SRM Youth Watch

Briefing Note – Science

What is geoengineering? – paying attention to definitions and concepts

Debates around climate-altering technologies get sometimes complexified by the confusion about words and concepts used. It is therefore important to pay attention and clearly define notions during a discussion on this topic.

The IPCC defined **Geoengineering** as "a broad set of methods and technologies that aim to deliberately alter the climate system in order to alleviate the impacts of climate change" in its fifth assessment report (AR5).

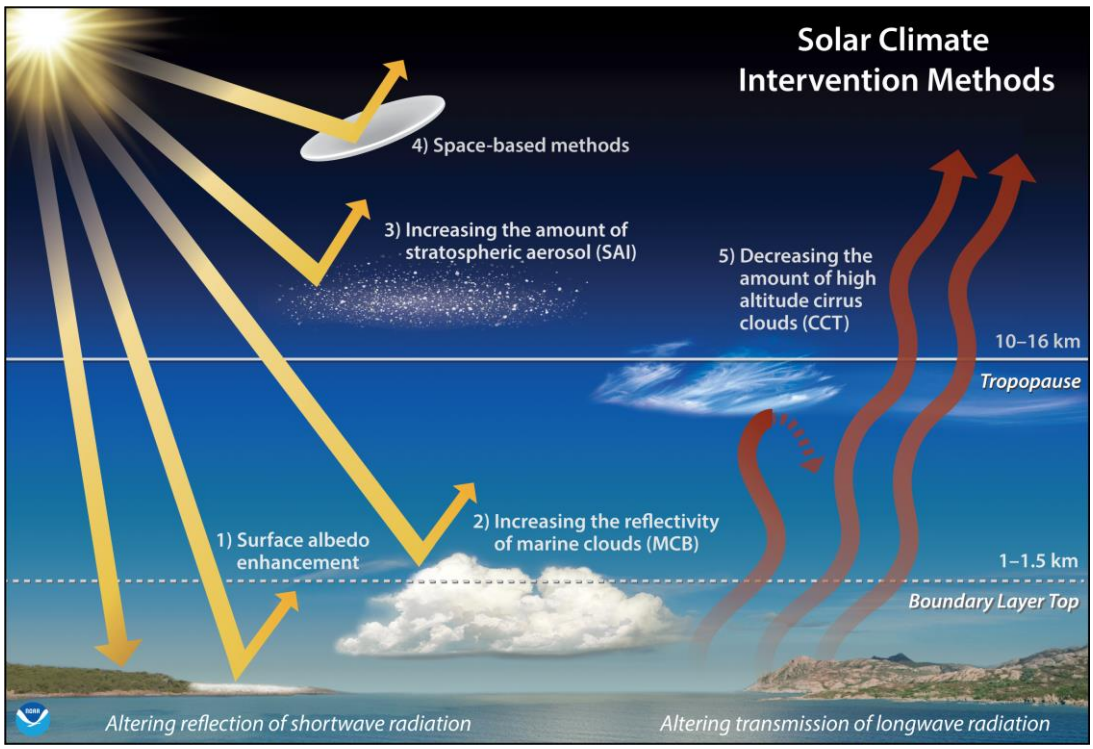
However, in its sixth assessment report (AR6), the IPCC chose not to refer to the term "geoengineering". Instead, separate consideration was given to the two main approaches considered as "geoengineering" in some of the literature: **solar radiation modification (SRM)** and **carbon dioxide removal (CDR)**. Other terms used in the literature to describe these technologies include climate geoengineering, climate intervention, and climate engineering.

In this sense, **using the word "geoengineering" can be problematic** as it encompasses a wide variety of technologies which pose different challenges. Using this term also conveys the idea that the Earth and its systems can be engineered, which undermines their complexity and can be seen as humanity overstepping its limits.

What is solar radiation modification (SRM)?

The term solar radiation modification covers techniques aiming at temporarily limiting global warming by enhancing the Earth's reflectivity and therefore limiting the amount of solar radiation entering the Earth's surface. These techniques include:

- Stratospheric aerosol injection (SAI) – injecting reflective particles, such as sulfate, into the atmosphere in order to increase Earth's reflectivity. SAI is the most-studied SRM approach.
- Marine cloud brightening (MCB) – increasing the reflectivity of clouds through the injection of particles, often sea salt.
- Cirrus cloud thinning – reducing the amount of cirrus clouds, which particularly trap infrared radiation (heat radiation), as GHGs do.
- Other techniques including ground-based albedo modification (such as painting the roofs of urban buildings white to increase their reflectivity); space-based approaches (such as placing mirrors between the sun and Earth to reflect or block sunlight before it reaches the Earth).



Solar radiation modification techniques
Source: National Oceanic and Atmospheric Administration (NOAA)

All these techniques have in common that **they do not address the root causes of climate change**. For instance, SRM does not tackle greenhouse gas emissions or ocean acidification. Therefore, **SRM approaches should not be considered as adaptation or mitigations efforts, but as additional measures**, at most.

In this sense, SRM can be referred to as a "mask" on climate change, or a "painkiller".

What are potential environmental risks of SRM?

Knowledge gaps remain regarding potential risks associated with the deployment of SRM. These potential risks are important to keep in mind when it comes to debating the deployment of SRM.

It is estimated that SRM, and more specifically SAI (Solar aerosol injection) may disrupt rainfall patterns and also intensify droughts in specific areas of the world, adding pressure on agriculture. Other studies tend to show that SRM deployment could lead to an increase in crop yields, changes in cyclone patterns, threats to biodiversity, and the spread of diseases like malaria.

Additionally, the consequences on photosynthesis, the evolution of aerosols in the atmosphere, aircraft technologies to deploy SAI globally, but also **ethics**, costs and risks of **geopolitical tensions** still need to be further studied. For instance, irregularities in SRM management would have concerning consequences, such as sudden temperature changes entailed by a halt in SRM deployment (a phenomenon known as termination shock).