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Dimming the midnight sun? Implications of the Sámi Council's intervention against the SCoPEx project

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Indigenous peoples are amongst those most vulnerable to the effects of climate change and any potential environmental effects of geoengineering projects. It is therefore not surprising that the Sámi Council decided to take an open stance on the SCoPEx solar geoengineering research project upon finding out of its planned test flight near Giron/Kiruna, Sweden, in the Sámi people's domicile area. In their open letter to the to the SCoPEx Advisory Committee, the Swedish Space Corporation and the Swedish government, the Sámi Council objected to the lack of any consultations with the Sámi people and the aims of the project, resulting in cancellation of the flight. As the Sámi Council has a strong track record of leadership among indigenous peoples globally, this intervention has implications for the role of indigenous peoples in relation to the question of geoengineering. This paper uses a discourse analytical method to analyse publicly available sources to map out the background for the Sámi Council's intervention against the SCoPEx project and its future implications. It finds that the manner in which the SCoPEx project's test flight was planned on Sámi domicile area, without any consultations, led the Sámi Council to find joint cause with environmental civil society groups opposed to geoengineering. Subsequently, the Sámi Council has taken an active role in rallying further indigenous opposition to the SCoPEx project and by extension geoengineering research. It is argued that this coalition of indigenous peoples' organizations and environmental civil society organizations is premised on a discursive framing of an opposition between nature-based solutions to climate change and, geoengineering as representative of a technological solution that allows extractive capitalism to persist. The Sámi Council's intervention has important humanitarian implications. As indigenous peoples are uniquely vulnerable to any environmental changes resulting from geoengineering, the Sámi Council's intervention and its outcome sets a precedent of indigenous peoples as stakeholders in the geoengineering question, whose views must be respected and interests safeguarded.

KEYWORDS

humanitarian perspectives, climate change, solar geoengineering, policy perspectives, humanitarian, Sámi Council, SCoPEx, indigenous peoples

Introduction

From a humanitarian perspective, indigenous peoples are amongst those most vulnerable to climate change. The impacts of climate change on indigenous peoples are global but take different forms in different regions, ranging from pacific islanders risking displacement by rising sea levels (Voyatzis-Bouillard and Kelman, 2021), to pastoralists in the Sahel suffering the consequences of droughts and land (Dieng, 2021) and the myriad negative effects unpredictable weather conditions have on people living close to nature (Jones, 2019; Schramm et al., 2020). The Sámi people, who inhabit northern Fennoscandia and the Russian Kola peninsula have also experienced adverse effects of climate change, with mid-winter thaws resulting in icy snows blocking access to reindeer pastures, forcing Sámi reindeer herders to resort to costly emergency fodder, and unpredictable weather conditions complicating seasonal herd migrations (personal correspondence with Sámi reindeer herders). Geoengineering advocates could therefore expect that the Sámi, along with other indigenous peoples, may be in favor of geoengineering research that could generate knowledge with the potential for drastically mitigating or even reversing global warming. However, there has been declared opposition from indigenous organizations through statements like the Anchorage Declaration. The Sámi have recently joined ranks with indigenous peoples opposing geoengineering research through the Sámi Council's open letters demanding the cancellation of the planned test flight for Harvard University's SCoPEx project, which had been scheduled for June 2021 on Sámi domicile lands in Giron/Kiruna (northern Sweden) and the halting of the project altogether. The SCoPEx project aims to explore some of the potential side-effects of Stratospheric Aerosol Injection (SAI) as a way of cooling the planet's temperature by reflecting more sunlight (Low et al., 2022, p. 5). Rather than embracing the concept of geoengineering as a potential solution for averting climate disaster, most indigenous organizations engaged in the question have rejected it as a distraction from measures necessary to curb climate change, like emission cuts (The Anchorage Declaration, 2009).

While indigenous opposition to geoengineering research is outspoken and widespread, it is not unanimous. An ocean fertilization geoengineering experiment was carried out with the consent of a Haida nation band council in Haida Gwaii, British Columbia. However, only one of the island's two Haida band councils approved the project, and many Haida individuals rejected it, seeing it as having been carried out in bad faith, with the approving band council not expressing the community's majority opinion (Gannon and Hulme, 2018; Whyte, 2018, p. 298). This experience has likely contributed further to indigenous skepticism toward geoengineering research.

A more positive example of geoengineering research involving indigenous people, is that of the University of Sydney and Queensland University-led cloud brightening experiment by the Great Barrier Reef, which was carried out with the consent of the local indigenous Manduburra organization, representing the traditional land and water owner, with an observer taking part in the experiment (Readfearn, 2020; Low et al., 2022, p. 90). The manner in which this research team consulted the local indigenous people and sought their informed consent stands in stark contrast to how the SCoPEx project planned its Giron/Kiruna test flight without consulting the local indigenous Sámi people. Instead of being informed of the planned the test flight through consultations with SCoPEx project representatives, as required by the UN Declaration on the Rights of Indigenous Peoples (UNDRIP, 2007) and humanitarian principles of safeguarding those most vulnerable (Sphere Project, 2018, pp. 38, 43), the Sámi learned about it from the Indigenous Environmental Network (IEN), which is part of the anti-geoengineering campaign *Hands off Mother Earth* (HOME). Given the Sámi people's historical and contemporary experience with settler society's continuous extractive incursions into Sámi ancestral lands and waters, it is unsurprising that learning about a solar geoengineering research project being planned in their domicile area without seeking their consent would draw a hostile response.

As the Sámi Council's intervention directly contributed to the Swedish Space Agency (SSA) canceling SCoPEx planned test flight, while the Great Barrier Reef experiment went ahead with local indigenous participation, it suggests that indigenous peoples have considerable normative power in conferring or denying legitimacy to geoengineering research. The manner in which the SCoPEx project planned its test flight, and the Sámi Council's reaction appears to have contributed to a hardening of indigenous opposition to geoengineering research, as it has deepened ties between them and environmental civil society organizations, as will be evidenced below. Moreover, the Sámi Council has a strong track record of leadership among indigenous peoples, and has since gone on to write an open letter to Harvard University asking them to scrap the SCoPEx project, co-signed by more than 30 indigenous peoples' organizations from around the world (Doyle, 2021). This is a highly unfavorable outcome to anybody interested in carrying out such research, caused by the SCoPEx project's failure to consult the Sámi people on high-stakes research planned on their ancestral lands. Moreover, it fails to live up to international standards on indigenous rights as codified in the UNDRIP (2007) and humanitarian principles as defined by the Red Cross/Red Crescent led Sphere Project (2018).

This paper will assess the implications of the Sámi Council's intervention against the SCoPEx project for the role of indigenous peoples in relation to geoengineering research. It takes stock of the background for the intervention, of how indigenous peoples came to matter in global environmental governance and their previous engagement with the question of geoengineering. It will also map out the alliances that have formed between indigenous peoples' organizations and environmental civil society organizations engaged in the question of geoengineering and how this has played into the Sámi Council's intervention. In doing this, it will employ Laclau and Mouffe's discourse theory to analyse how discursive framing of the SCoPEx project and the issue of geoengineering has catalyzed the formation of the alliance of indigenous peoples' organizations and environmental civil society organizations that the Sámi Council decided to join. The paper focuses on the Sámi Council's and HOME affiliated civil society organizations' discursive framing of the SCoPEx project and SAI research, and has opted not to include a similar assessment of SCoPEx and SAI advocacy discourse, as SCoPEx and SAI advocates, unlike the HOME affiliated organizations, appear to have made no effort to influence the Sámi Council.

Materials and methods

Laclau and Mouffe's (2001) discourse theory offers a valuable tool for analyzing the context of the Sámi Council's intervention against the SCoPEx project, as it enables seeing the shared narratives that

have brought different indigenous and environmental civil society groups together in joint opposition to geoengineering research.

Laclau and Mouffe (2001, pp. 4, 85–87) characterize their work as "post-Marxist," as they see it as an evolution of Marxist class-based analysis for a time where relational identities are much more fluid and transitory than during the early stages of industrial capitalism when Marxism emerged as a social theory. Rather than seeing contemporary society as characterized by opposition between clearly defined social classes, they see relational identities as inherently fluid (Laclau and Mouffe, 2001, pp. 85–87). The concept of articulation is central to Laclau and Mouffe's discourse theory. Articulations exist within the context of a discourse, and define or modify the relational identities of different groups of people, or elements as Laclau and Mouffe term such groups. Once these elements assume their relational positions through the practices of articulation, they become moments, with the appearance of clearly defined identities. However, the transformation of elements into moments is always incomplete, as the relational identities remain unstable, because every articulation is non-identical to itself, containing excess and non-conformity to the relational identities it tries to impose on different elements (Laclau and Mouffe, 2001, pp. 105–114).

Laclau and Mouffe term privileged positions of partial fixity within a discourse as nodal points. Society is held together by widely accepted discursive nodal points like "the nation," "democracy," and "human rights." It is with reference to such discursive nodal points that relational identities and differences in standing between different groups come to be accepted as "natural" (Laclau and Mouffe, 2001, pp. 113, 135). Tensions still exist between different social groups, but in contemporary society, there is such a wide plurality of relational identities and antagonisms that a unifying point of popular mobilization is absent (Laclau and Mouffe, 2001, pp. 85–87, 133–134). Under such conditions, political mobilization entails the articulation of discourses that claim existing discursive nodal points and frame inequalities as unjust with reference to them, while supplanting them with new nodal points (Laclau and Mouffe, 2001, p. 189). These discourses redefine relational identities by creating chains of equivalence between different social groups that bridge their differences with reference to their shared interests, in antagonistic opposition to groups seen as threatening those interests (Laclau and Mouffe, 2001, pp. 127–134). Thus, it is through the articulation of shared narratives centered on discursive nodal points with wide public acceptance that chains of equivalence can be created to bridge the difference between various groups in their pursuit of shared political goals.

The below application will demonstrate how claiming existing discursive nodal points has enabled indigenous peoples to assert themselves in global environmental governance forums and allowed the bridging of differences between indigenous peoples' organizations and environmental civil society organizations though the creation of chains of equivalence with reference to joint antagonism toward what geoengineering is seen to represent.

Results

This section uses Laclau and Mouffe's discourse theory to analyse the context and content of the Sámi Council's intervention against the SCoPEx project. It will first be shown how indigenous peoples came to matter in questions of global environmental governance by articulating themselves to the discursive nodal points of peoples' right to self-determination and human rights, and how indigenous peoples came to be engaged in the question of geoengineering alongside environmental civil society groups. This provides the context for the Sámi people's intervention against the SCoPEx project, which will be analyzed through the Sámi Council's open letters and an 80 min public webinar co-hosted by them and environmental civil society organizations that includes highly prominent environmental scholars and campaigners.

How indigenous peoples came to matter in global environmental governance

Indigenous peoples were long marginal in every sense, subject to genocides, forced displacement and assimilation. Their interests were given little regard and formal promises given to them were easily broken. The settler-states' treatment of indigenous peoples was motivated by a variety of discriminatory attitudes and assumptions that indigenous peoples had no future with the advance of modernity. Attitudes from settler-colonial governments ranged from exterminationist hostility (Quijano, 2000, p. 568), to pity, where indigenous peoples' demise should be softened (Lundmark, 2008, pp. 138–143), to wanting to "assist" indigenous peoples to overcome their "backwardness" through assimilation to settler culture (Tavanti, 2003, p. 107; Coulthard, 2014, p. 11).

Settler-states' attitudes toward indigenous peoples only began to change due to indigenous peoples' active efforts to challenge portrayals of them, which eventually resulted in some successes codified through national and international principles and legal standards for indigenous peoples' rights. A key catalyst for this was the emergence of the first intercontinental indigenous peoples' organizations, which gave indigenous peoples an unprecedented capacity to assert themselves on the global stage. This process was initiated through parallel efforts by indigenous peoples on both sides of the USA-Canada border. In Canada, indigenous peoples for the first time formed a national umbrella organization through the National Indian Brotherhood (NIB) to resist the implementation of the Canadian government's 1969 White Paper that would have abolished indigenous status and all accompanying indigenous treaty rights in Canada (McFarlane, 1993, pp. 101–107; Cowger, 1999, p. 3). In the USA, the Civil Rights Movement of the 1960s had inspired the emergence of an American Indian Movement. It hosted the inaugural gathering of the Pan-American International Indian Treaty Council (IITC) in 1974 (Sanders, 1989). The following year the NIB hosted the inaugural conference of the World Council of Indigenous Peoples (WCIP), which in addition to representatives of indigenous peoples from the Americas, also included Māori, Aboriginals of Australia, Innuits, and the Sámi People, represented by the Sámi Council (Sanders, 1977, pp. 15–18). The Sámi Council assumed a central role in the WCIP, hosting its second 1977 conference in Giron/Kiruna (the town by which the planned SCoPEx test flight was to take place) (Jull, 2003, p. 25). Though there were significant differences among the indigenous peoples [which in the end would contribute to the dissolution of the WCIP in 1996 (Nyyssönen, 2007, p. 329)], they succeed in creating chains of equivalence bridging their difference through the shared experience of settler-colonial dispossession and subjugation and opposition to continued colonial governance and extractivism, helping them achieve their shared goals of gaining representation at global forums.

By establishing the IITC and WCIP, indigenous peoples created the organizational capacity to assert themselves on the global stage. They found the discursive nodal point of peoples' right to self-determination, which the anti-colonial movements of the Global South had successfully embedded within the UN's human rights agenda (Alam and Al Faruque, 2019, p. 62), to be an effective pathway for articulating demands for indigenous rights. The then ongoing process of codifying the UN's human rights principles into legally binding covenants provided an entry point through which to begin articulating indigenous claims to self-determination on the global stage. For example, article 1 under both the International Covenant on Civil and Political Rights (ICCPR, 1966) and the International Covenant on Economic, Social and Cultural Rights (ICESCR, 1966), affirm peoples' right to self-determination, and the ICCPR's Article 27 affirms minorities' rights to practice their own culture. Legal challenges by indigenous groups and individuals within states that ratified these covenants and complaints to the UN's Human Rights Committee (UNHRC) have resulted in precedents that effectively extended such rights to indigenous peoples (Doyle, 2015; Saul, 2016). And the IITC's and WCIP's lobbying toward the UNHRC contributed to initiating a process that led to the formation of the UN Working Group on Indigenous Populations (UNWGIP) in 1982. The UNWGIP's work eventually led to the formation of the UN Permanent Forum on Indigenous Issues (UNPFII) in 2000 and the passing of the UNDRIP by the UN General Assembly in 2007 (Eide, 2006, pp. 163–164; Lile, 2006; Kemner, 2011, p. 14). The Sámi Council has nominated the Sámi people's representatives to the UNPFII, who have played highly influential roles with the Forum, exemplified by the first UNPFII Chairperson Ole Henrik Magga and the current UNPFII (at the time of writing) Chairperson, Ánne Nuorgam, being Sámi representatives (Sámiráddi, 2015; Scaffidi, 2021).

Gaining institutional acceptance of indigenous peoples' rights and representation at the UN level contributed to transforming outside perceptions of indigenous peoples from relics of the past, destined for cultural extinction, to a permanent feature of the world capable of adapting to modernity, from which settler society can learn, particularly on environmental issues. Thus, the discourse has shifted, from indigenous peoples as an impediment to settler society's progress, to becoming rights-bearing entities and a reservoir of knowledge of potential value for solving the sustainability problems setter society has encountered. While this instrumentalization of indigenous knowledge to settler society's needs is problematic (Reid and Chandler, 2018, pp. 259–261) and actively challenged by indigenous people (Deranger et al., 2022, pp. 69–71) there are also indigenous groups that embrace it (Zurba and Papadopoulos, 2021), as it provides a discursive nodal point to leverage indigenous influence in global environmental forums.

Thus, indigenous peoples successfully bridged their differences with reference to their shared plight under settler-colonialism and articulated of themselves onto the widely recognized discursive nodal point peoples' right to self-determination, as embedded within the UN's wider human rights discourse. However, despite gaining institutional acceptance of the principle of indigenous self-determination, translating it into concrete rights and safeguards has been an uneven process with indigenous peoples remaining highly vulnerable. They know, and have been recurrently reminded, that in projects where strong economic interests are at stake, their chances to influence are minimal, with "consultations" often amounting to being informed of what has already been decided (Dylan et al., 2013, pp. 74–78). They have also found out the hard way, that stopping projects early is often their only chance. Hence their approach is to say no when in doubt, and do so in time, to establish a precedent for accepting them as stakeholders before projects on their territories are initiated and expended with reference to existing sunk costs (Lawrence and Kløcker, 2016, pp. 50–51; Lindahl et al., 2016, p. 20).

Since indigenous peoples achieved some success in articulating themselves with the nodal points of self-determination and human rights within the UN, they have worked on transposing these discursive nodal points to global environmental governance to make human rights, and by extension indigenous rights, intrinsic to it. This can be seen in how they have approached two key global environmental governance covenants, the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD) and their annual Conferences of Parties (COPs).

Indigenous peoples are highly organized in their approach to these forums, as all accredited indigenous organizations attend the COPs under their respective umbrella organizations, the International Indigenous Peoples Forum on Climate Change (IIPFCC) (Suiseeya et al., 2022, p. 611) and the International Indigenous Forum on Biodiversity (IIFB) (Witter et al., 2015, p. 899). At both forums, the indigenous caucuses have followed the same discursive strategy to embed human rights, and by extension, indigenous rights, within the language of the formal commitments enacted under the umbrella of the framework agreements. With the CBD, they succeeded in incorporating a clause pertaining specifically to respect for indigenous knowledge, innovation and practices in Article 8j (Witter et al., 2015, p. 899). With the UNFCCC's Paris Agreement, indigenous peoples failed, despite their joint efforts with non-indigenous civil society organizations, to secure the inclusion of any reference to indigenous rights, or human rights (Suiseeya et al., 2022, pp. 614–622). They did, however, succeed in including a clause in the Paris Agreement on respecting indigenous peoples' knowledge under article 7.5. Also, symbolically, the Agreement refers to indigenous peoples in the plural, which was a point of contention, with some state delegations preferring the singular "indigenous people" to avoid the self-determination implications of using the plural form of "indigenous peoples" (Suiseeya et al., 2022, pp. 614–622).

Indigenous peoples' engagement with the question of geoengineering first took formal expression through the Anchorage Declaration, which was adopted at the IIPFCC's preparatory conference in the run-up to the 2009 Copenhagen UNFCCC COP 15 (McLean et al., 2009). The Declaration stated that the signatories challenged states to "abandon false solutions that negatively impact Indigenous Peoples" rights, lands, air, oceans, forests, territories and waters [including] nuclear energy, large-scale dams, geo-engineering techniques, "clean coal," agro-fuels, plantations, and market-based mechanisms such as carbon trading, the Clean Development Mechanism, and forest offsets (The Anchorage Declaration, 2009).

While the Anchorage declaration only mentioned geoengineering in passing alongside what were characterized as other false solutions to the climate crisis, the 2010 World People's Conference on Climate Change, in Cochabamba, Bolivia, turned out to be more significant in shaping indigenous peoples' stances in relation to geoengineering. The event was organized by civil society organizations disillusioned by the UNFCCC process following COP 15 (Zurba and Papadopoulos, 2021). During it, the ETC

Group initiated the anti-geoengineering campaign Hands Off Mother Earth (HOME) (Thiele, 2019, p. 463; Sikka, 2020, pp. 93–94), with other environmental civil society organizations like Friends of the Earth and indigenous organizations, including The Indigenous Environmental Network and La Viva Campesina, among co-founding members (Ribeiro, 2020, pp. 226–227; ETC Group, 2012). HOME published its manifesto in 2018, which declares firm opposition to all forms of geoengineering research, including shooting aerosols into the stratosphere, cloud brightening, ocean fertilization, and also carbon capture and storage. The manifesto has been signed by numerous, predominantly non-indigenous, environmental civil society organizations, including the Heinrich Böll Foundation (HOME Manifesto, 2018). Thus, while an anti-engineering coalition that included environmental civil society organizations and indigenous peoples' organizations already existed prior to the Sámi Council's intervention, indigenous peoples' organizations made up a small proportion of its declared members. The following sub-section analyses how the Sámi Council articulated themselves as part of that alliance, and how it has since taken a leading role in growing its indigenous contingent.

The Sámi Council's intervention against the SCoPEx project

While the Sámi Council has been active in global environmental governance, most clearly exemplified by their Permanent Participant status at the Artic Council (2023), they had up to their intervention against the SCoPEx project, remained outside the discussion on geoengineering. This section applies Laclau and Mouffe's discourse theory to publicly available material, to analyse how the Sámi Council decided to articulate itself in opposition to geoengineering research, alongside environmental civil society groups and influential environmental scholars and activists, as a result of SCoPEx's planned test flight in the Sámi domicile area.

Before proceeding with the analysis, is it worth pointing out, that though indigenous groups and environmental civil society organizations often work together to achieve their shared interests protecting the natural environment (see, for example, their above referenced collaboration at UNFCCC COPs), there are at times significant disagreements between them on what that entails, or what specific aspects of nature should be protected. The most infamous example of an environmental civil society organization and an indigenous people at loggerheads, is that of how Greenpeace's anti-sealing campaign of the 1970s and 1980s resulted in the EC/EU's seal pelt ban, which collapsed the seal pelt market and denied the Inuit's a vital revenue stream (Rodgers and Ingram, 2019, p. 18). A more recent example, is that of the Canadian Boreal Forest Agreement of 2010, which ended a 3 year long boycott campaign of Canadian forestry products, led by environmental civil society organizations including Greenpeace and Canopy. The agreement was negotiated between 21 Canadian forestry companies and 9 environmental civil society organizations without any consultations with the indigenous peoples residing in the boreal forests. This led the First Nations of Nishnawbe Aski Nation (NAN) council, representing 49 First Nations communities in Northern Ontario, to denounce the agreement for its disregard of indigenous stakeholders and demand its termination (Erickson, 2020, pp. 120–121). The Sámi people have found themselves directly at odds with environmental civil society organizations over the issues of wind power and predator conservation. Environmental civil society organizations have enthusiastically backed the expansion of wind power into the Nordic tundra, with little regard for its severely detrimental effect on Sámi reindeer herding or for the Sámi's territorial rights (Normann, 2021, p. 79) Conservationist organizations see the protection of predators like wolf, wolverine and lynx in reindeer herding areas as essential, with little consideration for their predation on the Sámi's reindeer (Vidal, 2016). The SCoPEx project, and what it is seen to represent has provided a shared reference point for indigenous organizations and environmental civil society organizations, environmental scholars and activists to paper over their potential differences and articulate themselves in united opposition to geoengineering research. The below analysis of the open letters and a public webinar co-hosted by the Sámi Council and HOME affiliated environmental civil society organizations maps out the discursive nodal points that created the chain of equivalence between them.

From the webinar and the other publicly available information, we can see that there was coordination between the Sámi Council and HOME member organizations—specifically the Indigenous Environmental Network, the ETC Group, and the Heinrich Böll Foundation—in their opposition to the SCoPEx project's planned Giron/Kiruna test flight. The Sámi Council's open letter,[1] dated 24.02.2021, addressed to the SSC, the Swedish Government and the SCoPEx Advisory Committee was preceded by a letter sent weeks earlier to the SSC and the Swedish government, co-signed by three aforementioned organizations, Greenpeace Sweden, Friends of the Earth Sweden, Friends of the Earth International and others. There are clear similarities between the letters as both highlights the unpredictability of SAI technology with potential for extreme consequences, the danger of a termination shock, of it deflating pressure to transition to carbon neutrality, and the lack of both Swedish representation and consultation with affected indigenous populations as required by UNDRIP (2007) (Open Letter to the SSC and Swedish Government by Greenpeace Sweden, Jordens Vänner/Friends of the Earth Sweden, Naturskyddsföreningen/Swedish Society for Nature Conservation (SSNC), Action Group on Erosion, Technology and Concentration (ETC Group), Biofuelwatch, Center for International Environmental Law (CIEL), Climate Justice Alliance (CJA), Friend of the Earth International, Heinrich Böll Foundation, Indigenous Environmental Network (IEN), WhatNext? (2020); Open Letter to the SCoPEx Advisory Committee by the Sámi Council Open Letter to the SCoPEx Advisory Committee (2021). The Sámi Council's letter also raises further objections toward the homogenous composition of the SCoPEx Advisory Committee, consisting almost entirely of US citizens and/or residents, and its approach to research ethics as expressed in the draft "Engagement Process for SCoPEx," which states that no research project should have to answer questions pertaining to the potential moral hazard of geoengineering deployment and surrounding decision making and governance

1 Co-signed by Johanna Sandahl, President, Swedish Society for Nature Conservation, Mikael Sundström Chairperson, Friends of the Earth Sweden and Isadora Wronski, Programme Manager, Greenpeace Sweden.

issues. The letter argues "that precisely because of the extraordinary and particular risks associated with SAI, this technology and SCoPEx cannot be treated like other research." The letter concludes by stating that research along the lines of SCoPEx cannot be carried out before concerns such as those raised in the letter have been addressed and full global consensus on its acceptability has been reached.

The close partnership that formed between the HOME coalition, represented by the ETC Group, Heinrich Böll Foundation, and the Indigenous Environmental Network, and the Sámi Council in articulating their opposition to the aims of the SCoPEx project can be further discerned from the webinar co-hosted by these organizations live streamed through the ETC Group's Facebook page on June 6th, 2021 (ETC Group's Facebook Page, 2021). The normative influence of the Sámi Council's intervention against the SCoPEx project can be seen from how the webinar drew the participation of the global influencers in the climate change debate of Naomi Klein, Vandana Shiva, Bill McKibben and Greta Thunberg in solidarity with the Sámi people. The rhetoric of the webinar contributors shows the discursive nodal points that formed the chains of equivalency within this diverse group and how this was posited in antagonistic opposition to what the SCoPEx project was seen to represent.

Vice President, Åsa Larsson Blind represented the Sámi Council at the webinar. In her opening statement, she said that the Sámi Council had been unaware of the SCoPEx project and the larger question of geoengineering, and was alerted to SCoPEx's planned activities in Giron/Kiruna in February 2021 by Tom Goldtooth of the Indigenous Environmental Network and the ETC Group. This triggered what Larsson Blind described as an "instinctive" response by the Sámi Council as expressed in the open letter:

> "We reacted quite instinctively when we learned what the idea of solar geoengineering is, and what they are attempting to do. We reacted instinctively, because this goes against our world view, that we as humans should live and adapt to nature, and it is against the respect with which we are taught to treat nature and mother earth. And it is the whole idea that the line of thought that has put us in the climate crisis in the first place should also be the one thing taking us out of it. And there our position is clear, that now is the time for all society to listen to what mother earth is telling us and nature is telling us now. Our focus should be on finding a way to a sustainable climate-friendly society. And this is why we have reacted… together with other organizations and allies, with the result of the cancellation of the test in Giron."

In Blind's statement, we can see the first discursive nodal point, of a world view of living in harmony with mother earth, which is posited in opposition to technological manipulation of nature through solar geoengineering.

Blind went on to state a quite categorical opposition to solar geoengineering, and that the Sámi Council was working to broaden indigenous opposition to it:

> "But now that we have engaged ourselves in the issue, our position is clear, that this technology of solar geoengineering, that is not a part of our chosen future. So, this is also why we have taken the initiative to gather indigenous peoples from around the world in a joint letter to Harvard University, urging them to put a stop to the SCoPEx project. And the message in this letter, is that we as indigenous peoples do not approve of the legitimizing development toward solar geoengineering and nor for it to be conducted in or above our lands or territories and skies, nor in any ecosystem anywhere."

The central discursive nodal point of the opposition between the extractive, mechanistic mastery over nature mentality and its technological solutions to climate change, and respect for the sanctity of Mother Earth and nature-based solutions also came through strongly in Vandana Shiva's contribution. Shiva is a physicist who founded the *Research Foundation for Science, Technology, and Natural Resource Policy* (RFSTN), author of numerous books, including *Ecofeminism, Gates to a Global Empire* and *We Feed the World*, and a social and environmental activist. Her contribution began with stressing how the idea of SAI was expressive of the mistaken assumption that control and mastery over nature is possible and desirable:

> "You are adding pollution to the existing pollution, creating the same instability. Pollution for a pollution problem; deliberate climate change as a solution to climate change is not just insane, but it is, as Einstein said, repeating the mindset that got you into the crisis in the first place. And what is that mindset? A mechanistic worldview. The idea of mastery and control, of engineering a solution for everything living."

The discursive fault line between geoengineering advocates as adherents of a misguided mastery over nature mentality, and the harmony with nature mentality and nature based-solutions to climate change championed by the webinar contributors, was further reinforced by emphasizing how dimming the sun through SAI would impede photosynthesis, which is a precondition for nature-based solutions to climate change. Holding up a leaf for dramatic effect:

> "When the sun shines on this green leaf, with chlorophyll, we get photosynthesis. We get the amazing capacity of this leaf to absorb carbon dioxide, but give us oxygen, give us carbohydrates. Blocking the sun means blocking photosynthesis. Blocking the sun means putting food production and food security at risk. And the grazing of the reindeer at risk. And you don't know, it's totally unpredictable what it's going to do. But it's doubly wrong, because this green leaf is the alternative to fossil fuels. We need to move from hydrocarbons to carbohydrates, the molecule of life, which gives us everything we need."

Naomi Klein, author of numerous influential books like *No Logo*, *Shock Doctrine* and *This Changes Everything* and a social and environmental activist, identified a tangible antagonist to mobilize against by focusing on the capitalist interests backing a technological solution to climate change, terming a small number of geoengineering advocating scientists and their billionaire backers the "geo clique." She focused particularly on the role of SCoPEx's lead scientist David Keith, and his relation to Bill Gates and the Alberta Tar Sands bitumen extraction financer Murrey Edwards, who were the initial financial backers for Keith's Alberta Tar Sands based carbon capture company Carbon Engineering:

> "This is significant, because, David Keith is in business, with Tar Sands companies. His private company, which is an air capture company called Carbon Engineering… There are all these conflicts of interest that these scientists who are pushing this [technological solutions] most aggressively, have their own private companies, which benefit from the normalization of the idea of a techno-fix."

Klein's focus on Keith's entrepreneurship highlights how the lines between capitalists backing geoengineering and the scientists advocating for it get blurred when the scientists operate on both sides of the money and know-how equation. Discursively, this serves to homogenize the scientists and their financial backers, and particularly those vested in the fossil fuel industry into the "geo clique," providing a clear opponent to mobilize activists' energies against. Klein further elaborated on the internal dynamics of the "geo clique," and how scientists like David Keith provide moral cover the continued wealth accumulation for fossil fuel magnates like Murrey Edwards:

> "It is that moral hazard, that so long as you are holding up the promise of a techno-fix, then you can keep digging it up… and I think it is particularly relevant that David Keith… though he certainly identifies as an environmentalist, and is certainly worried about the climate crisis, is so actively in business with one of the major drivers of said climate crisis. So, not just any old billionaire, like Bill Gates, but someone so embedded in the Tar Sands."

Klein also supplanted the discursive nodal point of geoengineering being representative of a mastery over nature mentality with how geoengineering projects and their funders reproduced a colonial *terra nullius* logic in their preference for finding remote sparsely populated areas for conducting outdoor experiments. As a prior example of such *terra nullius* predatory logic, she raised the example of the ocean fertilization experiment at Haida Gwaii and how it was carried out by a "rogue geoengineering entrepreneur [Russ George], who was selling this false promise of carbon credits for the Haida's protection of their forest, if they allowed him to dump a whole bunch of iron filings in the ocean."

Klein concluded by affirming the discursive battle lines between geoengineering representing extractive capitalist coloniality, and those seeking to live in harmony with nature, by connecting David Keith's involvement with carbon storage in the Alberta Tar Sands, with indigenous resistance toward the pipeline to the USA, including the blockade against the pipeline that Tom Goldtooth was attending at the time of the webinar.

Tom Goldtooth, founder and executive director of the Indigenous Environmental Network and ETC Group board member, joined the webinar late, having driven directly from an indigenous-led blockade against the planned routing of an oil pipeline from the Alberta Tar Sands beneath the Mississippi River in Minnesota. This further reinforced the framing of extractive, fossil fuel driven capitalism and technological solutions to the climate crisis against the alternative of respect for Mother Earth and nature-based solutions. Goldtooth had prior experience with organizing indigenous resistance against a prior planned SCoPEx test flight in Arizona:

> "SCoPEx was presented as a proposed initiative, in the United States, in the southwest a number of years ago, in the Tucson Arizona region, and when we found out, we immediately contacted the tribe of the Yaqui… who live south of Tucson, and they consulted with their spiritual leaders, I talked with them as well. And they were just like appalled."

Goldtooth connected indigenous opposition to geoengineering research to the longstanding discursive nodal point of indigenous peoples' right to give or withhold consent on projects affecting them under the UNDRIP, which is nestled within the wider nodal point of the UN's broader human rights agenda as demonstrated in the prior section:

> "So, lack of consultation is a big concern with our indigenous peoples. We found that out with the Sámi, we found that out in Tucson. This project, they are keeping it secret. I don't know what they have to hide, but under international standards, under the tool of the UN Declaration on the Rights of Indigenous Peoples, our indigenous peoples, in every region we reside, including Sweden, have a right to the provision of free, prior and informed consent, and the right to give their consent to these kinds of projects."

In his concluding remarks, Goldtooth affirmed the discursive nodal point of antagonist opposition between indigenous values and knowledge of living in harmony in nature and the mechanistic mastery over nature mentality that geoengineering is seen as representative of:

> "I just wanted to lift that up very quickly, on the important values of indigenous knowledge, that understands through thousands and thousands of years of our accumulation of our knowledge of the sacredness of Mother Earth and Father Sky. That's a delicate balance, and that society and humanity and Western sciences must not play God. They have to be held accountable for any technology that they are proposing. Enough damage has been done to the climate and the balance of our ecosystems. But we do have solutions, definitely."

Bill McKibben, author of books like *The End of Nature* and *Falter,* and co-founder of the environmental organization 350.org, spoke along similar lines to Klein, reinforcing the discursive nodal point of geoengineering being a preoccupation of billionaires benefitting from the extractivist status quo. He divided the billionaires into two camps: those who sought to escape the planet altogether and those who sought a technological fix to the climate crisis, both of which distract from the urgent task of decarbonising the global economy:

> "Bill Gates, who did the original funding for much of this research, is of the stay at home and come up with some technological miracles, to avoid having to do the real work ahead of us, which is to get off the coal and gas and oil and replace it with sun and wind and conservation and efficiency… Our job is to keep insisting that we have to move fast, that Jeff Bezos aside, there is no planet B, and we are not going to someplace else.… This is really an incredibly beautiful planet, the only one that we know of that supports life, and our job is to figure out how to get it back to the state that we know works."

Youth climate activist Greta Thunberg's contribution also centered on the discursive nodal point of how the concept of geoengineering was expressive of the same mastery over nature mindset that created the crisis:

> "When you are in a hole, stop digging. We cannot move out of this crisis with the same mindset that got us into this. We got into this mess by thinking we could control nature, by thinking we can manipulate and thinking we are above nature.… We simply do not know how the earth will respond to this mechanism, if we set these things going."

Thunberg's reflections on the problems with who would control geoengineering once it started also affirmed the framing an antagonistic relation between the beneficiaries of the status quo and those disadvantaged by it:

> "It is probably going to be the high-income countries and the richest people. And we will do things that benefit us, and perhaps even at the expense of other people. Unfortunately, that is most often the peoples living in the Global South and the indigenous peoples around the world. They are always going to suffer from these kinds of decisions. And that is the exact opposite of climate justice, and environmental justice, and social justice. It's like we are trying to do everything we possibly can to avoid reducing emissions… Even manipulating nature, manipulating the sky."

Åsa Larsson Blind's statement in the questions and answers part shows the potential long term implications of the SCoPEx project's planned test flight in Giron/Kiruna on indigenous peoples' standing in relation to geoengineering research. When Blind was asked about next steps in relation to the SCoPEx project, she stated that the Sámi Council had written an open letter to Harvard University for which they were collecting co-signatures from indigenous peoples' organizations from around the world before sending it:

Through the letter "we hope that we can show that we have a joint position and that we actually can influence the discussion. And to focus on what we should discuss. And I would like to also touch upon what Tom [Goldtooth] said, because I believe that it is very important. I'm convinced that indigenous peoples' knowledge has the potential to play a significant role and a way toward a sustainable future for all.… So, this step that we are taking, is also to that we, as indigenous peoples, we want to contribute to the solutions. And we do not see solar geoengineering as part of that. So, we hope that our letter can help us get into the discussion."

We can see from the below statement from Blind that the SCoPEx project team, through its conduct in failing to consult the Sámi people on their planned test flight in the Sámi domicile area provided an effective antagonistic reference point in relation to which a global indigenous coalition opposed to geoengineering could be mobilized:

> "We have taken this initiative, but it is on behalf of indigenous voices everywhere. We see the response that we get to this letter, that we have major indigenous organizations from all over the world. This is a joint position. So even if this is our initiative, I see this as a joint cause, and supporting the letter for indigenous voices everywhere, because we have broad support for the letter… is not a Sámi position, it is not an Arctic position, it's a joint indigenous position from all over the world. And we can also show with the position and the broad support that I am sure that we are going to get… it will also show that indigenous peoples are not alone in this, this is a global position, this is a joint position, and I hope that will also make a difference."

The open letter addressed at Harvard University, dated 04.06.2021, was co-signed by more than 30 indigenous peoples' organizations from around the world (Doyle, 2021; Sámi Council Open Letter to Harvard University, 2021). This suggests that the Sámi Council's global leadership among indigenous peoples has potential for significant impact in shaping their attitudes toward geoengineering research and in expanding the indigenous contingent of the anti-geoengineering coalition of indigenous peoples' organizations and environmental civil society groups. The tone adopted in the letter was a bit different from that of the Sámi Council's previous letter to the SCC, as it did not focus on any of the specifics of SCoPEx planned activities in Giron/Kiruna, but rather, centered on the value-driven, core discursive nodal point of antagonism between living in harmony with Mother Nature, and the mastery over nature mentality expressed though the concept of geoengineering:

> "We note with greatest concern that efforts toward the potential development of solar geoengineering technology are now taken and planned to be performed through field tests. SAI (stratospheric aerosol injection) technology builds upon artificially manipulating the environment and thereafter, if deployed, might generate irreversible changes to natural systems. Climate manipulation strongly contradicts our understanding and experience of how to respect and live in harmony with Mother Nature, and therefore, this technology is not something we see as a part of our chosen future."

From the above, we can see how the SCoPEx project provided a reference point for the deepening of a pre-existing alliance of green civil society organizations and indigenous peoples organizations centered on the HOME campaign, with the first step consisting of the Sámi Council opting to join it, followed by its effort to mobilize indigenous peoples from around the world, with some apparent success. As shown above, the key discursive nodal points that constitute the alliance of indigenous peoples' organizations and environmental civil society organizations, and high profile environmental scholars and activists, is their shared articulation of themselves as respecting the sanctity of Mother Earth, advocating for drastic emission cuts and nature-based solutions to climate change. Geoengineering is posited as embodying the opposite of these values, as it is seen as expressive of colonial, extractivist mastery over nature mentalities, and as a legitimation device for the status quo, providing the billionaires who fund it with the promise of a solution that avoids taking any drastic measures on emission cuts. The framing is one of antagonistic opposition between those fighting for the sanctity of Mother Earth and the predatory elites who try to solve the problems they have created by over-exploiting nature, through further, deliberate manipulation of it, where they stand to benefit as the providers of the solutions to the problems they created.

Discussion

From the above, we can see that the SCoPEx project team's decision to plan a test flight in Giron/Kiruna without consulting

representatives of the Sámi people has resulted in the Sámi Council joining forces with HOME affiliated organizations in opposing geoengineering research and rallying further support from indigenous organizations around the world. This is a concerning outcome to those in favor of geoengineering research, given the Sámi Council's track record of global leadership among indigenous peoples, as exemplified by its role within the WCIP and having held the UNPFII chairpersonship twice. The potential implications of this to indigenous peoples' standing on the question of engineering research have already been foreshadowed by the Sámi Council's success in recruiting indigenous peoples' organizations from around the world as co-signatories of their open letter to Harvard University, demanding halting of the SCoPEx project. The Sámi Council's and the HOME coalition's critical voices on geoengineering were further amplified by their success in recruiting some of the world's most influential environmental scholars and activists to their joint public webinar.

As demonstrated above, indigenous peoples and environmental civil society organizations do not always agree on how to safeguard nature or what aspects of it should be protected, and there have been instances of open conflict between them. Application of Laclau and Mouffe's discourse theory enabled perceiving how the manner in which the SCoPEx project's test flight in Giron/Kiruna was planned, rather less than transparently, provided a reference point for the articulation of a chain of equivalency between the Sámi council and environmental civil society organizations in opposition to geoengineering research. The SCoPEx project, funded in large part by wealthy individuals like Bill Gates (Tollefson, 2018), lends itself very well to the framing we saw in the webinar. Of it being the product of a small, unaccountable clique of scientists and financers pushing a techno-fix to the climate crisis, undermining the urgency for cutting emissions and finding nature-based solutions. With the reference point of antagonism against the "geo clique" and its predatory mastery over nature mentality, it is easy for indigenous peoples' organizations and environmental civil societies to unite in the name of their shared goals of respecting the sanctity of Mother Earth and nature-based solutions to climate change.

It is also remarkable that the SCoPEx project had previously planned a test flight in Arizona (Chen, 2017), that according to Goldtooth was canceled due to local indigenous peoples' objections to the lack of consultations. Though the SCoPEx Advisory Committee (2019)[2] was established well after this, its mission statement includes making "concerted efforts to consult, especially with those who have experienced historical barriers to participation, including Indigenous and local leaders." Thus, they should, by their own admission, have known of their obligation to obtain the free, prior informed consent of affected indigenous peoples under Article 32 of the UNDRIP (2007).[3] From the outside, it appears that they refrained from consultations with representatives of the Sámi people because they hoped they would be unaware of the project and not challenge it. As geoengineering is envisioned as a potential part of the solution to the humanitarian crisis of climate change, and Sámi reindeer herding depends on a delicate ecological balance, the SCoPEx project also fails to live up to Sphere's humanitarian protection principle of minimizing risks to those potentially negatively affected by humanitarian programmes (Sphere Project, 2018, p. 38). The SCoPEx project also failed to live up to Sphere's humanitarian protection principle (4) of helping vulnerable people claim their rights (Sphere Project, 2018, p. 43) by refraining from seeking the Sámi people's free prior consent as required under Article 32 of the UNDRIP (2007).

The cancellation of the SCoPEx Kiruna test flight is a good outcome for indigenous peoples, as the Sámi Council's intervention was credited as a significant contributing factor by the media (Doyle, 2021, 2022; Goering, 2021), it can potentially serve as a precedent for indigenous peoples' right to free and informed consent under Article 32 of the (UNDRIP, 2007) applying to geoengineering research. With such a precedent, and with such a strong and well-organized coalition of indigenous peoples' organizations and environmental civil society organizations, it is unlikely that any geoengineering project could be carried out without the knowledge or consent of affected indigenous peoples. This is important from a humanitarian perspective, as indigenous peoples are amongst those most vulnerable to localized climate and weather pattern change that could result from the implementation of geoengineering projects. Reflecting the perceived normative power of indigenous people to confer and deny legitimacy to geoengineering research projects, SCoPEx lead scientist, David Keith has said, regarding the feasibility of carrying out the Giron/Kiruna test flight following the Sámi Council's intervention: "There is no question that in the public battle, if it is Harvard against indigenous peoples, we can't proceed. That's just a reality" (Doyle, 2022). It is a significant and rare achievement for indigenous peoples to gain that kind of leverage. Effectively the kind of veto power they have unsuccessfully sought against extractive projects in their lands and waters for decades.

For indigenous organizations, a close relationship with environmental activist groups may bring risks as well as benefits. On one hand, they serve well to amply indigenous organizations' voices, as evidenced by the impressive line-up of panelists that participated in the webinar co-hosted by the Sámi Council and environmental civil society organizations. On the other hand, when indigenous organizations side with environmental civil society groups deeply committed to opposing geoengineering, it risks creating the perception of them being dogmatically opposed geoengineering. If public pressure starts building for using geoengineering solutions as a last resort for averting climate disaster, this could result in the side-lining of indigenous organizations with outspoken opposition. By stating that SAI research should not be carried out in any ecosystem in the absence of global consensus, the Sámi Council might have overplayed their hand by setting an impossibly high bar

2 The SCoPEx Advisory Committee (2021) was established in 2019 to, in its own words, 'provide oversight on the appropriateness of the research and advice on the governance of SCoPEx', and to 'ensure that any and all SCoPEx project is undertaken in a transparent, responsible, and legitimate manner by ensuring that it contributes to scientific understanding and is guided by meaningful public engagement'. The committee consists of former civil servants, scientists and academics from fields like physics, environmental law and climate science, with 10 current members at the time of writing, and 2 former members (SCoPEx Advisory Committee, 2020b).

3 This version of the SCoPEx Advisory Committee's (2021) mission statement was updated in June 2021, after receiving the Sámi Council's open letter, while the statement announcing the formation of the SCoPEx Advisory Committee (2020a) and outlined its mandate contained no reference to indigenous leaders, so the language on indigenous leaders was likely added in reaction to the Sámi Council's open letter.

that effectively amounts to outright rejection of SAI, which could lead to their exclusion from future discussion on its governance.

Another risk in working with environmental civil society organizations, is that their and indigenous peoples' perceptions of what respecting the sanctity of Mother Earth means can diverge. The ETC Group's reaction to the Great Barrier Reef cloud brightening experiment offers a cautionary tale. As stated above, the research group that carried out the Great Barrier Reef cloud brightening experiment followed the principles of UNDRIP Article 32 and humanitarian principles of safeguarding those most vulnerable, and helping them claim their rights, by seeking and obtaining the prior informed consent of the local indigenous people. The experiment shows how solar geoengineering, or at least marine cloud brightening, can be framed differently discursively, as it was emphasized by the project team that the cloud brightening technique is premised on speeding up a "natural" process of marine cloud formation by spraying atomised sea water into the air, which the observing Manduburra representative went along with:

> "We welcome scientific research where Indigenous people and the rest of Australia work together to maintain the reef ecosystem for future generations… This technology might help prevent bleaching and we like that it uses no chemicals and relies on natural processes" (Readfearn, 2020).

The ETC Group did not accept this discursive framing, describing the research project as "risky," "shockin" and in contravention to a claimed CBD moratorium on outdoor geoengineering experiments (ETC Group, 2020). The ETC's reporting on the research contains many of the same tropes identified above, including that this is a project of the geoengineering-clique pushing for a techno-fix to climate change that they can personally profit from, and that it provides an alibi for unabated fossil fuel driven emissions, distracting from the need for drastic emission cuts (ETC Group, 2020). The report uses a negative photographic image of the white research vessel, making it appear as if the vessel is black and is spraying a black mist into the air. As ETC Group's reporting never acknowledges the Manduburra's blessing of the project, it would appear that indigenous peoples' right to free prior informed consent to projects affecting them only matters to the ETC Group insofar as the indigenous peoples in question share the ETC Group's opinions on the projects. This example shows that indigenous peoples' organizations need to have a critical awareness of their non-indigenous partner organizations having their own agendas that are not always aligned with their interests, and that they might not treat them seriously when that is the case.

For a constructive dialogue between scientists interested in geoengineering research and indigenous peoples, engagement should start with acknowledgment and understanding of the forms of solar radiation management indigenous peoples area already contributing. The Sámi people have already been involved in research that confirms their significant contribution to mitigating climate change by protecting the reflective surfaces of the snowy tundras by directing reindeer grazing. Millions of kilometers are natural reflective surfaces are now endangered by creeping treelines, as invading trees and shrubs are darkening them (Chapin et al., 2005; Aune et al., 2011). In Fennoscandia, the systematically directed reindeer grazing by the Sámi has contributed to halting the creeping treeline, maintaining vast reflective surfaces that could otherwise have been lost (Olofsson et al., 2001, 2009; Pajunen et al., 2012). By contrast, loss of such reflective surfaces to shrubs and trees has long been observed in Alaska, where there is an absence of semi-tame caribou (Sturm et al., 2005). While the Sámi people have been making this significant contribution to solar radiation management unwittingly, it is precisely practices like Sámi reindeer herding, that are expressive of the kinds of long-standing practices indigenous peoples have institutionalized over countless generations, which they know to be sustainable and contributing in many ways to upholding the current ecosystem. Such practices must be recognized, understood and supported for a meaningful dialogue on geoengineering with indigenous peoples to be possible. If the discussion begins with acknowledging all the valuable ways with which they contribute to managing the ecosystem and by extension the climate, and how these practices can be protected and further expanded, it is much more likely that indigenous peoples can see value in interventions that manage the climate. A research project that exemplifies this approach is the co-Nordic project "How to preserve the tundra in a warming climate"[4] which attempted to use the potential of reindeer for maintaining the climate-cooling ecosystem services that the tundra offers. The project was carried out in collaboration with reindeer herding Sámi (Horstkotte et al., 2017). Such knowledge exchange and co-production between indigenous peoples and researchers holds the key to an open, productive discussion on all tools available for responding to the climate crisis, and how to protect indigenous peoples, their assets and values in the event of any potential intervention.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Written informed consent was not obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

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4 https://www.researchgate.net/project/NCoE-Tundra-How-to-preserve-the-tundra-in-a-warming-climate

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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