A RIGHTS-BASED APPROACH TO GOVERNANCE OF CLIMATE GEOENGINEERING

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SUMMARY

Faced with the growing threat of climate vulnerability, many have turned to the idea of geoengineering. However, many environmentalists and human rights advocates are wary of the risks related to geoengineering. At present, there is no international agreement that governs the deployment of geoengineering technologies. This Article explores a rights-based approach for the governance of geoengineering in international law, including the impetus, rationale, and options for implementation. The approach would take into account the need for participation, accountability, nondiscrimination, and equality in its development and deployment, while addressing the potential of such technologies in mitigating the impacts that climate change would have to the full enjoyment of human rights, including the right to a healthy environment.

> But we also need to acknowledge that the geoengineering genie is already out of the bottle. The likelihood of unilateral deployment of solar geoengineering increases every year. The global community must decide whether to engage now, by setting clear governance rules and guardrails, or allow individual actors to take the lead, creating a fait accompli for the rest of us.
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> — Ban Ki-moon,
> Secretary-General of the
> United Nations, 2007-2016[1]

Climate change is without question the greatest challenge of our generation, and we have no choice but to face this challenge head-on. The past five years have collectively been the warmest years in modern history.[2] The impacts of climate change are already being felt all over the world and have wide-ranging implications on both the environment and on various socioeconomic sectors.[3] We have to take unprecedented and ambitious steps if we are to have any hopes of slowing down these impacts.

In 2015, the Paris Agreement was adopted with the goal of holding "the increase in the global average temperature to well below 2° [Celsius (C)] above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change."[4] To this end, Parties are to undertake and communicate ambitious efforts that show progression over time through their nationally determined contributions.[5] However, the Emissions Gap Report published by the United Nations Environment Programme in November 2019 states that even if all the current conditional and unconditional national contributions on greenhouse gas reductions are met, we are still headed toward a minimum trajectory of a 3°C average temperature rise by the end of the century and an emissions reduction gap of about 30 gigatonnes of carbon dioxide equivalent ($GtCO_2e$) from the 1.5°C pathway.[6]

In the Intergovernmental Panel on Climate Change's (IPCC's) special report (SR1.5) on the impacts of global warming of 1.5°C above pre-industrial levels and related

1. Ban Ki-moon, *Governing Geoengineering*, Project Syndicate, Mar. 11, 2019, https://www.project-syndicate.org/commentary/climate-change-geoengineering-technologies-governance-by-ban-ki-moon-2019-03.
2. Alejandra Borunda, *The Last Five Years Were the Hottest Ever Recorded*, Nat'l Geographic, Feb. 6, 2019, https://www.nationalgeographic.com/environment/2019/02/2018-fourth-warmest-year-ever-noaa-nasa-reports/.
3. United Nations Framework Convention on Climate Change (UNFCCC), Climate Change: Impacts, Vulnerabilities, and Adaptation in Developing Countries (2007).
4. Paris Agreement to the UNFCCC, Dec. 12, 2015, art. 2, T.I.A.S. No. 16-1104 [hereinafter Paris Agreement].
5. *Id.* art. 3.
6. United Nations Environment Programme, Emissions Gap Report 2019 Executive Summary (2019), https://wedocs.unep.org/bitstream/handle/20.500.11822/30798/EGR19ESEN.pdf?sequence=13.

global greenhouse gas emission pathways, it states that risks are significantly lower at 1.5°C compared to 2°C, and that moving past 1.5°C will result in increases in mean temperature in most land and ocean regions, hot extremes in most inhabited regions, heavy precipitation in several regions, and probability of drought and precipitation deficits in some regions.[7] Global warming at 1.5°C will also lower impacts on terrestrial, freshwater, and coastal ecosystems and retain more of their services to humans compared to 2°C.[8]

The seemingly incremental difference will mean that by 2050, several hundred million more people will be exposed to climate-related risks and will be susceptible to poverty.[9] To stay below 1.5°C, however, emissions need to decline by 45% from 2010 levels by 2030 and reach net zero by 2050.[10] An estimated $2.4 trillion dollars in investments in the energy system will be needed between 2016 and 2035, translating to 2.4% of the world's gross domestic product.[11]

Significantly, all pathways provided in the IPCC SR1.[5] will require CO_2 removal of 100-1,000 $GtCO_2$ over the 21st century.[12] The report, however, notes that this accelerated level of removal is unprecedented and unproven and that further work needs to be done on the feasibility and sustainability of carbon removal.[13] In 2022 the IPCC will be publishing its Sixth Assessment Report, and many expect geoengineering technologies to be featured.[14]

In this Article, I will first provide the technical and legal landscape as well as projections for climate geoengineering. I will thereafter explore a rights-based approach for the governance of geoengineering in international law, including the impetus, rationale, and options for implementation. This approach would take into account the need for participation, accountability, nondiscrimination, and equality in its development and deployment while addressing the potential of such technologies in mitigating the impacts that climate change would have to the full enjoyment of human rights.

I. The Rise and Momentum of Climate Geoengineering: Landscape and Projections

Since the United Nations Framework Convention on Climate Change (UNFCCC) first recognized the anthropogenic causes of climate change and established the need to undertake measures to prevent them almost 30 years ago, numerous mechanisms and technologies have been employed by States to stem the harmful impacts of climate change to people and the environment.[15] As the situation becomes increasingly dire, many have started to diverge from established mitigation and adaptation methods toward more ambitious technologies such as climate geoengineering.[16]

A. Recognized Terms and Status of Deployment

"Geoengineering" is defined by the IPCC as "a broad set of methods and technologies that aim to deliberately alter the climate system in order to alleviate the impacts of climate change."[17] Geoengineering methods and technologies are currently classified between two main categories: CO_2 removal (CDR) technologies and solar radiation management (SRM) technologies.[18]

CDR technologies are tools aimed at reducing concentrations of atmospheric CO_2.[19] The IPCC SR1.5 glossary classifies these types of technologies as a special type of mitigation.[20] CDR itself is an umbrella term for various types of technologies, such as afforestation and forest ecosystem restoration, direct air capture and storage, bioenergy with carbon capture and storage, enhanced weathering and ocean alkalinity, and ocean fertilization.[21] These technologies can be classified under land-based methods and oceans ecosystem methods.[22]

SRM, on the other hand, is the intentional modification of shortwave radiations from the sun to reduce warming.[23] The aim is to "reduce net radiative forcing by balancing the positive forcing of greenhouse gases with a negative forcing introduced by reducing absorbed solar radiation."[24] The IPCC does not consider SRM to be included under traditional mitigation nor adaptation, and in fact was very cautious on the topic in SR1.5, warning that these technologies are still too risky and insufficiently understood to date.[25] While stratospheric aerosol injection is the method most associated with SRM, there are a number of other techniques that are being explored, including cirrus cloud

7. *Id.*
8. *Id.*
9. *Id.*
10. *Id.*
11. *Id.*
12. *Id.*
13. *Id.*
14. Carnegie Climate Governance Initiative (C2G), Technical Brief: Considering Climate-Altering Technologies in the IPCC AR6 (2d ed. 2019), *available at* https://www.c2g2.net/wp-content/uploads/c2g_technicalbrief_AR6.pdf.
15. Jesse L. Reynolds, The Governance of Solar Geoengineering: Managing Climate Change in the Anthropocene 1 (2016).
16. *Id.*
17. *Annex II: Glossary*, *in* Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change 123 (R.K. Pachauri et al. eds., IPCC 2014), *available at* https://www.ipcc.ch/site/assets/uploads/2018/02/AR5_SYR_FINAL_Annexes.pdf.
18. *What Is Climate Engineering?*, Union Concerned Scientists, Nov. 6, 2017, https://www.ucsusa.org/resources/what-climate-engineering.
19. C2G, *Emerging Technologies Terminology—A Living Guide*, https://www.c2g2.net/terminology-guide/ (last visited July 10, 2020).
20. *Annex I: Glossary*, *in* Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty (Valérie Masson-Delmotte et al. eds., IPCC 2018) [hereinafter *IPCC Glossary*], *available at* https://www.ipcc.ch/site/assets/uploads/sites/2/2019/06/SR15_AnnexI_Glossary.pdf.
21. *Id.*
22. Royal Society, Geoengineering the Climate: Science, Governance, and Uncertainty (2019), https://royalsociety.org/~/media/Royal_Society_Content/policy /publications/2009/8693.pdf.
23. C2G, *supra* note 14.
24. *Id.*
25. *IPCC Glossary*, *supra* note 20.

thinning, high-albedo crop propagation and snow forest clearance, marine cloud brightening, and microbubble and sea foam generation.[26]

A coalition called Geoengineering Monitor, composed of the ETC Group, Biofuelwatch, Heinrich Böll Foundation, and the Global Forest Coalition, monitors active geoengineering projects all over the world.[27] As of May 2020, there were a total of 329 ongoing greenhouse gas removal projects and 11 SRM projects. The coalition has also registered 62 ongoing weather modification projects.[28]

Of these projects, the solar geoengineering project of Harvard University called Stratospheric Controlled Perturbation Experiment (SCoPEx) launched in 2017 may be considered the most controversial to date, due to its plans for open-air testing.[29] According to Harvard, SCoPEx is a small outdoor research experiment with the goal of clarifying ambiguities surrounding "aerosol, chemistry, and mixing processes in the stratosphere."[30] The experiment will use a high-altitude balloon fitted with an instrument package where materials, including ice, calcium carbonate, and possibly sulfates, will be released to create a perturbed air mass that will then be used to measure changes in aerosol density, atmospheric chemistry, and light scattering.[31] This $20 million project dispersed water particles in 2017,[32] and started experimenting with calcium carbonate in 2019.[33] While the project team is adamant that it does not support solar geoengineering deployment and commercialization, they cite the improvement of large-scale models and estimates of the overall efficacy and risks of similar technologies as one of their goals.[34]

B. *Ethical Considerations and Risks Associated With Deployment*

Many environmentalists and human rights advocates are wary of the implications that extensive deployment of climate geoengineering technologies poses. Given the complexity of the earth's atmosphere, modeling cannot accurately provide a comprehensive comparison on how these technologies will perform in open-air testing.[35] In 2013, a group of representatives from the small island developing States in the Pacific came up with a succinct list of the potential risks of climate geoengineering.[36] The risks listed are the following:

- **Incomplete knowledge.** At present, there is scientific agreement that climate geoengineering technologies are widely unproven.[37] There are still a lot of unknown variables related to the deployment of these technologies, including the atmosphere's response to changes and impacts at global, regional, and national levels.[38] This is further compounded by the fact that these variables are not feasible for scientific demonstration.[39] Some studies suggest that solar geoengineering may result in uncontrolled climate variances with "regions that are too warm or cool, and too wet or too dry when compared with a climate without elevated greenhouse gas concentrations." Such an outcome will put millions of people at risk of food and water insecurity.[40]
- **The precautionary principle.** The group points to questions of procedural and distributive justice, governance, and the known and unknown human, sectoral, and systemic consequences of geoengineering as important issues that call for precaution in deployment.[41] Moreover, geoengineering may result in irreversible consequences of unknown proportions, and so measures must first be taken in order to prevent this.[42] The precautionary principle will be discussed in detail in the following section.
- **False sense of security.** Considering the immense global coordinated effort needed to address climate change, the concept of a panacea that geoengineering presents may result in a false sense of security and slow down national and global efforts toward adaptation and mitigation.[43] While climate geoengineering is still unproven, increasingly cheap alternatives to fossil fuels show that addressing the climate crisis by reducing emissions and decarbonizing the economy is possible, with minimal risks to people and the environment.[44] As a case in point, in 2013, the Russian Federation sought to include climate geoengineering in the IPCC's 2013 report in order to compensate for their desire to ravage the Arctic for oil and gas.[45]
- **Slippery-slope effect.** The group cautions on geoengineering research, pointing out that absent gov-

26. Geoengineering Monitor, *Geoengineering Map*, https://map.geoengineeringmonitor.org (last visited July 10, 2020).
27. *Id.*
28. *Id.*
29. Jeff Tollefson, *First Sun-Dimming Experiment Will Test a Way to Cool Earth*, Nature, Nov. 27, 2018, https://www.nature.com/articles/d41586-018-07533-4.
30. Harvard University Keutsch Research Group, *SCoPEx Science*, https://projects.iq.harvard.edu/keutschgroup/scopex (last visited July 10, 2020).
31. *Id.*
32. Arthur Neslen, *U.S. Scientists Launch World's Biggest Solar Geoengineering Study*, Guardian, Mar. 24, 2017, https://www.theguardian.com/environment/2017/mar/24/us-scientists-launch-worlds-biggest-solar-geoengineering-study.
33. *Harvard Project to Address Uncertainties in Solar Geoengineering*, Harv. U. John A. Paulson Sch. Engineering & Applied Sci., July 29, 2019, https://www.seas.harvard.edu/news/2019/07/harvard-project-address-uncertainties-solar-geoengineering.
34. Harvard University Keutsch Research Group, *supra* note 30.
35. Sam Adelman, *Geoengineering: Rights, Risks, and Ethics*, 8 J. Hum. Rts. & Env't 119, 127 (2017).
36. Penehuro Fatu Lefale & Cheryl Lea Anderson, *Climate Engineering and Small Island States: Panacea or Catastrophe?*, *in* Geoengineering Our Climate? Ethics, Politics, and Governance 159 (Jason Blackstock & Sean Low eds., Routledge 2019).
37. *IPCC Glossary*, *supra* note 20.
38. Lefale & Anderson, *supra* note 36.
39. Adelman, *supra* note 35.
40. Reynolds, *supra* note 15, at 26.
41. Lefale & Anderson, *supra* note 36.
42. Naomi Klein, This Changes Everything: Capitalism vs. The Climate 267 (2014).
43. Lefale & Anderson, *supra* note 36.
44. Adelman, *supra* note 35, at 138.
45. Martin Lukacs et al., *Russia Urges UN Climate Report to Include Geoengineering*, Guardian, Sept. 19, 2013, http://www.theguardian.com/environment/2013/sep/19/russia-un-climate-report-geoengineering.

ernance mechanisms in place, we might not be able to monitor and control responsibly the widespread deployment of these technologies.[46] A study conducted in 2014 compared five climate geoengineering methods and concluded that not only were all of them ineffective and potentially harmful, two of the methods were unsusceptible to safe termination.[47] Termination shock is seen as another risk that poses a problem to large-scale deployment of climate geoengineering technologies. This refers to the possibility that once these technologies are in place, it will be impossible to scale back because temperatures will likely shoot up at devastating rates, consequently posing greater impacts for people and communities.[48] Indiscriminate deployment of these technologies may lock in future generations to a climate strategy that is unsustainable.[49]

- **Inclusiveness.** Since any progress toward the deployment of geoengineering technologies will affect all human society and natural systems, the need for inclusiveness through international cooperation is integral.[50] Some climate geoengineering methods have already resulted in harm to local communities. For instance, some CDR methods have resulted in land grabbing and diversion of water and energy supplies.[51] Without an inclusive process for decisionmaking on climate geoengineering, vulnerable sectors will be exposed to further injustice.[52] Lack of governance shuts out relevant stakeholders and limits the scope of knowledge on the possible risks and impacts that these technologies may bring.[53]
- **Uncertainties.** Since climate geoengineering does not address the source of climate change, further research must be made on options that will complement mitigation.[54] There are also uncertainties in relation to governance and global politics considering the stakes involved. There are some that even propose the possibility of climate geoengineering technologies being used as a weapon, and militarized without an established framework for international cooperation.[55] Unequal and unilateral implementation of these technologies, absent an international governance mechanism, may lead to increased tensions and wider gaps in inequality.[56]

These ethical considerations and risks, while they may not conclusively determine the feasibility of climate geoengineering, evoke the necessity of a governance mechanism to regulate its development and possible deployment.[57] The next section will look into the existing legal framework for climate geoengineering and the international environmental principles that apply.

C. *Climate Geoengineering in International Law*

Climate geoengineering is a fairly new development in international law, and there is currently no comprehensive international governance mechanism that monitors and regulates these technologies as a whole.[58] However, there are a number of international treaty bodies that have attempted to undertake discussions on this matter in a limited capacity.

1. Treaty Law

The Convention on Biological Diversity (CBD) is currently the most advanced in its discussions on climate geoengineering. In 2010, the Conference of Parties (COP) to the CBD adopted a decision on climate-related geoengineering in 2010 that states:

> *[T]hat no climate-related geo-engineering activities that may affect biodiversity take place, until there is an adequate scientific basis on which to justify such activities and appropriate consideration of the associated risks for the environment and biodiversity and associated social, economic and cultural impacts, with the exception of small scale scientific research studies that would be conducted in a controlled setting in accordance with Article 3 of the Convention, and only if they are justified by the need to gather specific scientific data and are subject to a thorough prior assessment of the potential impacts on the environment.*[59]

In 2012, the COP adopted another decision, this time with more specificity, stating:

- "[T]hat there is no single geoengineering approach that currently meets basic criteria for effectiveness, safety and affordability, and that approaches may prove difficult to deploy or govern"[60];
- "[T]hat there remain significant gaps in the understanding of the impacts of climate-related geoengineering on biodiversity"[61]; and
- "[T]he lack of science-based, global, transparent and effective control and regulatory mechanisms for climate-related geoengineering, the need for a precau-

46. Lefale & Anderson, *supra* note 36.
47. Adelman, *supra* note 35, at 131.
48. *Id.* at 128.
49. Reynolds, *supra* note 15, at 29.
50. Lefale & Anderson, *supra* note 36.
51. Adelman, *supra* note 35, at 127.
52. *Id.* at 134.
53. Royal Society, *supra* note 22, at 60.
54. Lefale & Anderson, *supra* note 36.
55. Reynolds, *supra* note 15, at 28.
56. *Id.*
57. *Id.* at 31.
58. Secretariat of the Convention on Biological Diversity (CBD), CBD Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters 123 (CBD Technical Series No. 66, 2012).
59. *Biodiversity and Climate Change*, Dec. X/33, UNEP, U.N. Doc. UNEP/CBD/COP/DEC/X/33 (2010) (emphasis added).
60. *Climate-Related Geoengineering*, Dec. XI/20, UNEP, ¶ 6, U.N. Doc. UNEP/CBD/COP/DEC/XI/20 (2012).
61. *Id.* ¶ 7.

> tionary approach, and that such mechanisms may be most necessary for those geoengineering activities that have a potential to cause significant adverse transboundary effects, and those deployed in areas beyond national jurisdiction and the atmosphere, noting that there is no common understanding on where such mechanisms would be best placed."[62]

In 2016, the COP again discussed climate geoengineering, but only noted that a precautionary approach must be employed and that further research is needed.[63]

Aside from these decisions, the secretariat of the CBD has also been authorized to undertake a study on climate geoengineering; in particular, on its possible impacts on biodiversity and related social, economic, and cultural matters, and on a regulatory framework relevant to the CBD. In this study, it was affirmed that no international agreement currently exists with a mandate that would effectively regulate all types of climate geoengineering.[64] In discussing the mandate of the CBD in relation to climate geoengineering, it stresses that while the CBD has near-universal membership, the United States is merely a signatory and is only bound to not defeat the object and purpose of the Convention. Additionally, it recognized that while the CBD has many relevant provisions that would be applicable to the governance of climate geoengineering, it is not able to encompass all types of climate geoengineering technologies and there are some existing types that will be completely outside of its scope of expertise.[65]

While these decisions reflect the first global policy on climate geoengineering as a whole, the scope of the limitations are not firmly set and there is no option for redress and enforcement under the Convention. Further, a decision by the COP is not considered to be legally binding in international law.[66] As a case in point, the Harvard SCoPEx project makes reference to the 2010 CBD decision, but ultimately made an independent assessment that their experiment will not pose any significant hazard to people or the environment.[67]

Aside from the CBD, the UNFCCC would seem to be the most appropriate avenue to develop a governance framework for climate geoengineering. Unfortunately, Parties have skirted this issue for years, with many champions for and against its formal acceptance as part of the agenda.[68] The only type of CDR method officially recognized by the institution is land use management. It is discussed in the climate negotiations under the "REDD+" agenda where Parties are encouraged to undertake the following activities: (1) reduce emissions from deforestation; (2) reduce emissions from forest degradation; (3) conserve forest carbon stocks; (4) manage forests in a sustainable manner; and (5) enhance forest carbon stocks.[69]

The United Nations General Assembly (UNGA) has also dealt with climate geoengineering, albeit in a very limited and specific manner. The UNGA has universal membership with 193 Member States,[70] and is mandated by the United Nations Charter to work on various international issues, including those related to economic, social, cultural, and health fields, and the realization of human rights.[71] The UNGA has previously addressed with Members some types of climate geoengineering technologies, in particular ocean iron fertilization, encouraging further study on the issue with a precautionary approach.[72]

More recently, the United Nations Environment Assembly (UNEA) was also introduced to the climate geoengineering debate in its last session. The UNEA is described as the "world's highest-level decision-making body on the environment" and also enjoys universal membership. The UNEA is the governing body of the United Nations Environment Programme, and "provides leadership, catalyzes intergovernmental action on the environment, and contributes to the implementation of the UN 2030 Agenda for Sustainable Development."[73]

In March 2019, a UNEA resolution on geoengineering governance was proposed by Switzerland and supported by Burkina Faso, Micronesia, Georgia, Liechtenstein, Mali, Mexico, Niger, Senegal, and Montenegro. This resolution called for a status assessment and authorized various United Nations bodies to propose options for governance. It was strongly opposed by a number of countries and after two weeks of negotiation gridlock, Switzerland decided to withdraw the resolution.[74] It remains to be seen if this resolution, or another similar proposal, will be taken up again in the next session of the UNEA.

2. Principles of International Environmental Law

Outside of international treaty law, a number of widely accepted international environmental principles relate to and would seem to build a convincing argument for the necessity of a governance mechanism for climate geoengineering. While these principles are generally considered soft law, and are therefore nonbinding in the traditional sense, they reflect political consensus on environmental

62. *Id.* ¶ 8.
63. *Climate-Related Geoengineering*, Dec. XIII/14, UNEP, U.N. Doc. CBD/COP/DEC/XIII/14 (2016).
64. Secretariat of the CBD, *supra* note 58, at 123.
65. *Id.* at 103.
66. Lawyers Responding to Climate Change, *Binding Nature of COP Decisions*, https://legalresponse.org/legaladvice/binding-nature-of-cop-decisions/ (last visited July 10, 2020).
67. Harvard University Keutsch Research Group, *supra* note 30.
68. *Geoengineering and the UNFCCC Process: Spring 2018 Update*, Geoengineering Monitor, May 30, 2018, http://www.geoengineeringmonitor.org/2018/05/geoengineering-and-the-unfccc-process-spring-2018-update/.
69. UNFCCC REDD+ Web Platform, *UNFCCC Negotiations*, https://redd.unfccc.int/fact-sheets/unfccc-negotiations.html (last visited July 10, 2020).
70. UNGA, *About the General Assembly*, https://www.un.org/en/ga/ (last visited July 10, 2020).
71. U.N. Charter ch. IV.
72. Secretariat of the CBD, *supra* note 58, at 138.
73. UNEA, *About the United Nations Environment Assembly*, https://environmentassembly.unenvironment.org/about-united-nations-environment-assembly (last visited July 10, 2020).
74. *High-Emitting, Oil-Producing Countries Block Progress on Geoengineering Governance at United Nations*, Geoengineering Monitor, Mar. 14, 2019, http://www.geoengineeringmonitor.org/2019/03/high-emitting-oil-producing-countries-block-progress-on-geoengineering-governance-at-united-nations/.

issues and provide a framework for negotiating new mechanisms for environmental governance.[75]

As previously discussed, the precautionary principle has been invoked by the CBD when it comes to dealing with climate geoengineering. This principle deals with matters that have not achieved scientific certainty, and requires that measures to regulate and prevent harm be established even before impacts are completely known.[76] Principle 15 of the Rio Declaration provides an elaboration of this principle as follows: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."[77]

In 2009, the Royal Society concluded that "all of the geoengineering methods assessed have major uncertainties in their likely costs, effectiveness or associated risks and are unlikely to be ready for deployment in the short to medium term."[78] These uncertainties were reconfirmed in the IPCC SR1.5 in 2018.[79] Applying the precautionary principle, this uncertainty and lack of scientific knowledge should not be used as an excuse for lack of governance and a free-rein approach to research and deployment.

Interestingly, the principle could also be used to rationalize further scientific research on climate geoengineering as a precautionary measure against the impacts of climate change. However, research is considered separate from deployment, and measures must first be in place before this is allowed.[80] In navigating the divergence between research and deployment, the no-harm principle and the principle of prevention give guidance on how activities that risk environmental harm should be regarded by States.

It can be argued, with persuasive support, that the no-harm principle and the corresponding obligation not to cause transboundary environmental harm have reached the status of customary international law.[81] It is elaborated in various arbitral decisions, including of the International Court of Justice (ICJ), and in the Stockholm and Rio Declarations. It has its roots in the common-law principle of sic utere tuo ut alienum non laedas, which means that one's property must not be used to harm another. In international law, this translates to an obligation of a State not to use its territory to harm another State's territory.[82]

The principle of prevention, on the other hand, as provided under the International Law Commission's Draft Articles on the Prevention of Transboundary Harm From Hazardous Activities, is the obligation of States to "take all appropriate measures to prevent significant transboundary harm or at any event to minimize the risk thereof."[83] This principle was also recognized by the ICJ in the Pulp Mills case as part of customary international law.[84] Similar to the precautionary principle, this gives preference to measures that seek to prevent harm before an action is even taken.[85]

These two principles, taken together, establish an obligation upon States to, at the very least, monitor activities that could potentially result in transboundary harm, which may include advanced research techniques such as modeling and field testing. This involves assessing the risks and possible impacts of these activities, and establishing a decisionmaking process that would determine which technologies would be the most environmentally sound and would respect the rights of other States to the global commons.[86] Climate geoengineering, if left unregulated, leaves States vulnerable to possible violations of these principles. These technologies, by their very nature, deal with matters that are of common concern of mankind as established under the UNFCCC[87] and the Paris Agreement.[88] As such, while these principles do not assume a prohibition on activities with high risk of transboundary harm, they require States to act with due diligence, at the minimum, when these technologies are deployed within their territory.[89]

Such due diligence necessarily includes prior notification of potentially affected States and the assessment of environmental impacts.[90] "Prior notification" is codified under Principle 19 of the 1992 Rio Declaration and defined as the provision of "prior and timely notification and relevant information to potentially affected States on activities that may have a significant adverse transboundary environmental effect."[91] On the other hand, the ICJ in the Pulp Mills case has also recognized that States are obliged to perform an environmental impact assessment for activities that may result in harmful impacts to a shared source.[92] The implementation of these principles allows a potentially affected State to review and examine the proposed activity before harm may occur, thereby increasing its legitimacy and reducing untoward risks to people and the environment.[93]

II. Rights-Based Approach in the Governance of Climate Geoengineering

Given the risks associated with climate geoengineering, and the obligations imposed on States under international

75. David Hunter et al., International Environmental Law and Policy 433-38 (5th ed. 2015).
76. *Id.* at 478.
77. *Rio Declaration on Environment and Development*, U.N. Conference on Environment and Development, princ. 15, U.N. Doc. A/CONF.151/26 (1992) (emphasis added).
78. Royal Society, *supra* note 22, at 57.
79. *IPCC Glossary*, *supra* note 20.
80. Elizabeth Tedsen & Gesa Homann, *Implementing the Precautionary Principle for Climate Engineering*, 7 Carbon & Climate L. Rev. 90 (2013).
81. Hunter et al., *supra* note 75, at 472.
82. *Id.*
83. *Draft Articles on Responsibility of States for Internationally Wrongful Acts*, [2001] 2 Y.B. Int'l L. Comm'n 148, U.N. Doc. A/56/10.
84. Pulp Mills in the River Uruguay (Arg. v. Uru.), 2010 I.C.J. 14, ¶ 101 (Apr. 20, 2020).
85. Alexander Proelss, *Geoengineering and International Law*, 30 S+F 205 (2012).
86. *Id.* at 206.
87. UNFCCC, May 9, 1992, pmbl., S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107.
88. Paris Agreement, *supra* note 4, pmbl.
89. Proelss, *supra* note 85, at 206.
90. *Id.*
91. *Rio Declaration on Environment and Development*, *supra* note 77, princ. 19.
92. Pulp Mills in the River Uruguay (Arg. v. Uru.), 2010 I.C.J. 14, ¶ 204 (Apr. 20, 2020).
93. Hunter et al., *supra* note 75, at 491.

law, a comprehensive governance mechanism is needed to avoid harm and undue consequences resulting from its unregulated deployment.[94] When dealing with climate change, the Office of the High Commissioner for Human Rights (OHCHR) has affirmed the existence of an obligation to cooperate internationally, and this is affirmed by the Human Rights Council, which recognized that "the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions."[95]

A. Definition and Advantages of Using a Rights-Based Approach

The OHCHR advocates a rights-based approach to climate change and works closely with the UNFCCC to this end.[96] A "rights-based approach" is defined as a "conceptual framework that is normatively based on international human rights standards and operationally directed to promoting and protecting human rights." This approach looks at obligations and practices from a human rights lens in order to address inequalities and unjust divisions that encumber progress.[97]

It has been well-established that climate change impacts the full enjoyment of human rights and that human rights is integral in catalyzing climate action.[98] This is affirmed in the Preamble of the Paris Agreement, where it states that, "acknowledging that climate change is a common concern of humankind, Parties should, when taking action to address climate change, respect, promote, and consider their respective obligations on human rights . . . ."[99]

A rights-based approach is the surest way to achieve climate justice and full compliance with international environmental principles, as it promotes equal protection and provides defenses for the most vulnerable and disempowered sectors and communities.[100] This approach would also provide a clear standard upon which climate actions may be evaluated to achieve balance between risks and benefits, and will help countries surpass the political paralysis that has delayed effective climate action for more than 20 years.[101] For climate geoengineering in particular, where the range of affected persons is extremely broad and significant substantive and procedural human rights stand to be affected, a rights-based approach is even more critical.

B. Substantive Human Rights

Given that climate geoengineering is a fairly new development, the discussion on the intersection of these specific technologies with substantive human rights is limited. It is well-established, however, that substantive human rights, due to their nature and purpose, have a clear environmental aspect.[102] It could be argued that climate geoengineering falls somewhere between the human rights discourse on climate change adaptation, mitigation, scientific research, and experimentation.[103] In this respect, the right to life, health, adequate food and water, and adequate standard of living, indigenous rights and the right to self-determination, and the emerging right to a safe and healthy environment is relevant in relation to how the propagation of climate geoengineering may protect or undermine these rights.

The IPCC has repeatedly stated that climate change is life-threatening, as it brings droughts, storms, cyclones, flooding, and other extreme weather events, at a stronger intensity and greater frequency.[104] In fact, the World Health Organization projects an additional 250,000 deaths per year between 2030 and 2050.[105] As climate change worsens, the impacts that it will have on the right to life and health, as well as other human rights, will increase.[106] In 2016, the United Nations special rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy, and sustainable development stated that climate change will worsen the existing problem of access to safe drinking water, with an estimated 14% of the global population experiencing a reduction in water resources at a global average temperature rise of 2°C.[107] Food security will also be further threatened with climate change affecting access, utilization, and price stability of food.[108]

These impacts will be suffered most by those who are already vulnerable due to other factors such as geography, poverty, gender, age, indigenous[109] or minority status, national or social origin, birth, or other status or disability. A grave possibility that is also becoming more imminent

94. Royal Society, *supra* note 22, at 60.
95. *Resolution Adopted by the Human Rights Commission: Human Rights and Climate Change*, U.N. GAOR, 18th Sess., Agenda Item 3, U.N. Doc. A/HRC/RES/18/22 (2011).
96. OHCHR, *Integrating Human Rights at the UNFCCC*, https://www.ohchr.org/EN/Issues/HRAndClimateChange/Pages/UNFCCC.aspx (last visited July 10, 2020).
97. OHCHR, Applying a Human Rights-Based Approach to Climate Change Negotiations, Policies, and Measures, https://www.ohchr.org/Documents/Issues/ClimateChange/InfoNoteHRBA.pdf.
98. *Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy, and Sustainable Environment*, U.N. GAOR, 74th Sess., U.N. Doc. A/74/161 (2019).
99. Paris Agreement, *supra* note 4, pmbl.
100. Thomas Greiber et al., Conservation With Justice: A Rights-Based Approach 38 (International Union for Conservation of Nature, Environmental Law and Policy Paper No. 71, 2009).
101. *Id.* at 39.
102. Bridget Lewis, Environmental Human Rights and Climate Change: Current Status and Future Prospects 153 (2018).
103. Reynolds, *supra* note 15, at 101-13.
104. *Summary for Policymakers*, *in* Climate Change 2013: The Physical Science Basis. Contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Thomas F. Stocker et al. eds., IPCC 2013).
105. *Climate Change and Health*, World Health Org., Feb. 1, 2018, https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health.
106. Lewis, *supra* note 102, at 152.
107. *Report of the Special Rapporteur on the Issue of Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy, and Sustainable Environment*, U.N. GOAR, 35th Sess., Agenda Item 3, at 8, U.N. Doc. No. A/HRC/31/52 (2016).
108. *Id.*
109. *Id.*

is the complete inundation of small island States, which will exponentially increase forced migrations and have devastating effects to the right to self-determination.[110] The environment will not be immune either. At a global average temperature rise between 2°C to 3°C, 20%-30% of all plant and animal species will be at a high risk of extinction.[111] As it is, there are some scientists who believe that we are already experiencing the sixth wave of extinction, with more than 150 species lost per day.[112]

These projections would necessarily encourage ambitious climate action among States. The right to life in particular imposes a positive obligation to protect citizens from harms that are threatening the full enjoyment thereof.[113] Some say that this translates to an international obligation of States to reduce carbon emissions as a way of preventing or minimizing the harms that climate change brings.[114] Considering that current mitigation pledges fall short of the temperature goals set in the Paris Agreement, the question of whether climate geoengineering can be considered as an option for aggressive mitigation is becoming more relevant.

Without a comprehensive and inclusive mapping of the risks and benefits of all climate geoengineering technologies, however, it will not be possible to determine whether the element of necessity will overcome the requirements of the no-harm principle. The indiscriminate deployment of climate geoengineering technologies also poses various risks that will potentially affect the full enjoyment of substantive human rights. One example that demonstrates this is the Beijing blizzard cloud-seeding experiment that ultimately resulted in the death of 50 people and more than $650 million in damages.[115]

Current climate actions have also been determined to cause displacements that negatively affect several million people per year, the majority of which are vulnerable communities in developing countries.[116] Other technologies that are being explored, such as SRM, would be difficult to localize and would have global effects, thereby magnifying the potential risks.[117] A rights-based governance approach will allow the development of climate geoengineering technologies in a more inclusive and equitable manner while protecting common interests.

C. *Relevant Procedural Rights*

The lack of governance for climate geoengineering results in a complete disregard for procedural human rights. These rights ensure transparency and inclusivity toward fostering strong public trust in environmental projects.[118] Good governance would therefore necessitate the establishment of mechanisms to ensure that these rights are promoted and respected. The three access rights in particular—right to information, right to participation, and access to remedies—are considered integral in the environmental protection discourse.[119] These rights are well recognized even within the scope of international climate change policy. In particular, the UNFCCC in Article 6(a) calls on Parties to promote and facilitate access to information and public information,[120] while Article 12 of the Paris Agreement requires Parties to cooperate to enhance public awareness, public participation, and public access to information.[121]

Access to information is enshrined in Article 19(2) of the International Covenant on Civil and Political Rights (ICCPR), which grants the right to freedom of expression that includes "freedom to seek, receive, and impart information and ideas of all kinds."[122] The framing of this right is also reflected in Article 19 of the Universal Declaration of Human Rights (UDHR)[123] and in various other regional human rights conventions. Despite this, climate actions are often criticized for keeping project details hidden from the public.[124] Since climate geoengineering projects are largely concentrated in the private sector and are currently not covered by international guidelines on disclosure, the public has no means to determine whether these projects will lead to harm to people or the environment.[125]

This is even more important in the deployment of climate geoengineering technologies, given the wide range and scope of possible impacts these projects may have. Current climate geoengineering research is plagued by a lack of transparency that further feeds controversy and distrust. Some cloud-seeding experiments, for instance, result in climate geoengineering output even if the published purpose of the project is different.[126] Allowing private investors free rein in this area of research also makes it vulnerable to vested interests such as profit and fame.[127] Vested interests often lead to poor management decisions and extreme responses, which, in a field as risky and expansive as climate geoengineering, would be catastrophic.[128]

Public participation is another critical element to gaining public trust. The right to participation is found in Article 25(a) of the ICCPR, where it states that every citizen has the right and the opportunity to "take part in the conduct of public affairs, directly or through freely chosen representatives."[129] The United Nations Declaration on the

110. *Id.*
111. *Id.* at 9.
112. Secretariat of the CBD, Message From Mr. Ahmed Djoghlaf, Executive Secretary, on the Occasion of the International Day for Biological Diversity (2007), https://www.cbd.int/doc/speech/2007/sp-2007-05-22-es-en.pdf.
113. Lewis, *supra* note 102, at 158.
114. *Id.*
115. Jason Dean, *Blizzard Renews Storm Over China Making Snow*, Wall St. J., Nov. 16, 2009, at A12.
116. Damilola S. Olawuyi, The Human Rights-Based Approach to Carbon Finance 9 (2016).
117. Reynolds, *supra* note 15, at 26-31.
118. Olawuyi, *supra* note 116, at 111-30.
119. Sumudu Atapattu & Andrea Schapper, Human Rights and the Environment: Key Issues 109-28 (2019).
120. UNFCCC, *supra* note 87, art. 6(a).
121. Paris Agreement, *supra* note 4, art. 12.
122. ICCPR, Dec. 19, 1966, art. 19(2), 999 U.N.T.S. 171.
123. *Universal Declaration of Human Rights*, G.A. Res. 217A(III), U.N. GAOR, 3d Sess., at 71, U.N. Doc. A/810 (1948).
124. Olawuyi, *supra* note 116, at 111.
125. Jane Long & Dane Scott, *Vested Interests and Geoengineering Research*, 29 Issues Sci. & Tech. 45 (2013).
126. *Id.*
127. *Id.*
128. *Id.*
129. ICCPR, *supra* note 122, art. 25(a).

Right to Development, while not binding, goes further to say that popular participation is one of the three human rights standards that are essential for the full enjoyment of the right to development.[130] This right to participation extends to economic, social, cultural, and political affairs relevant to development.[131]

On the environmental side, Agenda 21 adopted at the Rio Earth Summit in 1992 recognizes the "need of individuals, groups, and organizations to participate in environmental impact assessment procedures and to know about and participate in decisions, particularly those that potentially affect the communities in which they live and work."[132] The very nature of climate geoengineering gives rise to an extensive right to participate. In discussing SRM technologies in particular, Wylie Carr et al. state that robust public participation improves trust and communication between scientists and the public, and ensures that deployment of these technologies are based on information from a wide variety of interests and values.[133]

"Access to justice" is defined as "the ability of the public to seek and obtain quick, effective, and fair remedy through formal and informal institutions."[134] Articles 8 and 10 of the UDHR outline further qualifications of such right, including the need for competent and impartial tribunals and fair representation.[135] The ICCPR likewise lists access to justice as a human right. In fact, practically all international human rights treaties have instituted redress mechanisms that are able to accept and decide on human rights complaints from individuals.[136] A similar mechanism is essential before extensive deployment of climate geoengineering is authorized. As previously discussed, transboundary harm is a likely consequence of climate geoengineering and a redress mechanism will allow for compensation for harms caused to both individuals and the global commons.[137]

III. Implementation of a Rights-Based Governance Mechanism for Climate Geoengineering

In 2009, the Oxford Geoengineering Programme authored the Oxford Principles of Geoengineering, which was later endorsed by the government of the United Kingdom. These principles remain the only existing national policy statement on climate geoengineering.[138] The principles are as follows:

> *Principle 1: Geoengineering to be regulated as a public good*
> *Principle 2: Public participation in geoengineering decisionmaking*
> *Principle 3: Disclosure of geoengineering research and open publication of results*
> *Principle 4: Independent assessment of impacts*
> *Principle 5: Governance before deployment*[139]

The Oxford Principles are consistent with a rights-based approach, and can be used as a guide in the development of options and elements for the governance of climate geoengineering.[140]

A. Elements of Implementation

The last four of the Oxford Principles provide guidelines for the implementation of a rights-based governance to climate geoengineering. As previously discussed, access to information, public participation, and substantive redress are rights that are vital for good governance. These rights must be protected by undertaking precautionary measures before widespread deployment is allowed. In applying a rights-based approach to climate change mitigation and conservation, the International Union for Conservation of Nature provides the specific steps that must be taken to ensure justice for all concerned while achieving its environmental objectives.[141] While climate mitigation actions may be more local in nature, these steps could also be used in relation to climate geoengineering technologies, given that they abide by the same principles and are guided by similar objectives.

The first step to a rights-based approach is to undertake a situation analysis. This analysis should identify the planned actions, their objectives, and the possible social and environmental impacts that may occur as a consequence of such actions.[142] In this respect, it is also important to recognize the relevant stakeholders and their respective roles.[143] All this will allow for evaluation of the most appropriate course of action with the least impact.[144] Upon doing so, the rights, claims, and duties applicable to the proposed action must also be identified to reach decisions based on a balanced and comprehensive view of the situation.[145] Lastly, the analysis must also include a determination of possible mechanisms for dis-

130. *Declaration on the Right to Development*, G.A. Res. 41/128, U.N. GAOR, 97th plenary mtg., U.N. Doc. A/RES/41/128 (1986).
131. Olawuyi, *supra* note 116, at 121.
132. *Transforming Our World: The 2030 Agenda for Sustainable Development*, G.A. Res. 70/1, U.N. GAOR, 70th Sess., Agenda Items 15 and 116, U.N. Doc. A/RES/70/1 (2015).
133. Wylie A. Carr et al., *Public Engagement on Solar Radiation Management and Why It Needs to Happen Now*, 121 Climatic Change 567 (2013).
134. Olawuyi, *supra* note 116, at 130.
135. *Universal Declaration of Human Rights*, *supra* note 123, arts. 8, 10.
136. Olawuyi, *supra* note 116, at 135.
137. Vishal Garg, *Engineering a Solution to Climate Change: Suggestions for an International Treaty Regime Governing Geoengineering*, 2014 U. Ill. J.L. Tech. & Pol'y 197 (2014).
138. Steve Rayner et al., The Oxford Principles (Climate Geoengineering Governance Research, Working Paper Series No. 1, 2013), *available at* http://geoengineering-governance-research.org/perch/resources/workingpaper1rayneretaltheoxfordprinciples.pdf.
139. *Id.*
140. *Id.*
141. Greiber et al., *supra* note 100, at 6.
142. *Id.* at 41.
143. *Id.* at 42.
144. *Id.*
145. *Id.* at 44.

pute settlement and compensation to foster accountability from the beginning.[146]

The second step would be to ensure that clear and understandable information about proposed actions are available and easily accessible.[147] This further extends to the dissemination of specific information on the rights, claims, and duties of potentially affected persons.[148] This will empower the right-holders, as well as the general public, to take part in the decisionmaking process and seek redress if needed.[149] This leads to the third step, which is to ensure participation by undertaking consultations, seeking and promoting free and prior informed consent, and providing and using conflict resolution mechanisms.[150] This will further legitimize the project as a whole as well as prevent undue interference of rights and escalation of conflict.[151]

The previous steps will consequently enable the fourth step, which is to take reasoned decisions that are in line with overarching objectives such as the sustainable development goals.[152] Lastly, the fifth step takes into account the possible impacts that may occur during the implementation of the proposed project.[153] A robust monitoring and evaluating mechanism is needed to match assumptions with experience and ensure a more comprehensive and effective approach over time.[154] It will also provide for a process that will account for changes and unintended or unforeseen impacts.[155]

All in all, these steps will ensure good governance for climate geoengineering, taking into account the need to respect and promote human rights for all relevant stakeholders.

B. *Options for Governance Under International Law*

The first Oxford Principle on regulation of climate geoengineering as a public good will not only protect common interests, it will also ensure accountability at the international level. Given the urgency of the climate crisis and the rise of unregulated climate technologies in the market, the creation of a new international agreement on climate geoengineering is far from ideal. Many international agreements exist that deal with particular types of climate geoengineering technologies, as identified by the CBD. These include the United Nations Convention on the Law of the Sea, the London Convention and London Protocol, the Montreal Protocol, the Environmental Modification Convention, space law, the Antarctic Treaty System, the Convention for the Protection of the Marine Environment of the North-East Atlantic, the Convention on Long-Range Transboundary Air Pollution, and the CBD itself.[156] However, these agreements are specific to particular areas of environmental protection and would not encompass the risks and benefits of climate geoengineering as a whole.

As a result, this Article focuses on existing mechanisms under the UNFCCC and the Paris Agreement as options for international governance. As the primary international agreement that deals with climate change actions and technologies, the UNFCCC, with its institutionalized mechanisms, is best suited to undertake climate geoengineering within its mandate.[157] In its governance of REDD+ implementation—the only climate geoengineering method currently recognized within the UNFCCC—social and environmental safeguards are employed that recognize environmental integrity, transparent governance, respect for human rights, and the protection of social well-being as an integral part of reducing greenhouse gas emissions.[158] This could be expanded to encompass all climate geoengineering and could be lodged under the technology mechanisms of the UNFCCC and the Paris Agreement.

1. UNFCCC Technology Development and Transfer Mechanism

The UNFCCC mandates Parties in Article 4 to promote and cooperate in the development and transfer of technologies that reduce greenhouse gas emissions.[159] It also urges developed-country Parties to take all practicable steps to promote, facilitate, and finance the transfer of and access to environmentally sound climate technologies and know-how to other Parties, particularly to developing countries.[160] Under its two bodies, the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN), the UNFCCC is able to support developing countries in their policy development and implementation of climate technology.[161]

The TEC works mostly on policy and has, since its establishment in 2010, addressed issues relating to financing, enabling environments and barriers, innovation, research, development, and demonstration of technologies.[162] It has also undertaken work on adaptation and mitigation technologies, technology needs assessment, technology road maps, and other strategic and emerging issues.[163] The CTCN, on the other hand, is the operational arm of the mechanism and facilitates the development of technology solutions and capacity-building through its network

146. *Id.* at 47.
147. *Id.* at 49.
148. *Id.* at 50.
149. *Id.* at 51.
150. *Id.* at 52-56.
151. *Id.* at 56.
152. *Id.*
153. *Id.* at 59.
154. *Id.*
155. *Id.* at 59-60.
156. Secretariat of the CBD, *supra* note 58, at 103-05.
157. J. Brent Marshall, *Geoengineering: A Promising Weapon or an Unregulated Disaster in the Fight Against Climate Change?*, 33 J. Land Use & Envtl. L. 183 (2017).
158. *Id.*
159. UNFCCC, *supra* note 87, art 4.1(c).
160. *Id.* art. 4.5.
161. UNFCCC, Technology Mechanism: Enhancing Climate Technology Development and Transfer (2015), https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEM/0e7cc25f3f9843ccb98399df4d47e219/174ad939936746b6bfad76e30a324e78.pdf.
162. *Id.*
163. *Id.*

of more than 500 organizations and private-sector partners.[164] As of December 2019, the CTCN has worked on 284 technical assistance requests and supported 171 technology projects.[165]

2. Paris Agreement Technology Framework

Article 10 of the Paris Agreement governs technology development and transfer under the Paris Agreement. The Technology Mechanism of the UNFCCC is mandated to serve the Paris Agreement in addition to its mandates under the Convention.[166] In addition to encouraging cooperation for mitigation of greenhouse gas emissions, the improvement of resilience is also stated as a long-term vision.[167] A technology framework is also established to provide guidance to the Technology Mechanism to promote and facilitate enhanced action.[168] To achieve the vision stated under this article, it also instructs Parties to provide support, including financial support, to developing country Parties to aid in the implementation and to strengthen cooperative action on technology development and transfer at all stages of the technology cycle.[169]

In 2018, the so-called Paris Agreement Rulebook, a set of COP decisions on the procedures and mechanisms that will guide the Parties in the implementation of the Agreement, was finalized.[170] Under the decision relating to the technology framework, Parties have decided to focus on five main areas: innovation, implementation, enabling environments and support, active engagement of relevant stakeholders, and closer collaboration between the public and private sectors.[171]

IV. Conclusion

The climate crisis will require aggressive innovation and collaboration at a rate that is unprecedented. It calls upon us to deviate from our current way of life toward a path that is more sustainable and in line with the capacities of the world in which we live. In this race for survival, we must not lose sight of humanity and the liberties that we have fought for and established over the years.

Climate geoengineering is not a panacea, and we must not treat it as such. While it is an option that may be worth exploring, our efforts must still be concentrated on mitigation, particularly emissions abatement, and adaptation. Current efforts show that we are careening toward a 3°C pathway and there exists no climate geoengineering technology that can be utilized in time to overcome this, without even taking into account the significant risks of premature deployment. States must come to the conclusion, however, that climate geoengineering technologies do exist, and they will continue to develop and evolve through time with or without regulation.

Without inclination on whether these technologies will eventually be authorized for deployment, establishing a governance mechanism will ensure that decisions are taken in a manner that is inclusive and equitable, with accountability and opportunity for redress, and with the least harm to people and the environment. With these goals in mind, a rights-based approach is imperative to ensure that the interests of all stakeholders are respected and promoted. In an endeavor that is as risky as climate geoengineering and with so much at stake, the widest consideration of all threats, risks, and consequences has to be a precondition to deployment.

164. *Id.*
165. CTCN, *Home Page*, https://www.ctc-n.org (last visited July 10, 2020).
166. Paris Agreement, *supra* note 4, art. 10.3.
167. *Id.* art. 10.1.
168. *Id.* art. 10.4.
169. *Id.* art. 10.6.
170. Jennifer Huang, Center for Climate and Energy Solutions, A Brief Guide to the Paris Agreement and "Rulebook" (2019), https://www.c2es.org/site/assets/uploads/2019/06/paris-agreement-and-rulebook-guide.pdf.
171. UNFCCC, *The Katowice Climate Package: Making the Paris Agreement Work for All*, https://unfccc.int/process-and-meetings/the-paris-agreement/katowice-climate-package (last visited July 10, 2020).