Submission by members of the network of academics for an International Non-Use Agreement on Solar Geoengineering

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This submission is made in response to the Human Rights Council Advisory Committee's request for inputs on its study on the impact of new technologies for climate protection on the enjoyment of human rights, which the Advisory Committee is requested to conduct pursuant to resolution 48/14 of the Human Rights Council. As a group of academics, we have responded to the core questions for all stakeholders and to the questions for the technical community and academic institutions.

As a preliminary point, we wish to raise a question of terminology. We consider the term "new technologies for climate protection" (NTCP) to be misleading insofar as it refers to techniques of deliberate intervention in the Earth's natural systems, such as Solar Radiation Management (SRM) and technologies for Carbon Dioxide Removal (CDR).[12] Referring to such techniques as *protection* technologies is misleading because these technologies do not actually protect the global climate system, but rather manipulate it—with significant risks for the enjoyment of human rights.[13] The technologies which the questionnaire characterizes as NTCP are best described as "climate *manipulation* technologies" or "geoengineering". We use these two terms interchangeably throughout this submission.

We further wish to emphasize that efforts to protect and restore ecosystems undertaken with full respect for the rights of Indigenous peoples and local communities are necessary to meet the goals of the Paris Agreement. Such efforts need to be recognized and supported with adequate finance, while simultaneously phasing out fossil fuels in accordance with mitigation

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[12] The questionnaire states: "The term *new technologies for climate protection* for the purpose of this questionnaire broadly refers to techniques of deliberate intervention in the Earth's natural system in order to prevent further climate change or reverse it. The two main kinds are (1) Solar Radiation Management SRM (i.e. stratospheric aerosols) and (2) Carbon Dioxide Removal CDR. CDR solutions can be nature-based (forestation, soil carbon sequestration, biochar, etc.) or technological (enhanced weathering, bioenergy with carbon capture and storage, direct air capture and storage, etc.)."
[13] Technologies for actual climate *protection* include renewable energy technologies and other technologies that address the root causes of climate change, rather than its symptoms.

pathways that limit warming to 1.5°C with limited or no overshoot. As we explain below in response to the questions posed in the questionnaire, climate manipulation technologies distract from these imperatives and carry a wide range of human rights risks.

Core questions (for all stakeholders)

1. *Which new technologies for climate protection (NTCP) are of particular importance when it comes to impact on human rights? List three most relevant and explain your choice.*

All planetary techno-fixes carry significant human rights risks. Solar geoengineering (also known as solar radiation management or modification, or SRM) is a case in point. SRM refers to a set of speculative technologies to lower global temperatures by artificially intervening in the climate systems of our planet. Because of the 'large uncertainties and knowledge gaps as well as substantial risks',[14] SRM technologies could have a significant adverse impact on the enjoyment of human rights. Carbon Dioxide Removal (CDR) technologies vary greatly in kind, potential, risks and scientific certainty, but in general pose significant risks for the enjoyment of human rights as well.[15] That is true for the most discussed and included in climate models CDR technologies like Bio-Energy with Carbon Capture Storage (BECCS), which poses significant risks to the right to food and the right of peoples not to be deprived of their means of subsistence, amongst others. It is also true for other speculative CDR technologies, which could disrupt entire ecosystems with widespread negative implications for the enjoyment of human rights.[16] We elaborate more on these risks below.

2. *What kind of NTCP may contribute to human rights promotion and protection? Please, explain how.*

Some might argue that climate manipulation technologies could potentially reduce or reverse global warming and thus in theory contribute to the protection of human rights against climate change. However, the potential of these technologies to reduce or reverse global warming remains entirely speculative. Moreover, these technologies are likely to have unintended and potentially catastrophic effects on planetary processes, resulting in great risks to the enjoyment of human rights.[17] Experiments with climate manipulation technologies are associated with a wide array of human rights violations as well.[18] Climate manipulation technologies may also perpetuate the use of fossil fuels, thereby aggravating the climate crisis, even in an ideal situation in which these technologies do not have unexpected, harmful effects on the planet.[19] In the case that climate manipulation technologies are deployed, termination of geoengineering schemes, whether due to unforeseen circumstances like technological failure or simply as the

[14] M.R. Allen & Others, 'Framing and Context' in V. Masson-Delmotte & others (eds.) 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 (Press, 2018), C.1.4.
[15] Ibid.
[16] Ibid.
[17] V. Masson-Delmotte & Others, 'IPCC, Summary for Policy Makers' in V. Masson-Delmotte & Others (eds.) n. 14, 12.
[18] P. Lawrance, 'Who Will Control the World's Thermostat? The Potential Human Rights Impacts of Climate Change and Geo-Engineering', (Human Rights Centre Blog, 23 July 2020), available at: <https://hrcessex.wordpress.com/2020/07/23/who-will-control-the-worlds-thermostat-climate-change-and-geo-engineerings-potential-human-rights-impacts/> accessed 4 May 2022.
[19] 'Fuel to the Fire: How Geoengineering Threatens to Entrench Fossil Fuels and Accelerate the Climate Crisis', (CIEL, 13 February 2019) <https://www.ciel.org/news/fuel-to-the-fire-how-geoengineering-threatens-to-entrench-fossil-fuels-and-accelerate-the-climate-crisis/> accessed 5 May 2022.

result of a decision by policy-makers due to negative impacts of the technologies, can result in what is called the "termination shock effect".[20] This refers to a massive pulse of global warming when the technology scheme is terminated, as an effect of the buildup of greenhouse gases which effects were suppressed by the technology.[21] This sudden and intense return of climate-carbon feedback processes is expected to have catastrophic effects, possibly leading to climate change at the rate of 20 times the current rate of warming, which has disastrous consequences for the enjoyment of human rights.[22] Therefore, it would be misleading to suggest that any kind of geoengineering would actually contribute to the promotion and protection of human rights.

3. *What are the key human rights challenges and risks arising from NTCP and from which in particular? Do NTCP create unique and unprecedented challenges or risks, or are there earlier precedents that help us understand the issue area?*

The key human rights challenges and risks of climate manipulation technologies concern their potential, large-scale impacts, which can significantly impact the enjoyment of human rights such as the rights to food and water.[23] The irreversibility of geoengineering, connected to the previously described "termination shock effect", poses risks to human rights as well. The political decision-making around climate manipulation technologies creates further human rights risks, with specific risks to the right to information, the right to self-determination and the right to free, prior and informed consent of Indigenous peoples.[24] The precedent that perhaps comes closest to understanding the risks of geoengineering is that of nuclear testing and development, which has caused grave human rights violations in affected territories.[25] The scale and scope of the human rights risks that geoengineering carry is likely to be even greater than that of nuclear testing.

4. *What specific human rights may be affected by the use of NTCP? Please, explain how. Who are the rights-holders that potentially would be the most affected by the use of NTCP? Are they also the most affected by climate change? How could they and the society at large be engaged in the decision-making process?*

The right to an adequate standard of living, as enshrined in article 11 ICESCR, amongst other sources,[26] includes the right to food and water, and is closely connected to the right to life, the right to health and the right to livelihood.[27] The adverse impacts that climate manipulation technologies like SRM can have on regional weather and precipitation patterns, can result in the food and water insecurity of billions, which is in direct violation of the right to food and

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[20] S.D. Baum, 'The Great Downside Dilemma for Risky Emerging Technologies' (2014) 89 Physica Scripta 1, 4; A. Ross & H. D. Matthews, 'Climate Engineering and the Risk of Rapid Climate Change' (2009) 4 Environmental Research Letters 1, 5.

[21] H. D. Matthews & K. Caldeira, 'Transient Climate-Carbon' (2007) 104(2) Proceedings of the National Academy of Sciences 9951.

[22] P.G. Brewer,, 'Evaluating a Technological Fix for Climate' (2007) 104(24) Proceedings of the National Academy of Sciences 9915, 9915.

[23] V. Masson-Delmotte & Others, n. 17.

[24] F. Biermann, J. Oomen, A. Gupta, S.H. Ali, K. Conca, M.A. Hajer, P. Kashwan, L.J. Kotzé, M. Leach, D. Messner, C. Okereke, A. Persson, J. Potocnik, D. Schlosberg, M. Scobie, S.D. VanDeveer, 'Solar Geoengineering: The Case for an International Non-Use Agreement' (2022) WIREs Climate Change 1; S. Adelman, 'Geoengineering: Risks, Rights and Justice' (2017) 8 Journal of Human Rights and the Environment 119.

[25] B. Barrilot, 'Human Rights and the Casualties of Nuclear Testing' (2007) 9 Journal of Genocide Research 443.

[26] See also, UNGA, 'Convention on the Rights of Persons with Disabilities', UN Doc. A/RES/61/106 (24 January 2007), Art. 25 (f); Convention on the Elimination of All Forms of Discrimination Against Women (adopted 18 December 1979, entered into force 3 September 1981) 1249 UNTS 13 (CEDAW), Art. 12; 'African Charter on Human and Peoples' Rights' (adopted 27 June 1987, entered into force 21 October 1986) OAU Doc. CAB/LEG/67/3 rev. 5, Art. 4, 16 & 22.

[27] UNCESCR, 'General Comment No. 12: The Right to Adequate Food', UN Doc E/C.12/1999/5 (12 May 1999); UNCESCR, 'General Comment No. 15: The Right to Water', UN Doc E/C.12/2002/11 (20 January 2003).

the right to water.[28] SRM can also reduce the availability of freshwater on islands that already face severe constriction of their water resources.[29] Similarly, the use of BECCS can result in displacement of agricultural production and higher food prices, resulting in food insecurity, particularly for subsistence farmers and the poor.[30] For the latter two groups, this threatens their right to livelihood as well.[31] BECCS massive water demands are likely to negatively affect the availability of potable water, in violation of the right to water.[32] The previously discussed termination shock effect and its associated rapid temperature spikes will undermine food production globally, but specifically vulnerable areas in the Global South.[33] As secure access to water and food are fundamental determinants of health, all of these effects have repercussions on the right to health.[34] The enjoyment of the right to health may be further undermined due to an increase in diseases like Lyme, hantavirus and schistosomiasis relating to biodiversity loss as a result from geoengineering-caused weather changes, light availability and ocean circulation.[35] Likewise, the close connection of the right to life, to access to food and water, as well as factors determining health, means that the right to life is likely to be adversely impacted by the deployment of climate manipulation technologies. Increased climate change as a result of the termination shock effect or these technologies' stimulus to continue the emission of greenhouse gases, further perpetuate the threats that climate change poses to the right to life.

The right to a healthy environment is particularly threatened by climate manipulation technologies due to their potentially catastrophic effects on weather patterns, biodiversity and ecosystems as a whole, as discussed above. Furthermore, the anticipated impact on fossil fuel reduction – that is to say, the diverting away of efforts and resources from a rapid phasing out of fossil fuels – has major adverse effects on the environment, and could amount to a violation of the right to a healthy environment.[36]

One of the fundamental elements of the right to science is the right of everyone to enjoy the benefits of scientific progress without discrimination.[37] Most importantly in the context of geoengineering, this right requires the protection from negative effects of scientific and

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[28] J. Shepherd et. al., 'Geoengineering the Climate: Science, Governance and Uncertainty' (The Royal Society, 2009), 11; W.C.G. Burns, 'The Paris Agreement and Climate Geoengineering Governance: The Need for a Human Rights-Based Component' (Centre for International Governance Innovation, 2016), 20–21.

[29] C.G. McCormack et al, 'Key Impacts of Climate Engineering on Biodiversity and Ecosystems, with Priorities for Future Research' (2016) 13 Journal of Integrative Environmental Sciences 103, 115.

[30] W.C.G. Burns, n.28.

[31] G. Choplin, & P. Claeys, 'The Right to Decent Income and Livelihood in the United Nations Declarations on the Rights of Peasants and Other People Working in Rural Areas' (Fian International Analytical Briefing, 2017), 1.

[32] W.C.G. Burns, n. 28, 21.

[33] L. Xia et al, 'Solar Radiation Management Impacts on Agriculture in China: A Case Study in the Geoengineering Model Intercomparison Project (GeoMIP)' (2014) 119 Journal of Geophysical Research: Atmospheres 8695, 8706.

[34] UNCESCR, 'General Comment No. 14: The Right to the Highest Attainable Standard of Health', UN Doc. E/C.12/2000/4 (11 August 2000), §11.

[35] L. M. Russell et al, 'Ecosystem Impacts of Geoengineering: A Review for Developing a Science Plan' (2012) 41 Ambio 350, 361; UNHRC, 'Report of the Special Rapporteur on the issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment', UN Doc A/HRC/31/52 (1 February 2016), 9; C.G. McCormack et al, n. 29.

[36] 'Submission to Special Rapporteur on Human Rights and the Environment', (CIEL, July 2020) available at: <https://www.ohchr.org/sites/default/files/CIELInputs.docx>, accessed 18 May 2022; UNHRC, 'The Human Right to a Clean, Healthy and Sustainable Environment', UN Doc. A.HRC/RES/48/13 (18 October 2021).

[37] See e.g. in International Covenant on Economic, Social and Cultural Rights (adopted 16 December 1966, entered into force 3 January 1976) 993 UNTS 3, art. 15. See further UNHRC, 'Report of the Special Rapporteur in the Field of Cultural Rights: The Right to Enjoy the Benefits of Scientific Progress and its Applications', UN Doc. A/HRC/20/26 (14 May 2012), §29.

technological progress on the enjoyment of human rights.[38] Considering the possibly catastrophic impact of climate manipulation technologies on human rights, the normative framework around research governance does not allow the development or use of these technologies. Furthermore, the right to science calls for procedural fairness and participation in the decision-making around science.[39] The current scientific and political framework structurally lacks diverse and inclusive representation, rendering participation of those most affected by geoengineering highly unlikely. (See our answer to question 3 below for an elaboration on this point.) Moreover, this lack of diverse and inclusive representation in science and governance is at odds with the obligation to ensure that everyone enjoys the benefits of scientific progress without discrimination.

Indigenous people's right to free, prior and informed consent (FPIC) entitles Indigenous peoples to effectively determine decision-making that has an impact on them or their territories. Given the potentially massive and disproportionate impact of the deployment of geoengineering or geoengineering experiments on Indigenous peoples and their territories,[40] FPIC is of particular importance in decision-making on geoengineering. The use of geoengineering in itself could also interfere with or violate a range of substantive rights of Indigenous peoples.[41] For example, it would expose Indigenous peoples to forced displacement and migration, deprivation of their lands through land-use changes or weather pattern changes, and changes to their agricultural opportunities. Further, geoengineering could impact their right to freely manage their territory and resources. These combined impacts press in favour of a precautionary approach, whereby States refrain from permitting, encouraging or undertaking geoengineering experiments or deployment. Such an approach is further supported by the principle of effectiveness and FPIC. Indeed, the transboundary and unusually large-scale nature of geoengineering make it effectively impossible to respect FPIC in decision-making on its use.[42] This is compounded by the unequal power dynamics at the international and global level, which enable powerful states or private actors to carry out geoengineering projects that impact the entire planet by themselves.[43] The current political dynamics are thus unfit to respect FPIC.[44] This is illustrated by prior and current geoengineering experiments that have flagrantly violated FPIC.[45]

The rights-holders that would be the most affected by the use of climate manipulation technologies are likely to be those who are also most affected by the impacts of climate change, i.e., Indigenous peoples and members of marginalized groups, particularly those in the most

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[38] 'The Right to Enjoy the Benefits of Scientific Progress and its Applications' (UNESCO, 2009), 5.

[39] K. Barham & A. Hubert, 'The International Human Right to Science and its Application to Geoengineering Research and Development' (ABlawg, 7 September 2016), available at: <https://ablawg.ca/2016/09/07/international-human-right-to-science/>, accessed 19 May 2022.

[40] UNHRC, 'Promotion and Protection of the Rights of Indigenous Peoples in Disaster Risk Reduction, Prevention and Preparedness Initiatives', UN Doc.A/HRC/27/66 (7 August 2014); D. Currie, 'Governing the "Big Bad Fix": Geoengineering, Human Rights and International Law' (Geoengineering Monitor, 28 February 2018), available at: <https://www.geoengineeringmonitor.org/2018/02/governing-the-big-bad-fix/#:~:text=Indigenous%20law%20aside%2C%20broader%20human,as%20rights%20to%20self%2Ddetermination> accessed 12 May 2022.

[41] UNHRC, n. 40.

[42] L. Amorelli et. al. (eds.), Hoodwinked in the Hothouse: Resist False Solutions to Climate Change (3rd Ed., Hoodwinked, 2021), 45.

[43] Ibid.

[44] K. P. Whyte, 'Indigeneity in Geoengineering Discourses: Some Considerations' (2018) 21 Ethics, Policy and Environment 289, 302.

[45] See e.g. M. Lukacs, 'World's Biggest Geoengineering Experiment 'Violates' UN Rules' (The Guardian, 15 October 2012), available at: <https://www.theguardian.com/environment/2012/oct/15/pacific-iron-fertilisation-geoengineering>.

climate-vulnerable countries, and future generations.[46] International human rights law requires that those most at risk of human rights violations resulting from climate change and/or the use of geoengineering are able to participate in decision-making on geoengineering. This in turn requires that control over climate manipulation technologies is globally inclusive. Consultation of the most climate-vulnerable and least developed countries is not enough, nor is it enough if full knowledge is available to them. Rather, decisive (i.e., effective and enforceable) control of the most at-risk countries, and of Indigenous peoples and groups, over if and how climate manipulation technologies should be developed or deployed is required.[47] However, it is unlikely that far-reaching international agreements that transfer that power are reached.[48] Moreover, even the most inclusive forms of governance over climate manipulation technologies cannot guarantee effective participation of members of future generations whose right to a safe climate system might be violated as a result of the use of these technologies.[49]

Future generations are among the rights-holders that are particularly affected by climate manipulation technologies. By diverting resources and attention from decreasing greenhouse gas emissions to developing climate manipulation technologies, we risk creating a situation in which future generations become "locked in" in a pathway to deploy geoengineering, even when these technologies are incredibly hazardous.[50] The termination shock effect, discussed under question 2 above, further adds to this lock-in: if irreversible climate manipulation technologies are deployed, future generations cannot decide to end their deployment without facing catastrophic effects on the planet and their human rights. In sum, promoting high-risk, still mostly undeveloped, irreversible technologies in response to the climate crisis when effective, safe and immediately deployable climate protection measures are available is in direct contradiction to intergenerational equity and the rights of future generations.

5. *Is the existing international and your national human rights framework adequate to safeguarding human rights of those affected by the use of NTCP? Why or why not? If not, what principles may be identified in order to address the gaps? List them according to priority.*

The existing international human rights framework does not allow the use of climate manipulation technologies, based on the precautionary principle, the obligations of States to respect and ensure human rights and the right to free, prior and informed consent of Indigenous peoples. A non-use agreement of climate manipulation technologies such as SRM is required to strengthen the safeguarding of human rights against the risks these technologies pose.[51]

6. *Given that NTCP may present potential risks for the enjoyment of human rights, to what extent do human rights legal obligations require the States to pursue other climate protection policies presenting less risks of harm, including mitigation and adaptation measures?*

States have obligations under international human rights law to exert maximum efforts to prevent further human rights violations resulting from climate change. These obligations entail an obligation to rapidly phase out fossil fuels and accelerate other mitigation actions; enhance

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[46] Biermann, F., et al, 'Solar Geoengineering: The Case for an International Non-Use Agreement' [2022] *WIREs Climate Change* 1, p. 3.
[47] Ibid.
[48] Idem, p. 4.
[49] UN General Assembly, 'Human Rights Obligations Relating to the Enjoyment of a Safe, Clean, Healthy and Sustainable Environment' 15 July 2019, UN Doc. A/74/161.
[50] C. McKinnon, 'Sleepwalking into Lock-In? Avoiding Wrongs to Future People in Governance of Solar Radiation Management Research' (2019) 3 *Environmental Politics* 441, 444; A.C. Lin, 'The Missing Pieces of Geoengineering Research Governance' (2015) 100 *Minnesota Law Review* 2509, 2513.
[51] F. Biermann, n. 24, 3.

adaptation; and ramp up climate finance to developing countries.[52] Climate manipulation technologies do not address the causes of climate change, but only seek to manage the symptoms. Actual climate *protection* policies address the root causes of the climate crisis, as opposed to managing the symptoms or "buying time" while allowing further greenhouse gas emissions. Even exploring the use of climate manipulation technologies could have the perverse effect of suggesting that greenhouse gases can continue to be emitted, which in turn could hamper the phase out of fossil fuels and undermine efforts to combat deforestation. Given the wide-ranging risks of geoengineering to the enjoyment of human rights, States are required to pursue actual climate protection policies as well as policies to protect vulnerable people.

Moreover, climate manipulation technologies fail to address and are likely to perpetuate the injustice that forms the root cause of the climate crisis – that is, the emissions of greenhouse gases by a select group of corporations and persons who have benefitted and continue to benefit from these emissions, while a large part of the global population neither emits significant amounts of greenhouse gases nor benefits from it through economic welfare.[53] As such, the use of these technologies contravenes the obligation of States to respect, protect and promote human rights as part of a just transition to more sustainable societies.

It is worth underscoring that actual climate protection technologies and strategies capable of addressing the root causes of climate change while correcting inequalities are readily available.[54] These actual climate protection strategies pose less of a risk to human rights, and these risks are manageable.[55] If used correctly, these strategies contribute greatly to the protection and realization of human rights. As such, international human rights law requires the use of such strategies.[56] Climate manipulation technologies, in contrast, are fundamentally incompatible with international human rights law due to the risks described above: they are neither a contribution toward sustainable societies, nor are they just.

7. *As opposed to focusing on selected few technologies, do you think a holistic and inclusive approach will help reduce any gaps in the existing system for addressing human rights challenges from NTCP?*

See our answer to question 4 above.

8. *What should be the responsibilities of key stakeholders (UN agencies, states, NHRIs, civil society, technical community and academia, private sector) in mitigating the risks of NTCP to human rights and/or fostering its protection?*

The responsibility of key stakeholders should be to refrain from promoting or allowing the use of climate manipulation technologies. Considering the substantial risk of unintended and catastrophic effects of the use of these technologies and the risk of human rights violations in the process of their development, these technologies should be banned. Stakeholders should do whatever they can to prevent the normalization and legitimization of research aimed at facilitating the use of climate manipulation technologies. Below, we identify specific responsibilities for each of these actors.

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[52] See M. Wewerinke-Singh, 'State Responsibility, Climate Change and Human Rights under International Law' (Bloomsbury Publishing, 2019); See also UNGA, n. 49.
[53] V. Masson-Delmotte & Others, n 17, 12.
[54] M.G. Lawrence et al., 'Evaluating Cliamte Geoengineering Proposals in the Context of the Paris Agreement Temperature Goals' (2018) 9 Nature Communications 3734.
[55] See also M Wewerinke-Singh, 'A Human Rights-Based Approach to Energy: Realizing the Rights of Billions Within Ecological Limits' (2022) 31(1) RECIEL, 16-26.
[56] M. G. Lawrence et al. n. 54. Notably, such strategies can also pose risks to human rights – but not at the scale that climate manipulation technologies do.

Currently, the international human rights framework does not explicitly ban the use of geoengineering or coordinate the non-use of climate manipulation technologies by States. There is a responsibility for UN agencies to coordinate international consensus on the impermissibility of geoengineering and explicitly speak out against the use of climate manipulation technologies. That means that UN agencies should refrain from discussing geoengineering in a positive way that relativizes the risks, or in any other way that legitimizes or normalizes it. UN agencies should speak out against the use of geoengineering and have the responsibility to coordinate the creation of an international ban on climate manipulation technologies.

In light of their individual and joint human rights obligations, States must prohibit and prevent the development or use of climate manipulation technologies within their respective jurisdictions and internationally through cooperation. At the national level, States should not include geoengineering experiments or use in their climate policy or incentivize public discourse that could legitimize or normalize the use of climate manipulation technologies. They must put into place legislation that bans the use of these technologies and ensure proper enforcement of such legislation, for example by creating a national oversight mechanism so that initiatives for geoengineering cannot get off the ground. States also have the responsibility to refrain from licensing geoengineering experiments. Emerging high-risk technologies like climate manipulation technologies often struggle to find private financing in the beginning phases of research, and are thus dependent on public subsidies.[57] Against this backdrop, it is critical that States refrain from financing or otherwise supporting research that could lead to the development and/or deployment of climate manipulation technologies. States should cooperate towards an international agreement that codifies this set of obligations.

The technical and academic communities have the responsibility not to engage in research and development that could lead to the deployment of climate manipulation technologies. They also are responsible for speaking out against the use of these technologies and directing the debate on climate measures toward actual climate protection measures. Discussions about geoengineering should not be set up in a way that relativizes the dangers of geoengineering or normalizes the use of climate manipulation technologies.

Private actors have the obligation to avoid practices that violate human rights, and where their policies have caused or contributed to any negative impacts on human rights, they must provide for or cooperate in the remedying of these impacts.[58] In the context of climate change and geoengineering, that means that private actors must direct their effects toward actual, effective climate protection measures. They carry the responsibility not to engage in geoengineering experiments or other research that could facilitate the use of climate manipulation technologies, nor fund such research initiatives. This is especially important because the development and deployment of climate manipulation technologies with a commercial interest is likely to exacerbate the previously described adverse impacts of these technologies on human rights, including the continuation of greenhouse gas emissions and

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[57] K. Bracmort & R.K. Lattanzio, 'Geoengineering: Governance and Technology Policy' (Congressional Research Service, 2013), 24.

[58] UNGA, 'Guiding Principles on Business and Human Rights: Implementing the United Nations "Protect, Respect and Remedy" Framework', UN Doc. A/HRC/17/31 (21 March 2011). See also, 'Amicus Curiae Brief Presented by ClientEarth' (ClientEarth, 2012), available at: <https://www.clientearth.org/media/j5khftqf/amicus-curiae-brief-presented-by-clientearth-annex-a-b-c-d-ce-en.pdf>, 29; A. Benjamin et. al., Oslo Principles on Global Climate Change Obligations (Eleven International Publishing, 2015), 27-30.

disproportionate effects on those who are in the most vulnerable positions to be affected by climate change and geoengineering.

Much like UN agencies, NHRIs have the responsibility to prevent the normalization of geoengineering. NHRIs should speak out against the use of climate manipulation technologies, highlight the dangers of geoengineering and shed light on its impermissibility in the context of the State's human rights obligations. Any national oversight or accountability mechanism at the disposal of NHRIs must be used to hold actors who engage in geoengineering research or discourse accountable.

Specific questions for the technical community and academic institutions

1. *How would you differentiate between "new" and "old" technologies for climate protection?*

As noted above, we consider the term "new climate protection technologies" to be misleading as these speculative technologies manipulate rather than protect the global climate system with high risks attached. To characterize technologies for actual climate protection (such as renewable energy technologies) as "old" technologies is similarly misleading, as many of these technologies are cutting-edge and in constant development. What the questionnaire suggests are "old" and "new" technologies should instead be described as climate *protection* technologies and climate *manipulation* technologies.

2. *Which NTCP do you find most important for the global efforts to combat climate change and why?*

Geoengineering should not be used to combat climate change, so there is no "most important" climate manipulation technology. Instead, all global efforts should be directed toward addressing the structural root causes of climate change by focusing on reducing greenhouse gas emissions, facilitating a just transition away from fossil fuels and amending our relationship with ecosystems and nature.

3. *What will be the impact of NTCP on the enjoyment of human rights in the short-term and the long-term?*

Some scholars have suggested that geoengineering might have some positive effects on global warming in the short-term because it could offset some of the effects of the anthropogenic greenhouse gases that have accumulated in the global atmosphere.[59] However, as noted above, these effects remain entirely speculative. In contrast, we can predict with a relatively high degree of probability that the deployment of climate manipulation technologies will majorly impact the enjoyment of human rights *negatively* in the short-term. Geoengineering experiments can impact human rights negatively by requiring the displacement of local communities, which can violate the right of peoples not to be deprived of their means of subsistence and a wide range of other rights. Disrupted weather patterns are likely to arise, to the detriment of, for example, the rights to food, water and health as well as the right to private and family life of those local to the area.[60] In addition, geoengineering creates a heightened risk of violent conflict as a result of increased resource scarcity and/or geopolitical tensions We elaborate on these risks and impacts in our answer to question 1 (core questions for all stakeholders) and below.

[59] M. G. Lawrence et al., n. 54.
[60] Ibid.

Procedurally, as highlighted above, experiments with or use of climate manipulation technologies would violate the right to free, prior and informed consent of Indigenous peoples.[61] Violations relating to procedural aspects of geoengineering are also likely to occur in a broader human rights context. As geoengineering impact rightsholders in all States, fair and just governance and decision-making at the international level are of paramount importance.[62] It is highly unlikely that the required fairness and justice can be achieved in global governance.[63] The lack of diverse representation in the technical sciences and its structural nature (based mostly in the Global North, funded by wealthy states and large corporations with an interest in being able to continue to emit greenhouse gases to ensure profit) means that the research used to determine the risks and benefits of geoengineering is fundamentally unfair.[64] The lack of diverse and equal representation in international politics, especially concerning those who face the biggest negative impacts of climate change, further aggravate this inequality. There is little evidence that the most climate-vulnerable countries, whose population is at the highest risk of suffering from drastic climate change, will or could have a decisive influence over the deployment of climate manipulation technologies.[65] This means that any decision taken and acted upon today on whether the benefits of geoengineering outweigh its risks almost certainly amounts to a violation of international legal standards relating to public participation, transparency and the right to self-determination.[66] Likewise, geoengineering experiments are capable of impacting human rights negatively by requiring the displacement of local communities and infringing on their economic, cultural and social life. Such displacement is likely to particularly affect marginalized groups who are poorly represented in political decision-making processes.[67]

In the long term, geoengineering is equally likely to detrimentally impact the enjoyment of human rights. The manipulation of the Earth's major planetary processes is likely to have unforeseen consequences at such a major scale that these effects are uncontrollable and will have great repercussions on the environment and human life in general.[68] The available research on SRM, for example, shows that SRM has the potential to alter weather patterns dramatically, which may disrupt complex and not fully understood weather systems, posing great risks to the most fundamental human rights like the right to food, water and even life, as well as to various other rights such as the right to family life.[69] CDR too is associated with potentially adverse impacts on the enjoyment of human rights. We explain how each of these rights are affected in further detail under question 3 (core questions for all stakeholders).

4. *How should the impact of the use of NTCP be assessed and attributed given scientific uncertainty? What is the role for the precautionary approach?*

Climate manipulation technologies should not be used, so that there is no impact to be assessed and attributed. In light of the precautionary principle, the lack of scientific certainty regarding the full impacts of geoengineering, which have the potential to be catastrophic, means that experimenting with or using geoengineering is not permissible. The impermissibility of

[61] K.P. Whyte, n. 44.
[62] F. Biermann et al, n. 24. S. Adelman, n. 24.
[63] F. Biermann et al, n. 24.
[64] J.L. Graves Jr. et al., 'Inequality in Science and the Case for a New Agenda' (2022) 119 PNAS 1.
[65] F. Biermann et al, n. 24.
[66] Ibid; P. Sands & K. Cook, 'Joint Opinion on the Restriction of Geoengineering under International Law' (Heinrich Böll Foundation, 2021), §165.
[67] D. Currie, n. 40.
[68] V. Masson-Delmotte, n. 17. S. Adelman, n. 24.
[69] D. P. Keller et al., 'Potential climate engineering effectiveness and side effects during a high carbon dioxide emission scenario' (2014) 5 Nature Communications, 3304.

geoengineering follows from an assessment of the full spectrum of real risks associated with the deployment of geoengineering, as weighed against only speculative benefits. These risks include the risk that reliance on geoengineering encourages overshooting the temperature goal of the Paris Agreement, which would result in massive human rights violations, including widespread violations of the right of self-determination. The best available scientific research shows that the effectivity of geoengineering is highly uncertain, and that geoengineering may very well have hazardous impacts on the planet, and human rights by extension. When considering this uncertainty in light of the irreversibility of geoengineering and the availability of actual climate protection strategies like the phasing out of fossil fuels and the switch to renewable energy, which are much better understood and overall beneficial to the enjoyment of human rights, the precautionary principle clearly prohibits geoengineering.[70] This also rings true for smaller-scale studies: even at the scale of local geoengineering experiments, the risks are poorly understood and capable of having large and irreversible repercussions on the local environment, possibly affecting local weather patterns, agriculture and subsequently the provision of food and water.[71] Again, it is irresponsible and indeed unlawful to accept these risks to the enjoyment of human rights for technologies that are at best highly uncertain and at worst disastrously dangerous, especially when strategies to address the root causes of climate change are available and much less perilous. That is all the more true in light of the lack of fair and just governance described in question 3, which is at odds with the right of public participation and related international standards for transparency.

5. *Will the current international human rights framework and standards as well as national policies be effective in addressing human rights challenges from NTCP? If not, how can they be improved?*

The current international human rights frameworks and standards do not permit geoengineering. Neither the precautionary principle nor human rights standards allow geoengineering initiatives, as the risks to the enjoyment of human rights are simply too great and the decision-making around such technologies is highly unlikely to be fair and just, resulting in further human rights violations.

6. *Do you think that policy efforts to address human rights challenges in NTCP will promote their use or deter it? How to strike a balance between the need to employ technology with the goal of reaching net zero CO2 emissions and the need to protect human rights?*

The notion that climate manipulation technologies can be deployed in a way that is compatible with human rights is highly misleading. It is equally misleading to call geoengineering necessary for reaching the goal of net zero greenhouse gas emissions, when strategies that address the root causes of climate change are available, proven to be effective, much less precarious and overall beneficial to the enjoyment of human rights. The uncertainty and irreversibility of the impacts of geoengineering on the planet and the enjoyment of human rights, combined with their dubitable effectiveness, their link to existing human rights violations and the availability of much less perilous, safe, and overall beneficial climate protection strategies, mean that there is no balance to be struck between the supposed "need" to employ climate manipulation technologies and the need to protect human rights.

[70] C. Ryngaert, 'Climate Change Mitigation Techniques: Assessing the Externalities of Reforestation and Geo-Engineering in Light of International Law' (2016) Ratio Juris 273, 290.
[71] F. Biermann, n. 24, 1.