending EC approval

waste and the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction (BBNJ Agreement), which has been adopted but is not yet in force.

Any marine-based SRM activity, and potentially land-based ones that would affect the marine environment, will be subject to law of the sea obligations, including those related to prior assessment, permitting and ongoing monitoring, and liability for damage to the marine environment. Furthermore, the existing governance frameworks are a forum for developing future rules on SRM, especially as they relate to protection of the marine environment. The LC/LP Parties have already begun a legal and technical analysis to evaluate the possible need for regulation of marine geoengineering, including marine cloud brightening and microbubbles, reflective particles and materials.

3.5.3. Polar law

Polar law refers to treaties and frameworks that govern activities in the Antarctic and Arctic regions. In the Antarctic, there is the 1959 Antarctic Treaty and subsequent agreements (collectively known as the Antarctic Treaty System or ATS). In the Arctic, the Arctic Council is an intergovernmental policy forum under which Arctic States have negotiated binding legal agreements and issued non-binding recommendations for the region. The governance mechanisms and treaties in both regions primarily focus on environmental protection and cooperation in scientific research.

Whilst there are no rules specific to SRM in the polar regions, any existing or proposed activities, such as surface albedo modification to reduce Arctic ice melt, may be subject to existing rules on scientific research (e.g. impact assessments, data sharing, on-site inspections). In the Antarctic, rules would be decided within the ATS; in the Arctic, rules might be decided by the Arctic States.

3.6. Intellectual property (IP) rights law

Intellectual property (IP) rights are the rights associated with intangible assets, including copyrights, patents, and trade secrets. These rights enable creators to control how their creations and inventions are used and exploited. IP law extends the international human right to protect the moral and material interests arising from scientific, literary or artistic productions.

While currently no specific IP rules address SRM, IP such as patents and trade secrets could play a significant role for private sector actors in the

Pending EC approval

research and development of SRM technologies. As a scientific innovation, researchers and developers of SRM techniques have a right to protect their IP. However, given the global interests at stake with SRM research, and in the interest of promoting transparency and collaborative research efforts, some have suggested different proposals for the management of IP in the context of SRM, such as limiting the possibility of patenting SRM interventions, or forming 'data commons' to ensure SRM research data is freely and publicly available.

3.7. Rules on responsibility and liability

3.7.1. International rules on State responsibility

Rules on State responsibility are considered customary international law and are codified in the International Law Commission (ILC) Draft Articles on Responsibility of States for Internationally Wrongful Acts. All States are subject to these rules on State responsibility, which dictate the responsibility of a State for breaching an international obligation. This includes ensuring activities within a State's jurisdiction or under its control do not breach an international obligation, such as the no-harm rule. In the context of SRM, this means that States have a responsibility to prevent breaches of international obligations caused by activities within its jurisdiction or under its control.

3.7.2. EU law on liability

At the EU level, the *Francovich* doctrine establishes a liability framework for Member States for the non-compliance with, or failure to implement EU legislation. Furthermore, the EU's liability regime for environmental damage may give rise to liability for environmental damage caused by certain activities, building on the 'polluter-pays' principle. The latter framework may be particularly relevant to SRM activities that cause environmental damage. However, a key challenge in enforcing liability rules may be the attribution of harm to a specific SRM activity.

3.7.3. National law on civil and criminal liability

Whilst international rules are concerned with the prevention of transboundary harm and responsibility for breaches between States, national law provides the framework for establishing liability for harms caused by natural or legal persons. In many jurisdictions, the law of tort (or law of delict in some jurisdictions) is concerned with establishing civil

Pending EC approval

liability for wrongful acts, whereas criminal law is concerned with criminal liability for wrongful acts.

National law related to civil and criminal liability may be relevant for SRM when damage occurs in the territory of the concerned State. Where international rules of State responsibility require a transboundary element when damage occurs, national law may also give rise to liability for damage within national boundaries. This may be particularly relevant for outdoor SRM research activities of which the impacts and potential harms remain within national boundaries. It would also be relevant for local or regional applications of SRM techniques, such as cooling a city, protecting local ecosystems, or preserving Arctic ice.

4. Next steps

This scoping note on applicable legal frameworks forms the basis for the in-depth legal analysis the Co-CREATE project will undertake as part of WP4 (ethical and legal analysis). The legal analysis will build on the list of legal issues identified in section 2, and analyse the relevant legal frameworks identified in section 3 in the context of SRM. The report will outline the legal dimensions of a potential governance framework for SRM research. It will also be used towards the Co-CREATE synthesis report, which seeks to bring contributions from the project's building blocks (ethical and legal analysis, governance analogues, analytical frameworks and engagement processes) into a comprehensive toolset for identifying the conditions for responsible SRM research (WP7).

Pending EC approval

Page left intentionally blank

Pending EC approval

Co-CREATE

Conditions for Responsible Research on SRM

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

This work was co-funded by UK Research and Innovation (UKRI) under the UK government's Horizon Europe funding guarantee [No. 10123643 – Climate Strategies; No. 10094614 – Trilateral Research Limited; No. 10098060 – University College London; Grant No. 10114521 – University of Manchester].