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### SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL ADVICE

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Item 7.3 of the provisional agenda\*

### **IMPACTS OF CLIMATE-RELATED GEOENGINEERING ON BIODIVERSITY: VIEWS AND EXPERIENCES OF INDIGENOUS AND LOCAL COMMUNITIES AND STAKEHOLDERS**

*Note by the Executive Secretary*

1. The Executive Secretary is circulating herewith, for the information of participants in the sixteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice, the report of the online forum on the views and experiences of indigenous and local communities and other stakeholders and the possible impacts of geoengineering techniques on biodiversity.
2. The study on the impacts of climate-related geoengineering on biological diversity (UNEP/CBD/SBSTTA/16/INF/28) acknowledges that there is currently very little information available about the perspectives from indigenous and local communities. The Secretariat organized two sessions—on the margins of the seventh meeting of the Ad Hoc Open-ended Working Group on Article 8(j) and Related Provisions of the Convention on Biological Diversity and of the fifteenth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice—to initiate dialogue on the subject and to hear preliminary views and experiences of indigenous and local communities and other stakeholders.
3. The Secretariat also launched an electronic discussion to collect views and experiences of indigenous and local communities and other stakeholders, on the possible impacts of geoengineering techniques on biodiversity, using the online global forum for indigenous peoples, small islands and vulnerable communities “Climate Frontlines”, which is run by the United Nations Educational, Scientific and Cultural Organization (UNESCO), in partnership with the Secretariat of the Convention on Biological Diversity, the Secretariat of the United Nations Permanent Forum on Indigenous Issues (SPFII) and the Office of the High Commissioner on Human Rights (OHCHR). The forum reaches over 46,000 people and operates in English, French and Spanish. A summary of the main messages from the online discussion is available in all United Nations languages in section IV of document UNEP/CBD/SBSTTA/16/10. The present note contains the full report of the online forum on the views and experiences of indigenous and local communities and other stakeholders and the possible impacts of geoengineering techniques on biodiversity.

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\* UNEP/CBD/SBSTTA/16/1.

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In order to minimize the environmental impacts of the Secretariat's processes, and to contribute to the Secretary-General's initiative for a C-Neutral UN, this document is printed in limited numbers. Delegates are kindly requested to bring their copies to meetings and not to request additional copies.

4. The report has been prepared for the Convention on Biological Diversity by a consultant, with additional contributions from the Secretariat of the Convention on Biological Diversity. The document is presented in the form in which it was received by the Secretariat.

## **IMPACTS OF CLIMATE RELATED GEOENGINEERING ON BIODIVERSITY: VIEWS AND EXPERIENCES OF INDIGENOUS AND LOCAL COMMUNITIES AND STAKEHOLDERS**

### **KEY MESSAGES**

**KM1. The lack of attention to and serious consideration of the contributions of indigenous peoples and local communities to addressing the issues related to anthropogenic climate change is an important gap.** In highlighting their contributions to reducing the impact of global climate change, indigenous peoples and local communities draw on their local experiences, and their traditional knowledge which is based on a detailed and holistic understanding of the interrelatedness of the physical, biological, social and spiritual worlds. This holistic understanding of the environment is crucial to understanding the responses of indigenous peoples to issues such as geoengineering. For many indigenous peoples, these values and the possibility of added impacts brought about by new technologies are of immense concern as has been expressed through various statements by indigenous representatives at the international level.

**KM2. Various United Nations standards, including the United Nations Declaration of Indigenous peoples, emphasize the need for indigenous peoples to effectively participate in all matters that may impact upon them and yet there has been little participation in discussions around geoengineering.** Indigenous peoples approached individually have responded by saying they have not looked into the issue or that they are not experts in the area. More capacity-building is needed; culturally relevant capacity-building and information on these issues remains at best scant. The reliance on reports by the NGO community highlights the lack of expertise and availability of reports generated on new technologies by indigenous peoples themselves.

**KM3. However, the consistency with which indigenous peoples highlight the importance of their values relative to understanding specific technologies deserves specific examination.** It is necessary for decision makers and scientists to understand the wider multidisciplinary concerns expressed by indigenous peoples, to root their geoengineering proposals within this broader framework and to set aside part of their investigation to understanding how to incorporate a holistic approach into their work.

**KM4. Guidance relevant to geoengineering already exists albeit in the form of voluntary CBD agreements.** These include the Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessment regarding Developments Proposed to take place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities, as well as the recently adopted Tkarihwaié:ri Code of Ethical Conduct on Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant for the Conservation and Sustainable Use of Biological Diversity. Also, principles including the precautionary approach contained in principle 15 of the Rio Declaration on Environment and Development and in the preamble to the Convention on Biological Diversity are of utmost importance in approaching geoengineering proposals. The precautionary principle would require that the prediction and assessment of potential harms to biological diversity by geoengineering proposals should include local criteria and indicators, and should fully involve the relevant indigenous and local communities. Discussions continue about the need for more stringent and enforceable guidelines.

**KM5. Geoengineering has received little support from indigenous and local communities who are acknowledged as being among the world's most vulnerable populations to climate change.** Indigenous participants have called for greater involvement of indigenous and local communities in the development of proposals for geoengineering. Not all indigenous and local communities have called for a total ban or for modeling work or controlled in-laboratory experimentation to cease. In fact, some see it as useful in further understanding the complexities of the Earth's ecosystems and in better understanding the potential benefits and harms of geoengineering proposals. On the other hand, there is certainly a strong reluctance to see geoengineering experiments being carried out on a significant scale in the natural world.

**KM6. Understanding geoengineering impacts from indigenous perspectives is an issue that requires further exploration.** Further efforts are needed to broaden outreach through short and accessible information on geoengineering and relevant international frameworks and for the collection of views through in-depth interviews with indigenous climate change experts.

## **IMPACTS OF CLIMATE RELATED GEOENGINEERING ON BIODIVERSITY: VIEWS AND EXPERIENCES OF INDIGENOUS AND LOCAL COMMUNITIES AND STAKEHOLDERS**

### **I. INTRODUCTION**

1. At the tenth meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD), adopted a decision to

Compile and synthesize available scientific information, and views and experiences of indigenous and local communities and other stakeholders, on the possible impacts of geo engineering techniques on biodiversity and associated social, economic and cultural considerations, and options on definitions and understandings of climate-related geo-engineering relevant to the Convention on Biological Diversity. (COP 10, Decision X/33, Para 9(l))

2. An electronic discussion forum was facilitated through Climate Frontlines by which indigenous peoples and local communities were invited to raise issues and questions on the possible impacts of geo engineering techniques on biodiversity and the associated social, economic and cultural considerations. To aid discussion, initial articles were provided (see Annex I).

### **II. INDIGENOUS AND LOCAL COMMUNITIES AND CLIMATE CHANGE**

3. Indigenous peoples and local communities are acute observers of local environmental shifts and trends, and they have developed strategies to cope and to adapt to sometimes drastic changes in their environment, including climate change. Local and indigenous knowledge offers numerous insights into environmental change and complements broader-scale scientific research with local precision and nuance. Recognition of local and indigenous knowledge also enhances equity and the effectiveness of environmental governance, thereby making an important contribution towards the advancement of global sustainability.<sup>1</sup>

4. At the International Indigenous Peoples Forum on Climate Change, indigenous peoples and local communities have called for action on climate change, recognizing it as a “challenge and opportunity for humanity to transform global economic, political, social, cultural relations to live in balance with Mother Earth.” The main pathway by which the climate crisis can be reached is through “social equity between and within nations, maintaining ecological integrity, addressing the climate and ecological debt, and pursuing an effective transition away from fossil fuel dependency towards a green economy.”<sup>2</sup>

5. In addition to addressing calls for concerted action on climate change, indigenous peoples favor the deep reductions of greenhouse gases and a human-rights based approach to sustainable development. Since the first indigenous intervention in global climate change fora, indigenous peoples have recognized the “direct relationship between the denial of Indigenous Peoples’ land and water rights, along with the

<sup>1</sup> Outcomes of *Indigenous Knowledge and Sustainable Futures*, a panel at Planet Under Pressure 2012 co-convened by UNESCO and the Secretariat of the Convention on Biological Diversity.

<sup>2</sup> IIPFCC. International Indigenous Peoples Forum on Climate Change. 2009. Policy Proposals on Climate Change. URL: <http://www.indigenousportal.com/Climate-Change/IIPFCC-Policy-Paper-on-Climate-Change-September-27-2009.html>

appropriation without consent of Indigenous Peoples' natural resources, and the causes of global climate change today.”<sup>3</sup>

### **III. INDIGENOUS DECISION-MAKING PROCESSES**

6. The lack of attention to and serious consideration of the contributions of indigenous peoples and local communities to addressing the issues related to anthropogenic climate change is an important gap. Although it should be noted that there are many examples of successful local engagement that could be scaled up and replicated. In highlighting their contributions to reducing the impact of global climate change, indigenous peoples and local communities draw on their local experiences, and their traditional knowledge which is based on a detailed and holistic understanding of the interrelatedness of the physical, biological, social and spiritual worlds. This holistic understanding of the environment is crucial to understanding the responses of indigenous peoples to issues such as geoengineering. For indigenous peoples, these values and the possibility of added impacts brought about by new technologies are of immense concern and this has been expressed through different indigenous statements made at the international level<sup>4</sup>.

7. Various United Nations standards, including the United Nations Declaration of Indigenous Peoples, emphasize the need for indigenous peoples to effectively participate in all matters that may impact upon them and yet there has been little participation in discussions around geoengineering.

8. For indigenous peoples, much remains unknown about geoengineering. They perceive an exclusive nature to current geoengineering research and discussions. It is broadly felt that many of the reports generated by the scientific community are not presented in a culturally appropriate manner, or in plain language and therefore much of the information necessary to make specific decisions remains out of reach. Indigenous peoples approached individually have responded by saying they have not looked into the issue or that they are not experts in the area. In this regard, the concerns of indigenous peoples and local communities regarding the accessibility of knowledge and information on geoengineering is similar to the perceived gap in the science – policy interface on this issue. As such, there may be an opportunity to address the lack of information for indigenous peoples and local communities and policy makers in a manner that builds coherence and enhances the understanding between both groups.

9. In particular, the consistency with which indigenous peoples highlight the importance of their values relative to understanding specific technologies deserves specific examination. It is necessary for decision makers and scientists to understand the wider multidisciplinary concerns expressed by indigenous peoples, to root their geoengineering proposals within this broader framework, and to set aside part of their investigation to understanding how to incorporate a holistic approach into their work.

### **IV. EXISTING NORMS AND STANDARDS RELEVANT TO INFORMING AN INCLUSIVE APPROACH TO GEOENGINEERING GOVERNANCE**

10. In pointing towards an inclusive approach in debating issues of geoengineering, indigenous peoples and local communities refer to existing international decisions that set the standard for indigenous peoples' and local communities' participation in governance processes, advocating that the “protection of indigenous peoples' rights can only be achieved through the explicit inclusion of said rights and international norms in international mechanisms and agreements.”<sup>5</sup>

<sup>3</sup>A Call To Action: The Albuquerque Declaration, 1998. Available at:  
<http://www.earthsummit2002.org/toolkits/women/majors/indig/ind1.html>

<sup>4</sup> Including the Anchorage Declaration of the 2009 Indigenous Peoples' Global Summit on Climate Change and statements made through the International Indigenous Peoples' Forum on Climate Change (IIPFCC).

<sup>5</sup> IIPFCC (2009). Submission to Subsidiary Body for Scientific and Technological Advice for Parties (SBSTA) ON ITEM 11 OF FCCC/SBSTA/2008/L.23. Available at: <http://unfccc.int/resource/docs/2009/smsn/ngo/108.pdf>

11. The United Nations Declaration on the Rights of Indigenous Peoples elaborates the collective rights of indigenous peoples to their lands, territories and resources and the continued enjoyment of their unique relationship to these lands and waters. Article 29 specifically refers to the ‘right to the conservation and protection of the environment and the productive capacity of their lands or territories or resources.’ Articles 29, 30 and 32 also lay out the obligation to ensure no military activities, storage of hazardous materials or projects particularly in connection with the development, utilization or exploitation of mineral, water or other resources, on indigenous lands, territories and resources, without the free, prior and informed consent of indigenous peoples.

12. Without prejudice to future geoengineering decisions and indigenous and local community views on geoengineering, any framework on the governance of geoengineering and its associated research needs to take into consideration relevant international agreements and obligations. These include the need for public participation, affirming the precautionary approach and ensuring inclusion in impact assessment that takes into account both potential social and cultural impacts.

13. Impact assessment guidance relevant to geoengineering already exists albeit in the form of voluntary CBD agreements. These include the Voluntary Guidelines for the Conduct of Cultural, Environmental and Social Impact Assessment regarding Developments Proposed to take place on, or which are Likely to Impact on, Sacred Sites and on Lands and Waters Traditionally Occupied or Used by Indigenous and Local Communities, as well as the recently adopted Tkarihwaié:ri Code of Ethical Conduct on Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant for the Conservation and Sustainable Use of Biological Diversity.

14. Principles including the precautionary approach contained in principle 15 of the Rio Declaration on Environment and Development and in the preamble to the Convention on Biological Diversity are of utmost importance in approaching geoengineering proposals. The precautionary principle would require that the prediction and assessment of potential harms to biological diversity by geoengineering proposals should include local criteria and indicators, and should fully involve indigenous peoples and local communities.

15. In intergovernmental agreements, principle 10 of the Rio Declaration and Agenda 21 provide the basis for public participation in sustainable development. Agenda 21 recognizes nine major groups of civil society that are key actors in sustainable development, including indigenous peoples. Access to information is emphasized as a component of effective participation in sustainable development and global environmental governance. The UN Economic Commission for Europe Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention) strengthens regional commitment to ensure public participation in environmental decision-making.

## **V. GLOBAL INDIGENOUS RESPONSES TO GEOENGINEERING AND GEOENGINEERING RESEARCH**

16. Geoengineering has received little support from indigenous and local communities who are acknowledged as being among the world’s most vulnerable populations to climate change. Indigenous participants have called for greater involvement of indigenous and local communities in the development of proposals for geoengineering. In global declarations, such as the Anchorage Declaration of the 2009 Indigenous Peoples Global Summit on Climate Change, geoengineering is described as a ‘false solutions to climate change that negatively impact Indigenous Peoples’ rights, lands, air, oceans, forests, territories and waters.’<sup>6</sup> Similarly, the 2010 World People’s Conference on Climate Change and the Rights of Mother Earth advocates for a ‘new system that restores harmony with nature and among human beings...the recovery, revalorization, and strengthening of the knowledge, wisdom, and ancestral

<sup>6</sup> Indigenous Peoples' Global Summit on Climate Change. 2009. The Anchorage Declaration. 24 April 2009. Indigenous Peoples' Global Summit on Climate Change, Alaska. Available at: <http://unfccc.int/resource/docs/2009/smsn/ngo/168.pdf> (Verified 10 April 2012)

practices of Indigenous Peoples, which are affirmed in the thought and practices of “Living Well,” recognizing Mother Earth as a living being with which we have an indivisible, interdependent, complementary and spiritual relationship.’ Geo-engineering within this framework is seen as ‘a false solution that may only exacerbate[s] the current crisis.’<sup>7</sup>

17. Not all indigenous and local communities have called for a total ban or for modeling work or controlled in-laboratory experimentation to cease. In fact, some see such studies as useful in further understanding the complexities of the Earth’s ecosystems and in better understanding the potential benefits and harms of geoengineering proposals. On the other hand, there is a strong reluctance to see geoengineering experiments being carried out on a significant scale in the natural world.

18. While the general level of uncertainty surrounding the impact of geoengineering is understood, there is a concern that any regional impacts may occur particularly in remote places that contain the lands, territories and resources of indigenous and local communities. These may particularly include the Arctic and small island regions.

19. With regards to specific geoengineering approaches, while indigenous peoples have long advocated the restoration of degraded forests with native trees, and biochar itself is inspired by ‘terra preta’ soils in Amazonia that were created hundreds of years ago by pre-Colombian settlements that incorporated charcoal into soils to increase their fertility, large-scale carbon dioxide removal technologies may threaten indigenous peoples’ rights to land, territories and resources and the right to food security. Although there is still debate as to whether afforestation and reforestation are considered geoengineering, there are a number of other land and marine-based geoengineering approaches that raise similar rights concerns.

20. The perceived polarization around geoengineering further complicates decision-making by indigenous peoples. Advocating only for societal acceptance of geoengineering or geoengineering research can be perceived to not be respectful of the relationship between indigenous peoples and local communities and their lands, territories and resources. Similarly, advocating for pure denial of geoengineering or geoengineering research can be perceived to not be respectful of the calls of indigenous peoples for effective action on climate change.

21. Current discussions on geoengineering research cannot exclude indigenous peoples and wider groups of stakeholders as defined in Agenda 21. Support from private sector sources to geoengineering research should be broadened to include support to multiple disciplines or interdisciplinary approaches to geoengineering. This should specifically include support to understanding and incorporating concerns and perspectives from indigenous peoples and local communities.

22. While a crucial prerequisite for any proposed governance of emerging technologies should be reliable information about impacts of this technology, this information is not currently perceived as being available or easily accessible.

## **VI. ISSUES FOR FURTHER CONSIDERATION**

23. Understanding geoengineering impacts from the perspective of indigenous peoples and local communities is an issue that requires further exploration. Further efforts are needed to broaden outreach through concise and accessible information, in multiple languages, on geoengineering and relevant international frameworks and for the collection of views through in-depth interviews with indigenous climate change experts and local communities.

<sup>7</sup> World People’s Conference on Climate Change and the Rights of Mother Earth. 2010. People’s Agreement. World People’s Conference on Climate Change and the Rights of Mother Earth, April 22<sup>nd</sup> 2010. Cochabamba, Bolivia. Available at: <http://pwccc.wordpress.com/support/> (Verified 10 April 2012)

24. The opportunity to understand indigenous and local community perspectives on geoengineering provides a broader opportunity to enhance the role of indigenous peoples and local communities in decision-making on emerging technologies and harmonization of frameworks. This can lead to a more inclusive and participatory approach to global environmental governance. There is a further opportunity to understand broader issues including how to incorporate traditional decision-making and indigenous governance mechanisms when decisions over new technologies. Collective responsibility, consensus building, consultation with Elders and ensuring the perspectives of indigenous women are included are common pathways for indigenous decision-making that need to be respected.

25. In seeking to address climate change, indigenous peoples and local communities uphold that their traditional livelihoods and holistic ways of living provide low-carbon approaches that need to be recognized and respected. Respecting indigenous knowledge and management systems enhances local resource use. Support for these systems should be considered alongside other options for mitigation or geoengineering.

26. The opportunity to understand indigenous and local community perspectives on geoengineering raises issues of control over natural resources, as well as recognition of land tenure. Perceiving global environmental challenges within a daily framework raises important questions. How do we reconcile local decision-making over local resources to environmental governance issues of technologies? Is it on a case by case basis in terms of research that comes within the boundaries? When should geoengineering be initiated? How should it be regulated? How can this be done in concert with natural processes? How controllable is it? Geoengineering presents a particularly unique aspect to this debate as many of the techniques proposed would occur in areas beyond national jurisdiction or the atmosphere.

27. To further incorporate indigenous and local community perspectives, future governance structures should include the opportunity to build a genuine intercultural dialogue between indigenous and local communities, scientists, policy-makers. Indigenous peoples emphasize the importance of creating a genuine two way dialogue, not one that only seeks to ask for consent or denial of the technologies.

28. The further views and perspectives of indigenous and local communities should be sought in future multilateral action on emerging technologies, including the development of any institutional frameworks. However, more capacity-building is needed; culturally relevant capacity-building and information on these issues remains at best scant. The reliance on reports by the NGO community highlights the lack of expertise and availability of reports generated on new technologies by indigenous peoples themselves. Support should be given to indigenous and local communities to enable them to provide views in an informed manner.

29. Further developments on geoengineering research and technologies should include the provision of information in a transparent, culturally appropriate manner respectful of environmental and indigenous considerations.

*Annex I***GEOENGINEERING BRIEFS PRESENTED ON CLIMATE FRONTLINES**

The following briefs have been made available online in three languages (EN / FR / ES) from <http://www.climatefrontlines.org/en-GB/node/620>

**GEOENGINEERING THE CLIMATE? WHAT BENEFITS? WHAT IMPACTS?**

As climate change impacts become more apparent and global negotiations to reduce greenhouse gas emissions are prolonged, have we adequately considered actions that complement carbon emission reductions, such as climate engineering or geoengineering? Geoengineering refers to deliberate large-scale interventions in the Earth's climate system in order to moderate global warming. Do potential gains from using geoengineering to slow or contain climate change impacts outweigh possible negative impacts on people and biodiversity?

Indigenous peoples and local communities (ILCs) call for urgent action to stem the global climate change crisis, but they have also expressed concern about growing attention to 'solutions' such as geoengineering. The Anchorage Declaration, from the 2009 Indigenous Peoples Global Summit on Climate Change, states:

We challenge States to abandon false solutions to climate change that negatively impact Indigenous Peoples' rights, lands, air, oceans, forests, territories and waters. These include 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.<sup>8</sup>

On the other hand, at a 2010 UNESCO expert meeting on geoengineering<sup>9</sup>, small island representatives like Liz Thompson, the former Minister of Energy & Environment of Barbados, engaged directly with the issue by asking whether we should be discussing mitigation vs geoengineering or rather mitigation plus geoengineering. Raising the issue of participation of Small Island Developing States in this debate, she also asked that more information on geoengineering be made available.

In a recent piece for the New York Times called "Geo-engineering can help save the planet", ecologist Thomas Lovejoy says: "The power of ecosystem restoration to reduce atmospheric carbon dioxide and avoid disruptive climate change is great but insufficient. We also need to use non-biological means to reduce atmospheric carbon...It is in our own self-interest to manage ourselves, the planet and its climate system in an integrated fashion. We can do so, and there are abundant economic possibilities in doing so, but the window of opportunity is closing rapidly."<sup>10</sup>

<sup>8</sup> Indigenous Peoples' Global Summit on Climate Change. 2009. The Anchorage Declaration. 24 April 2009. Indigenous Peoples' Global Summit on Climate Change, Alaska. Available at: <http://unfccc.int/resource/docs/2009/smsn/ngo/168.pdf> (Verified 10 April 2012)

<sup>9</sup> 2010 UNESCO Geoengineering science and associated governance issues <http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/emerging-issues/geo-engineering/>

<sup>10</sup> Lovejoy, T.E. 2011. Geo-Engineering Can Help Save the Planet. The New York Times. Available at: <http://www.nytimes.com/2011/06/11/opinion/11ht-edlovejoy11.html>. (Verified 10 April 2012)

At the 10th meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD), governments adopted a decision to

Compile and synthesize available scientific information, and views and experiences of indigenous and local communities and other stakeholders, on the possible impacts of geo engineering techniques on biodiversity and associated social, economic and cultural considerations, and options on definitions and understandings of climate-related geo-engineering relevant to the Convention on Biological Diversity. (COP 10, Decision X/33, Para 9(l))

In collaboration with the Secretariat of the Convention on Biological Diversity (CBD), the Climate Frontlines Forum<sup>11</sup> is launching a discussion on geoengineering techniques and their potential impacts in order to understand the views and experiences of indigenous and local communities and other stakeholders. These discussions also provide an opportunity to consider additional issues, such as the governance of geoengineering research.

We propose a series of briefs on the following topics:

- Geoengineering in brief
- Solar geoengineering - some examples and impacts
- Carbon geoengineering - some examples and impacts
- Community participation and inclusion in impact assessments, and the potential role of the Akwe Kon Voluntary guidelines for the conduct of cultural, environmental and social impact assessments

## **Geoengineering in brief**

Geoengineering refers to a broad spectrum of technologies that are large-scale and designed specifically to counter the impacts of climate change.<sup>12</sup> While geoengineering is still at the conceptual stage, some individuals believe that the deployment of these types of technologies may help prevent the worst climate change impacts. They therefore argue that more attention be given to geoengineering research in order to understand and test these technologies. On the other hand, others fear that geoengineering may cause its own host of unwanted large-scale environmental and social impacts. Still others express concern that a focus on geoengineering and related research may provide a pretext for not reducing greenhouse gas emissions.

Many indigenous peoples and communities living in small islands, high-altitude and Arctic environments are already exposed to the consequences of a warming world. These changes are having an impact impact on their livelihoods and access to natural resources, with potential changes to identity and culture.<sup>13</sup> As a result, indigenous peoples have been at the forefront of calls for global action. But even though geoengineers claim it will reduce impacts, indigenous peoples and local communities continue to express concerns. Should geoengineering be retained as an option for combatting climate change? Does

<sup>11</sup> <http://www.climatefrontlines.org>

<sup>12</sup> Some discussions on the definition of geoengineering can be found in the CBD draft report on the impact of geoengineering on biodiversity <http://www.cbd.int/climate/geoengineering>, IPCC Third Assessment report WGIII: Mitigation Section 4.7 Biological Uptake in Oceans and Freshwater Reservoirs ([http://www.grida.no/publications/other/ipcc\\_tar/](http://www.grida.no/publications/other/ipcc_tar/)) , and the Royal Society report: *Geoengineering the Climate* [http://royalsociety.org/uploadedFiles/Royal\\_Society\\_Content/policy/publications/2009/8693.pdf](http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/2009/8693.pdf)

<sup>13</sup> See Climate Frontlines discussion on Early Impacts on the Frontlines (<http://www.climatefrontlines.org/en-GB/node/132>)

geoengineering's potential for reducing the impact of climate change on biodiversity and resources outweigh the risks of negative impacts on biodiversity and society?

At the international policy level, parties to the Convention on Biological Diversity are considering whether geoengineering may compromise on the goals of the Convention. The Secretariat has released a set of draft documents for peer-review which can be found here<sup>14</sup>. Prepared for consideration by the Subsidiary Body on Scientific, Technical and Technological Advice, these documents review current research on geoengineering and set out the different possible impacts of geoengineering techniques.

For the time being, geoengineering has not been implemented on a large scale and many proposed techniques are only at the research and development stage, primarily using computer models. Some small-scale field testing has been conducted or proposed. For example, ocean fertilization has been conducted in the Southwest Atlantic Sector of the Southern Ocean by an Indo-German research team.<sup>15</sup> In 2011, a proposal to pump water into the sky using a large balloon and a 1 km hose was suspended due to public protests.<sup>16</sup>

There is a broad range of geoengineering technologies and various ways of conducting geoengineering research. Can some projects be considered safe enough for research to proceed? Should we pursue certain approaches while abandoning others? For example, a report of a series of congressional hearings conducted by the US Committee on Science and Technology recommended that some proposed techniques such as space mirrors or desert-based reflectors were too expensive or too environmentally or politically risky for further research.<sup>17</sup>

## **SOLAR GEOENGINEERING - SOME EXAMPLES AND IMPACTS**

Giant mirrors in space. Chemicals injected into the atmosphere. Roofs painted white the world over. Some proposed geoengineering technologies seem far-fetched and highly technical. Many, however, are being given serious consideration.

Although a wide spectrum of ideas are on the table, two major approaches are being considered. The first set of strategies are based on solar radiation management (SRM), which proposes to decrease warming by 'reducing the incidence and subsequent absorption of incoming solar radiation' or to put it simply, to cut down the amount of sunlight reaching the earth. The second set of techniques involve removal of carbon dioxide from the earth's atmosphere (for more on this, see next section).

Nature itself provided an example of how solar radiation management works. During the Mount Pinatubo eruption in 1991, an ash stream was projected 35 kilometers into the air, injecting 20 million tons of sulfur dioxide into the atmosphere. As a result, much sunlight was reflected back into space and the global average temperature dropped by 0.5 C.

14 <http://www.cbd.int/climate/geoengineering/review/>

15 See Nature's Jan 2009 coverage: Ocean fertilization experiment draws fire (<http://www.nature.com/news/2009/090109/full/news.2009.13.html>), Ocean fertilization experiment suspended (<http://www.nature.com/news/2009/090114/full/news.2009.26.html>), Ocean fertilization: dead in the water? (<http://www.nature.com/news/2009/090128/full/457520b.html>)

16 4 Natural Environment Research Council. 4 Oct 2011. Update on SPICE project. <http://www.nerc.ac.uk/press/briefings/2011/05-spice.asp>. See also Vidal, G., 2011. Giant pipe and balloon to pump water into the sky in climate experiment, Guardian, [online]. Available at: <http://www.guardian.co.uk/environment/2011/aug/31/pipe-balloon-water-sky-climate-experiment>.

17 Engineering the climate: Research needs and strategies for International Coordination, Oct 2010. <http://www.whoi.edu/fileserver.do?id=74967&pt=2&p=81828>

Solar or SRM technologies aspire to produce a similar effect by putting installations in space to deflect solar radiation. For example, cloud albedo may be increased by injecting seawater or sulfur aerosols into the atmosphere, or surface albedo can be increased by painting roofs white or planting crops with shiny leaves.

By reducing the amount of sunlight that reaches the earth's surface, solar radiation absorbed by the earth is diminished and less heat is generated. This may help compensate for the increased warming brought about by greenhouse gases that prevent the earth's heat from escaping back into space. The earth's climate is affected by the balance between incoming radiation (energy) from the sun and outgoing thermal radiation (heat) which cools the earth but may be blocked by greenhouse gases. SRM works by reducing incoming radiation rather than reducing greenhouse gases. In other words, SRM does not treat the primary cause of global warming - greenhouse gases. As a result, if SRM is used on a large scale but no efforts are made to control greenhouse gases, then large and rapid increases in global temperatures could occur if SRM were suddenly stopped.

Compared to other geoengineering technologies, SRM could rapidly modify the climate. However, a lot of uncertainty remains about its potential impacts. The CBD draft report on Impacts of Climate Related Geo-engineering on Biological Diversity questions whether the impacts from SRM might not be worse than the problem it is supposed to resolve.

The combination of changes – more diffuse light, unpredictably, altered precipitation patterns, potentially high CO<sub>2</sub> concentrations – would be unlike any known combination that extant species and ecosystems have experienced in their evolutionary history. However, it is not clear whether the novel environment of the SRM world would be more or less challenging for today's species than that caused by the climate change that it would be seeking to counter.<sup>18</sup>

Another potential impact of injecting sulfur dioxides into the upper atmosphere could be a further thinning of the ozone layer. Arctic communities have already experienced the impact of a weakened ozone layer due to chlorofluorocarbons (CFCs). In a 2007 article, Inuit activist Sheila Watt-Cloutier explains: "Because one of the major (ozone) "holes" sits over the North Pole, our people are bombarded with the sun's damaging ultraviolet radiation at much higher levels than the rest of the world... more of the sun's heat and radiation is also being locked into our atmosphere by another set of pollutants: greenhouse gases. For Inuit, these problems are very much connected, as the rapidly increasing temperatures around our Arctic combine with the heightened UV radiation, affecting our ability to hunt, travel and maintain our traditional subsistence culture."<sup>19</sup> If SRM, by adding a third chemical to this atmospheric mix - sulfur dioxide - that may exacerbate ozone depletion while, according to some, locally intensifying greenhouse warming over the Arctic. For this reason, it's perhaps understandable that some Arctic peoples remain skeptical about the benefits of solar geoengineering.

## CARBON GEOENGINEERING - SOME EXAMPLES AND IMPACTS

Unlike solar geoengineering, carbon geoengineering addresses the root cause of climate change by removing carbon dioxide (CO<sub>2</sub>), a major greenhouse gas, from the atmosphere. These techniques are also referred to as carbon dioxide removal (CDR) or more simply, carbon technologies.

Ocean fertilization is one CDR technique. The theory is to trigger large blooms of algae by 'fertilizing' the iron-deficient ocean with iron sulphate. The algal bloom would absorb carbon, removing it from the

<sup>18</sup> See page 4 for the executive summary of the CBD draft report, which is also open for a second round of peer review comments (<http://www.cbd.int/climate/geoengineering/review/>). Section 4.1.3 goes into further detail.

<sup>19</sup> Watt-Cloutier, Sheila (2007). Ozone treaty offers insurance against climate change. The Globe and Mail. Published Thursday, Sep. 06, 2007. Available at: <http://www.theglobeandmail.com/news/opinions/article780681.ece>

atmosphere and then store it by sinking to the sea floor. Thirteen field trials have been conducted since the 1990s, but they have not been successful. One reason is that iron particles sink too quickly and thus have limited opportunity to stimulate algal growth. As a result, some scientists have concluded that ocean fertilization is not an appropriate technique, while others are calling for larger-scale field trials.

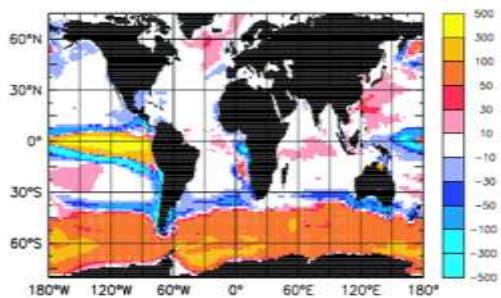
The CBD draft report on Impacts of Climate Related Geo-engineering on Biological Diversity raises a number of concerns

For ocean fertilization technique to work, biological primary production (photosynthesis by algae and bacteria) will increase, inevitably involving changes in phytoplankton community structure and diversity, with implications for the wider food-web...More permanent changes are however likely if ocean fertilization is sustained, and carried out on a climatically-significant scale. Such changes may include an increased risk of harmful algal blooms, involving increased toxic diatoms.<sup>20</sup>

But as CDR slows global climate change by addressing root causes, it may also reduce negative impacts on biodiversity deriving from climate change. Ocean acidification, for example, may be diminished as CDR reduces the atmospheric carbon that is the cause. However, some scientists believe that ocean fertilization may slow near-surface acidification, while increasing acidification of the deep ocean.<sup>21</sup>

Phytoplankton (algal) blooms that would be triggered by ocean fertilization would also affect fish stocks, but not in a uniform manner. The CBD report explains that fish stocks could be expected to ‘generally increase in response to increased phytoplankton ... arising from ocean fertilization’ but that they could also ‘decrease in ... areas where primary production is reduced.’

Figure 1. Changes in primary production after 100 years of global iron fertilization



Projected increases (red, orange and yellow) and decreases (blue) in vertically integrated primary productivity ( $\text{gC}/\text{m}^2/\text{yr}$ ) after 100 years of global iron fertilization.

During the 2009 Climate Conference in Copenhagen, Fiu Elisara, Samoan Executive Director of the O le Siosiomaga Society and indigenous representative to the UN climate negotiations, reported on new climate technologies:

<sup>20</sup> See Section 5.2.1.1 Direct external ocean fertilization techniques, with reference to Changes in phytoplankton community structure and diversity and food webs, of the CBD draft report on Impacts of Climate Related Geo-engineering on Biological Diversity, available at <http://www.cbd.int/climate/geoengineering>

<sup>21</sup> See Section 5.2.4.1 Direct external ocean fertilization techniques, with reference to General Issues on Biomass Production, of the CBD draft report on Impacts of Climate Related Geo-engineering on Biological Diversity, available at <http://www.cbd.int/climate/geoengineering>

<sup>21</sup> See Section 5.2.1.1 Direct external ocean fertilization techniques, with reference to Ocean Acidification, , of the CBD draft report on Impacts of Climate Related Geo-engineering on Biological Diversity, available at <http://www.cbd.int/climate/geoengineering>

For us in the Pacific, it is important to ensure that on top of being victims of the climate crisis, we do not want to become guinea pigs for new unproven technologies or old hazardous technologies such as nuclear power with the excuse that more technology is needed to fix the climate. As one colleague said here in Copenhagen, "It is totally irresponsible that negotiators are discussing the development and the transfer of technologies without any mechanisms to filter which ones can be useful and which ones will create more problems for peoples and the environment. We need immediately the inclusion and application of the precautionary principle on the issue of technology".

But not all geoengineering technologies are new. In contrast with ocean fertilization, land-based carbon reduction technologies are more familiar to indigenous peoples and local communities, especially those living in or near forested areas. These technologies include afforestation – or the planting of trees on land that has not had forest for more than 50 years – and reforestation – planting trees in areas that have been deforested more recently. They also include biochar which is a technique that turns biomass into charcoal.

The rationale behind such techniques is the following. Tree and plant biomass absorbs carbon dioxide as it grows. When this biomass is burned or left to rot on the ground, the absorbed carbon dioxide is released back into the atmosphere. Biochar technologies break this cycle by stocking carbon in the form of charcoal which is then buried in the soil.

These technologies have won the enthusiasm of some biodiversity scientists. Thomas Lovejoy argues:

At the moment, roughly half the excess carbon dioxide in the atmosphere comes from destruction and degradation of ecosystems over the past three centuries. A significant amount of CO<sub>2</sub> can be withdrawn by ecosystem restoration on a planetary scale. That means reforestation, restoring degraded grasslands and pasturelands and practicing agriculture in ways that restore carbon to the soil. There are additional benefits: forests benefit watersheds, better grasslands provide better grazing and agricultural soils become more fertile. This must integrate with competing uses for land as the population grows, but fortunately it comes at a time of greater urbanization.<sup>22</sup>

Indigenous peoples have long advocated the restoration of degraded forests with native trees, and biochar itself is inspired by 'terra preta' soils in Amazonia that were created hundreds of years ago by pre-Colombian settlements that incorporated charcoal into soils to increase their fertility.

Are there concerns about biochar techniques? The CBD draft report cautions:

[t]he storage or disposal of biomass may have impacts on biodiversity separate from those involved in (biochar) production. Removal of biomass from agricultural ecosystems may have negative impacts on agricultural productivity and biodiversity.<sup>23</sup>

Biochar projects have already been implemented across Africa, and afforestation and reforestation projects are common. However, these technologies would have to be implemented on a massive scale to

<sup>22</sup> Lovejoy, T.E. 2011. Geo-engineering can help save the planet. New York Times. Available at [http://www.nytimes.com/2011/06/11/opinion/11iht-edlovejoy11.html?\\_r=2](http://www.nytimes.com/2011/06/11/opinion/11iht-edlovejoy11.html?_r=2)

<sup>23</sup> See Section 5.2.4.1 Direct external ocean fertilization techniques, with reference to General Issues on Biomass Production, of the CBD draft report on Impacts of Climate Related Geo-engineering on Biological Diversity, available at <http://www.cbd.int/climate/geoengineering>

have the desired effect on the earth's atmosphere. Might not large-scale CDR technologies threaten existing biodiversity, indigenous peoples' rights to land and the use of land for ensuring food security?

### **Community participation and inclusion in impact assessments, and the potential role of the Akwe Kon Voluntary guidelines for the conduct of cultural, environmental and social impact assessments**

In the previous sections of this series we tried to give an overview of geoengineering and the different issues that could arise when thinking about geoengineering. We have looked at the different aspects of geoengineering, and identified some issues that may be of concern to indigenous peoples.

In the CBD decision on the impacts of climate geoengineering to the goals of the Convention there is a specific request to understand concerns of indigenous peoples and local communities on this matter. Within the CBD and, increasingly, in many other international forums, the importance of contributions from indigenous peoples' is being acknowledged. Although global recognition of indigenous peoples' rights through instruments such as the UN Declaration on the Rights of Indigenous Peoples has played a strong part in this evolving framework, it is not just based on international diplomacy. Many researchers have started to collaborate with indigenous peoples to be able to understand impacts and responses to climate change.

In an interview with Science magazine, Smithsonian curator Igor Krupnik explains:

I wouldn't put it like "indigenous people" and "scientists." It's a difference between someone who lives in the environment daily, and someone who studies it [at a distance]. If you wake up every morning and your day depends upon the weather, if your life depends upon going out and coming back safe, and bringing food and traveling, then you're naturally much more attentive and in tune to the environment.

This is a result of just how little we've worked on this together. We assume that indigenous people were around for millennia, and scientists started looking into indigenous knowledge of climate change in the past 15 years. So I'm not surprised how little we know. That would be my main message: We know so little and we want so much from these people, from their knowledge. We want it immediately, we want it for our specific goals, we want it for our models, for our predictions, and this is not the way you address other people's knowledge. It's not a common commodity; it's other people's culture.<sup>24</sup>

In the application of developments and research that could potentially impact indigenous peoples and local communities, the Convention on Biological Diversity has developed two guidelines. The first is the Akwe Kon Guidelines for assessing the cultural, social and environmental impacts of proposed developments on sacred sites and traditional lands and waters of indigenous and local communities<sup>25</sup>. These were formally adopted by CBD country Parties at the sixth Conference of the Parties in 2002 and these provide a framework to ensure the full involvement of indigenous peoples and local communities in assessments of proposed development, and as well, how to take into account traditional knowledge in these assessment processes.

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<sup>24</sup> Loury, E. 2012. Q&A. *What Can Indigenous People Tell Us About Climate Change?* Science. Available at: <http://news.sciencemag.org/sciencenow/2012/02/q-and-a-what-can-indigenous-peop.html> (Verified 12 April 2012).

<sup>25</sup> Akwe Kon Guidelines are available at: <http://www.cbd.int/doc/publications/akwe-brochure-en.pdf>

The second is the Code of Ethical Conduct on Respect for the Cultural and Intellectual Heritage of Indigenous and Local Communities Relevant for the Conservation and Sustainable Use of Biological Diversity (the Tkarihwaié:ri code of ethical conduct)<sup>26</sup>.

The 2009 Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters<sup>27</sup> makes clear the links between human rights, environmental rights and the right to participate in environmental decision-making. It aims to improve decision-making on environment by, among others, advocating for effective public participation, and greater access to justice on public decisions.

Understanding the multilateral governance frameworks that already exist is crucial to provide a basis for discussing of global importance – including climate change and actions that could be taken to remedy its impacts. Are there other important frameworks that can contribute towards these discussions?

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<sup>26</sup> Tkarihwaié:ri code of ethical conduct is available at: <http://www.cbd.int/decision/cop/?id=12308>

<sup>27</sup> UN Economic Commission for Europe Convention on access to information, public participation in decision-making and access to justice in environmental matters is available at: <http://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf>