

## **Solar Geoengineering: Assessing Whether Lack of Scientific Evidence Justifies Halting Solar Geoengineering Research**

*By Advaita Lonkar*

*Masters in International Law Candidate at the Geneva Graduate Institute, Switzerland*

DOI: 10.55662/JST.2024.5203

---

### **Abstract**

This article examines the relevance of the research on solar geo-engineering, which has become the new buzz-word in climate change mitigation. With current climate mitigation policies becoming evidently inadequate, one needs to look at science for the panacea. Solar geoengineering is a double-edged sword, capable of giving desirable results in the near future but equally capable of multiplying the complexities of the problem in long term future. There continue to exist certain deep-rooted concerns about the necessity and end-use consequences of this technology. The article attempts to examine both these facets. It also throws light on the concerns of indigenous communities and the principle of intergenerational justice with respect to the conduct of solar geoengineering research. The article ends with a conclusion which aims at giving a balanced solution to the research question.

### **Introduction**

Geoengineering entails deliberate intervention in the Earth's natural systems, on a large-scale, with the aim and objective to counteract climate change.<sup>1</sup> Amidst the wide range of geoengineering techniques, the two most researched categories are:

- i) Solar Radiation Management (SRM) or Solar geoengineering

---

<sup>1</sup> 'Oxford Geoengineering Programme // What Is Geoengineering?'  
<<https://www.geoengineering.ox.ac.uk/www.geoengineering.ox.ac.uk/what-is-geoengineering/what-is-geoengineering/>> accessed 24 November 2023.

ii) Carbon Dioxide Removal (CDR) or Carbon Geoengineering

The focus of this paper will be on the Solar Radiation Management (SRM) popularly known as Solar Geoengineering. It is best described as a technique of reflecting a small fraction of sunlight back into space, thereby 'cooling' the planet.<sup>2</sup> In contrast to carbon geoengineering, solar geoengineering does not address the root cause of climate change. It instead aims to break the link from concentrations to temperatures, thereby reducing some climate damages.<sup>3</sup> Since it predominately involves manipulating the Earth's climatic system, this method or even research into it has created controversy. Studies indicate that application of SRM may worsen the problem rather than solving due to its inherent complexities.<sup>4</sup>

Conversely, there are many proponents of this technique who fiercely advocate further scientific research into it so as to acquire better knowledge to comprehend and minimise its side-effects. This paper critically analyses the concerns and challenges of both. It concludes to answer if further research into Solar Geo-Engineering is desirable or otherwise. Solar Radiation Management (SRM) or Solar Geoengineering envisages bringing the Earth's temperatures down by engaging two proposed techniques. One of them is the Stratospheric Aerosol Injection, which involves injecting miniscule particles of sulphur dioxide into the stratosphere. These particles, known as, aerosols, would reflect certain quantity of sunlight back into space.<sup>5</sup> This process is also called as 'global dimming'.<sup>6</sup> The Stratospheric Aerosol Injection technology derived its inspiration from the large-scale effects witnessed in the aftermath of the Mt Pinatubo Volcano in June 1991 which injected large quantities of sulphur dioxide into the stratosphere thereby cooling the Earth's surface by 0.5 degree celsius in the following year.<sup>7</sup>

---

<sup>2</sup> 'Geoengineering' <<https://geoengineering.environment.harvard.edu/geoengineering>> accessed 24 November 2023.

<sup>3</sup> *ibid.*

<sup>4</sup> Paul J Crutzen, 'Albedo Enhancement by Stratospheric Sulfur Injections: A Contribution to Resolve a Policy Dilemma?' (2006) 77 *Climatic Change* 211.

<sup>5</sup> 'What Is Geoengineering and How Could It Help Tackle Climate Change?' (*Grantham Research Institute on climate change and the environment*) <<https://www.lse.ac.uk/granthaminstitute/explainers/what-is-geoengineering-and-how-could-it-help-tackle-climate-change/>> accessed 24 November 2023.

<sup>6</sup> *ibid.*

<sup>7</sup> Crutzen (n 4).

The other proposed technique is the Marine Cloud Brightening, wherein the clouds over the oceans would be made 'lighter' in colour thereby reflecting some sunlight back into space by engaging the principle of "albedo effect" (lighter surface reflect more light).<sup>8</sup> The analysis of the problematique is made in two parts: the first one deals with the concerns surrounding Solar Geoengineering, which has rendered it controversial. The second part talks about why further research into Solar Geoengineering is desirable, which is followed by a conclusion.

### **Why Solar Geoengineering is increasingly controversial**

The most potent argument against Solar Geoengineering or Solar Radiation Management (SRM) is the precautionary principle itself. The precautionary principle is increasingly being relied upon by international legal and policy communities while responding to scientific uncertainty.<sup>9</sup> Solar geoengineering may possibly spearhead irreversible environmental impacts like changing weather patterns, ozone loss, acid rain, increased ocean acidification, damage to agriculture from lack of sunlight, less predictable weather, air pollution from the particulates coming down and monsoon failures.<sup>10</sup> All these possibilities make SRM, the best candidate for applying the precautionary principle.<sup>11</sup> The implementation of precautionary principle has been given utmost important in international environmental law, especially when it comes to anticipating the ill-effects of a scientific technology which has momentous consequences. According to the Wingspread declaration of 1998, "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not established scientifically".<sup>12</sup> Even the COP 10 mandate to the Convention on Biological Diversity (CBD) applied the precautional approach while rejecting the implementation on geoengineering techniques to counter climate

---

<sup>8</sup> admin, 'Solar Geoengineering: Is Controlling Our Climate Possible?' (*Science in the News*, 20 December 2017) <<https://sitn.hms.harvard.edu/flash/2017/solar-geoengineering-controlling-climate-possible/>> accessed 24 November 2023.

<sup>9</sup> Kevin Elliott, 'Geoengineering and the Precautionary Principle' (2010) 24 *International Journal of Applied Philosophy* 237.

<sup>10</sup> Mathias Risse, 'On the Role of Solar Geoengineering in Combatting Climate Change':

<sup>11</sup> Elliott (n 9).

<sup>12</sup> 'Wingspread Statement on the Precautionary Principle' <<https://www.gdrc.org/u-gov/precaution-3.html>> accessed 24 November 2023.

change.<sup>13</sup> Similarly, the Royal Society also concluded that all geoengineering methods assessed have major uncertainties in their likely costs, effectiveness and are therefore unlikely to be deployed in the short or medium term.<sup>14</sup> In its Chapter 4 on 'Global Warming- 1.5 degrees celsius', the Intergovernmental Panel on Climate Change (IPCC), which is the United Nations body for assessing the science related to climate change, focuses on the uncertainties around the application of Solar Geo-Engineering.<sup>15</sup>

Deploying advanced technology to reduce the temperature of the earth could possibly result in the 'Global North' shirking its responsibility in its mitigation efforts, especially considering that Global North has been primarily responsible for climate change. Principles of justice and Common but differentiated principles demand that Global North take the primary responsibility for mitigating the problem of climate change which has had disproportionate effects on Global South.<sup>16</sup> The application of Solar Geo-Engineering may prove to be a temptation for the rich industrialised nations to 'take the easy way out' rather than adopting a comprehensive decarbonization programme.<sup>17</sup> The most enticing 'global distributive justice' argument is for the Global North to take up the (costly) burden of emissions reduction. According to the scientific research conducted so far, the Solar Geo-Engineering or SRM technology would be less expensive, by orders of magnitude, which may be utilised as a 'quick fix' by the Global North. In comparison, engaging in mitigation and adaptation efforts in more expensive and onerous.

Another possible consequence of the prohibitive nature of cost of Solar Radiation Management might also lead to the problem of what economists call the 'free-driver effect'.<sup>18</sup> An affluent nation or even a single billionaire in possession of this technology may have the power to bring into effect geoengineering actions with endless chain of consequences, thereby

---

<sup>13</sup> Biosafety Unit, 'Climate-Related Geoengineering and Biodiversity' (23 March 2017) <<https://www.cbd.int/climate/geoengineering/>> accessed 24 November 2023.

<sup>14</sup> Elliott (n 9).

<sup>15</sup> 'Chapter 4 — Global Warming of 1.5 °C' <<https://www.ipcc.ch/sr15/chapter/chapter-4/>> accessed 24 November 2023.

<sup>16</sup> 'Horton\_and\_keith\_2016.Pdf' <[https://keith.seas.harvard.edu/files/tkg/files/horton\\_and\\_keith\\_2016.pdf](https://keith.seas.harvard.edu/files/tkg/files/horton_and_keith_2016.pdf)> accessed 22 November 2023.

<sup>17</sup> *ibid.*

<sup>18</sup> *ibid.*

affecting the whole planet.<sup>19</sup> Critics fear that Solar Geoengineering would disproportionately affect the Global South most of all.<sup>20</sup> Studies indicate that long-term effects of solar geoengineering may potentially disrupt Asian and African summer monsoons.<sup>21</sup> This raises the concern that Solar Geo-Engineering or SRM may in fact make matters worse off than they would with global warming alone. Alan Robock in his article 'Regional Climate Responses to Geoengineering with Tropical and Arctic SO<sub>2</sub> Injections', analyses a model which argues that Solar Geoengineering technology could lead to a 'lesser cloud cover' over Sub-Saharan Africa which has large-scale rainfed agriculture.<sup>22</sup> Lesser cloud coverage would increase the temperatures in African & Asia, thereby aggravating their problems. Reduced precipitation in Africa, South America and South-East Asia renders solar geoengineering as a tool with potential to increase benefits for some by increasing harm for others, in this case, the Global North benefitting at the expense of Global South.<sup>23</sup> A particular concern in the context of disproportionate effect on Global South is the possibility of 'Stratospheric Imperialism'. There are concerns that US is already engaging in stratospheric imperialism through the highly advanced research conducted by Harvard University in the form of the SCoPEX project.<sup>24</sup> The Global North, which has the requisite resources and technology, may get an inequitable head-start, eventually achieving an 'upper-hand' in terms of knowledge and utilisation of this life-altering technology. The possession of this technology may be unjustly utilised for geopolitical domination over the Global South. This may give rise to a new form of imperialism, leaving the countries of the Global South at the mercy of the Global North.<sup>25</sup> It may also lead to conflicts and climate wars in the future.

Harvard University, under its specialised project called Stratospheric Controlled Perturbation Experiment (SCoPEX), has been conducting advanced research on Sámi Land which is

---

<sup>19</sup> Steve Nordquist, 'Solar Geoengineering: What If Countries Could Move the Earth's Thermostat?' (*LSE Business Review*, 17 April 2019) <<https://blogs.lse.ac.uk/businessreview/2019/04/17/solar-geoengineering-what-if-countries-could-move-the-earths-thermostat/>> accessed 24 November 2023.

<sup>20</sup> 'Horton\_and\_keith\_2016.Pdf' (n 16).

<sup>21</sup> Alan Robock, Luke Oman and Georgiy L Stenchikov, 'Regional Climate Responses to Geoengineering with Tropical and Arctic SO<sub>2</sub> Injections' (2008) 113 *Journal of Geophysical Research: Atmospheres* <<https://onlinelibrary.wiley.com/doi/abs/10.1029/2008JD010050>> accessed 22 November 2023.

<sup>22</sup> *ibid.*

<sup>23</sup> 'Horton\_and\_keith\_2016.Pdf' (n 16).

<sup>24</sup> Kevin Surprise, 'Stratospheric Imperialism: Liberalism, (Eco)Modernization, and Ideologies of Solar Geoengineering Research' (2020) 3 *Environment and Planning E: Nature and Space* 141.

<sup>25</sup> Jennie C Stephens and Kevin Surprise, 'The Hidden Injustices of Advancing Solar Geoengineering Research' (2020) 3 *Global Sustainability* e2.

inhabited by indigenous people called the Sámi. It covers parts of Northern Norway, Sweden, Finland and Russia's Kola Peninsula. Their population is estimated around 70,000 to 100,000.<sup>26</sup> In June 2021, the Sámi Council wrote a letter to Harvard University asking them to cease all work around solar geoengineering, not just on Sámi Land, but globally.<sup>27</sup> This letter has been co-signed by 35 indigenous groups and organizations from different countries, mostly with connections to the Arctic.<sup>28</sup> The Sámi consider themselves as the caretakers, a trait similar to many indigenous communities. Well known for championing environmental causes in the Arctic and beyond and fostering collaboration among indigenous groups around the world, the Sámi community considers Solar Geoengineering as contrary to how humanity should interact with environment.<sup>29</sup> The concerns raised by the Sámi community were both procedural and substantive.<sup>30</sup> The primary concern was who gets to decide significant issues related to the Solar Engineering project, specifically the Stratospheric Aerosol Injection. Secondly, they express their grievance of not having been consulted on the matter before commencing research on Sámi Land. The SCoPEX Advisory Committee failed to include representation from affected groups. The council reiterated their concerns with regard to risks of deployment and the possibility of the SRM offsetting the mitigation efforts already underway. The concerns raised by Sámi group are potent, as they rightly call solar geoengineering as "the most momentous technological idea humanity as ever toyed with."<sup>31</sup> As highlighted in the petition advocating ceasing Harvard's SCoPEX project, the Sámi people reiterate their belief in the environment as 'mother nature' and 'father sky'. They worship the environment as 'pious' and therefore consider solar geoengineering technology to be excessively anthropocentric and grossly violative of respect towards the nature. Indigenous world-view regards the 'human-being' as part of nature, and as mere custodians of the environment with a moral duty to hand-over healthy ecosystems to future generations.

---

<sup>26</sup> Risse (n 10).

<sup>27</sup> *ibid.*

<sup>28</sup> 'Open letter requesting cancellation of plans for geoengineering related test flights in Kiruna' (*Sámiráđđi*, 2 March 2021) <<https://www.saamicouncil.net/news-archive/open-letter-requesting-cancellation-of-plans-for-geoengineering>> accessed 1 December 2023.

<sup>29</sup> Risse (n 10).

<sup>30</sup> 'Indigenous Group Petitions Harvard to Shut Down Controversial Geoengineering Project to Block Sun | News | The Harvard Crimson' <<https://www.thecrimson.com/article/2021/6/27/saami-council-petition-shut-down-scopex/>> accessed 1 December 2023.

<sup>31</sup> 'Support the Indigenous voices call on <br/>Harvard to shut down the SCoPEX project' (*Sámiráđđi*, 9 June 2021) <<https://www.saamicouncil.net/news-archive/support-the-indigenous-voices-call-on-harvard-to-shut-down-the-scopex-project>> accessed 24 November 2023.

In this regard, the concerns raised by indigenous communities are coherent with the principles of intergenerational justice, which must not be ignored. What we owe to the future is easily corrupted simply because we cannot ‘debate’ the future people.<sup>32</sup> Taking into consideration the concerns and opinion of indigenous community is the best shot at achieving intergenerational justice, as they as often in sync with each other.

### **Why further research may be desirable, even necessary**

Mitigation and adaptation efforts undertaken by countries so far, have not yielded significant results. The goals set in the Paris Agreement are far from being realised. Many climate experts are now claiming that the ‘window of action’ for meeting the Paris goals is rapidly closing.<sup>33</sup> Benefits of mitigation efforts are realised only in the long term. Adaptation on the other hand is instrumental in bring about substantial short-term benefits but being implemented locally, it is spatially restrictive.<sup>34</sup> Advantages brought about by SRM can be implemented on a global scale, in contrast to the more local-scale benefits accrued by adaptation. Secondly, the cost incurred by SRM would be much lower than adaptation. In this scenario it would be worth exploring if solar geoengineering can be deployed as a potential climate policy tool along with mitigation and adaptation.

The countries of the Global South are till today hugely dependent on fossil fuels for their energy needs. Even though significant measures are underway to nudge the energy sector in developing and underdeveloped countries towards renewable energy, this transition is often a slow-motion process.

The adoption of SRM technology can afford the countries of Global South, a much needed window of time, to enable a successful transition towards renewable energy. The application

---

<sup>32</sup> Risse (n 10).

<sup>33</sup> ‘Window to Reach Climate Goals “Rapidly Closing”, UN Report Warns | UN News’ (8 September 2023) <<https://news.un.org/en/story/2023/09/1140527>> accessed 26 November 2023.

<sup>34</sup> ‘Horton\_and\_keith\_2016.Pdf’ (n 16).

of SRM technology will essentially slow down the process of heating of the Earth's atmosphere by reflecting a part of the sunlight entering the Earth, back into space, thereby 'delaying' the heating of the Earth. This way, countries of Global South will get enough time to replace fossil fuels with renewable energy, without excessively contributing to global warming & climate change.

Another argument in favour of further research into Solar Geoengineering is that since developing & underdeveloped countries are condemned to suffer the disproportionate brunt of climate change and would continue to do so in the future, the foregoing of research on solar geoengineering might be detrimental to the collective interests of Global South.<sup>35</sup> This means that engaging in further research into Solar Geoengineering may be in the interest of the developing and underdeveloped countries as they are, very often, at the receiving ends of the worst consequences of climate change. Arguably, the Global South may lose much more than the Global North by foregoing scientific research in Solar Geoengineering.

The cost differential between adaptation and SRM has greater redistributive potential for the Global South.<sup>36</sup> To forego further research into SRM would amount to shirking of responsibility by the Global North which has the resources, technology and incentive to carry out research.<sup>37</sup>

According to David Keith, one of the foremost proponents of Solar Geoengineering, the distributive justice arguments against SRM. Firstly Global North shirking its responsibility & secondly the disproportionate adverse impact of Solar geoengineering on the Global South can be offset by further scientific research along with adoption of a comprehensive climate risk management framework<sup>38</sup>. For this to work, the most important prerequisite is the principle that the adoption of Solar Geoengineering technology must not be viewed as a replacement of the adaption and mitigation efforts, but rather as a 'complementary' mechanism.

---

<sup>35</sup> A Atiq Rahman and others, 'Developing Countries Must Lead on Solar Geoengineering Research' (2018) 556 Nature 22.

<sup>36</sup> 'Horton\_and\_keith\_2016.Pdf' (n 16).

<sup>37</sup> *ibid.*

<sup>38</sup> *ibid.*



There is also a need for a comprehensive framework dealing with the regulations surrounding the scientific study and implementation of the SRM technology. The most significant questions being: who is conducting and funding the solar geo-engineering project, the circumstances warranting the utilisation of his technology, how the technology will likely be deployed, the system of checks and balances, whether individuals or private sector, however powerful, be given access to this technology etc, must be addressed exhaustively in this framework. Also, there must be inclusion of as wide representation as possible. The voices of indigenous communities, affected people, small island developing countries and least developed countries must be heard.

### **Conclusion**

Even though there may not be enough affirmative evidence in the field of solar geoengineering at present, further research in this domain is indeed desirable. Scientific research on the SRM technology is still at a relatively nascent stage and it would be premature to forego research at this stage on the basis of presupposed consequences.

While it is true that scientific research must be carried out with utmost care and observing the precautionary principles, it is significant to bear in mind that research of any scientific technology does not automatically authorize its implementation. If after further advanced research into solar geoengineering, there continue to remain persistent fundamental doubts about its application and its adverse consequences, then it would be sagacious to forego research. Commitment to conduct research does not entail obligation to implement.

This paper positively asserts that to forego research in solar geoengineering at this stage would amount to throwing the baby out with the bathwater. The potential benefits which can be possibly achieved with the help of solar engineering are immense. It is nearly a decade since the adoption of the climate goals as part of Paris Agreement but instances of climate change induced human right violations in the form of forced displacement, migrations, untimely floods and droughts, monsoon failures, etc have been rampant. The mitigation and adaptation efforts are obviously not enough: in terms of scale of implementation, the time period of results and sheer political will of the countries to make the necessary changes. In

this case, it is incumbent for us to turn to scientific research and the huge potential it may have, with regard to protection against climate change.

It is equally important to emphasize at the outset that solar geoengineering cannot, in any capacity, be a substitute to mitigation and adaptation efforts. The success in the field of scientific research in the SRM technology should not be used as a 'license' by countries to continue with their excessive emissions. Solar Geoengineering can, at best, be applied as a 'complementary' climate policy tool and not as an 'alternate' climate policy tool.

While research into solar geoengineering takes form and shape, it is desirable to simultaneously work towards a consensus-based framework of basic principles addressing issues relating to utilisation and funding of the technology as well as ensuring meaningful engagement of all stakeholders.

To conclude, scientific research in the field of solar geoengineering is imperative in order to objectively decide whether its application is plausible or not. If scientific research concludes it to be disastrous and resulting in irreversible climate change effects, then it must be abandoned. But if not, solar geoengineering may well prove to be our last resort to save the world from the inevitable disaster.

### **Bibliography:**

1. Admin. "Solar Geoengineering: Is Controlling Our Climate Possible?" Science in the News, 20 December 2017, <https://sitn.hms.harvard.edu/flash/2017/solar-geoengineering-controlling-climate-possible/>. Accessed 24 November 2023.
2. "Chapter 4 – Global Warming of 1.5 oC." <https://www.ipcc.ch/sr15/chapter/chapter-4/>. Accessed 24 November 2023.
3. Crutzen, P. J. "Albedo Enhancement by Stratospheric Sulfur Injections: A Contribution to Resolve a Policy Dilemma?" (2006) 77 Climatic Change 211.
4. Elliott, K. "Geoengineering and the Precautionary Principle." (2010) 24 International Journal of Applied Philosophy 237.

5. "Geoengineering."  
<https://geoengineering.environment.harvard.edu/geoengineering>. Accessed 24 November 2023.
6. "Horton\_and\_keith\_2016.Pdf"  
[https://keith.seas.harvard.edu/files/tkg/files/horton\\_and\\_keith\\_2016.pdf](https://keith.seas.harvard.edu/files/tkg/files/horton_and_keith_2016.pdf).  
Accessed 22 November 2023.
7. "Indigenous Group Petitions Harvard to Shut Down Controversial Geoengineering Project to Block Sun." News, The Harvard Crimson.  
<https://www.thecrimson.com/article/2021/6/27/saami-council-petition-shut-down-scopex/>. Accessed 1 December 2023.
8. Nordquist, S. "Solar Geoengineering: What If Countries Could Move the Earth's Thermostat?" LSE Business Review, 17 April 2019,  
<https://blogs.lse.ac.uk/businessreview/2019/04/17/solar-geoengineering-what-if-countries-could-move-the-earths-thermostat/>. Accessed 24 November 2023.
9. "Open letter requesting cancellation of plans for geoengineering related test flights in Kiruna." Sámiráđđi, 2 March 2021, <https://www.saamicouncil.net/news-archive/open-letter-requesting-cancellation-of-plans-for-geoengineering>. Accessed 1 December 2023.
10. "Oxford Geoengineering Programme // What Is Geoengineering?"  
<https://www.geoengineering.ox.ac.uk/www.geoengineering.ox.ac.uk/what-is-geoengineering/what-is-geoengineering/>. Accessed 24 November 2023.
11. Rahman, A. A. et al. "Developing Countries Must Lead on Solar Geoengineering Research." (2018) 556 Nature 22.
12. Risse, M. "On the Role of Solar Geoengineering in Combatting Climate Change."
13. Robock, A., Oman, L., and Stenchikov, G. L. "Regional Climate Responses to Geoengineering with Tropical and Arctic SO<sub>2</sub> Injections." (2008) 113 Journal of Geophysical Research: Atmospheres  
<https://onlinelibrary.wiley.com/doi/abs/10.1029/2008JD010050>. Accessed 22 November 2023.
14. Stephens, J. C., and Surprise, K. "The Hidden Injustices of Advancing Solar Geoengineering Research." (2020) 3 Global Sustainability e2.

15. "Support the Indigenous voices call on Harvard to shut down the SCoPEX project." Sámiráđđi, 9 June 2021, <https://www.saamicouncil.net/news-archive/support-the-indigenous-voices-call-on-harvard-to-shut-down-the-scopex-project>. Accessed 24 November 2023.
16. Surprise, K. "Stratospheric Imperialism: Liberalism, (Eco)Modernization, and Ideologies of Solar Geoengineering Research." (2020) 3 Environment and Planning E: Nature and Space 141.
17. Unit B. "Climate-Related Geoengineering and Biodiversity." 23 March 2017, <https://www.cbd.int/climate/geoengineering/>. Accessed 24 November 2023.
18. "What Is Geoengineering and How Could It Help Tackle Climate Change?" Grantham Research Institute on climate change and the environment, <https://www.lse.ac.uk/granthaminstitute/explainers/what-is-geoengineering-and-how-could-it-help-tackle-climate-change/>. Accessed 24 November 2023.
19. "Window to Reach Climate Goals 'Rapidly Closing', UN Report Warns." UN News, 8 September 2023, <https://news.un.org/en/story/2023/09/1140527>. Accessed 26 November 2023.
20. "Wingspread Statement on the Precautionary Principle." <https://www.gdrc.org/u-gov/precaution-3.html>. Accessed 24 November 2023.