

The proposals for Solar Radiation Management (SRM) is a form of climate engineering that would reduce global warming by reflecting UV-rays of the sun. Solar Radiation Management is an important topic for the [IAS Exams](#).

What is the purpose of Solar Radiation Management?

To combat global warming, projects regarding climate engineering have been proposed.

Climate scientists are trying to come up with various methods through which the human race will be able to stave off the worst effects of climate change. It has been proposed by these scientists that the reflectivity of the Sun's infrared rays or the albedo of the Earth, be increased by spraying aerosols into the stratosphere. They believe that this will help in removing or at the very least, stemming the increase of the greenhouse gas effect.

Using methods such as the one mentioned above, SRM's purpose is to effectively manage Earth's climate, although it is not possible to enact complete control without ignoring geographical borders.

What can be done, however, is that SRM projects be used as a temporary response to bring levels of greenhouse gases under control by greenhouse gas reduction methods.

What are the methods used for SRM?

The following methods are used for Solar Radiation Management

- Space Sunshades, using mirrors in space, placing vast satellites at Lagrange Point 1, space parasol, etc.
- Stratospheric aerosol injection – methods involving the injection of sulfate aerosols into the stratosphere.
- Marine Cloud Brightening (spraying a fine seawater spray in the air), seeding of high cirrus clouds with heterogeneous ice nuclei.
- Surface-Based Options like whitening roofs, growing more reflective crops, etc.

What is the impact of Solar Radiation Management?

Like all aspects of science, it is quite ambiguous regarding how positive or negative the impact of SRM will be. Therefore it is prudent to gauge both the aspects before concluding.

Advantages of SRM

- SRM has certain advantages relative to emissions cuts, carbon dioxide removal. When implemented properly it will mitigate the effect of climate change very rapidly, within months of enactment

- Some of the SR methods proposed are cost-effective when it comes to implementing them.
- This creates a different problem structure. Whereas the provision of emissions reduction and carbon dioxide removal present collective action problems (because ensuring a lower atmospheric carbon dioxide concentration is a public good), a single country or a handful of countries could implement solar radiation management. Finally, the direct climatic effects of solar radiation management are reversible on short timescales.

Limitations of Solar Radiation Management

As well as the imperfect cancellation of the climatic effect of greenhouse gases, there are other significant problems.

Control and predictability

There are no real-world simulations done so far regarding the effects of SRM. Most of the information available is from models and computer simulations. The actual results may differ from the predicted effect. It may be difficult to predict the ultimate effects of projects, with models presently giving varying results. In the cases of systems which involve tipping points, effects may be irreversible.

Termination Shock

If solar radiation management were masking a significant amount of warming and then were to abruptly stop, the climate would rapidly warm. This would cause a sudden rise in global temperatures towards levels which would have existed without the use of the climate engineering technique.

Effect on sunlight, sky and clouds

Managing solar radiation using aerosols or cloud cover would involve changing the ratio between direct and indirect solar radiation. This would affect plant life and solar energy. It is also believed that additional effects would include the difference in the appearance of the sky, notably a hazing of blue skies.

Side Effects

There may be unintended climatic consequences of solar radiation management, such as significant changes to the hydrological cycle that might not be predicted by the models used to plan them. Such effects may be cumulative or chaotic. Ozone depletion is a risk of techniques involving sulfur delivery into the stratosphere. Not all side effects are negative, and an increase in agricultural productivity has been predicted by some studies due to the combination of more diffuse light and elevated carbon dioxide concentration

Weaponization

In 1976, 85 countries signed the United Nation Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques. The Convention states that any attempts to weaponise climate engineering techniques are prohibited. There is still the risk of rogue parties circumnavigating this convention and thus does not eliminate the risk of weaponisation. If perfected to a degree of controllability and accuracy that is not considered possible at the moment, climate engineering techniques could theoretically be used by militaries or militants to cause droughts or famines.