



# Solar Radiation Management

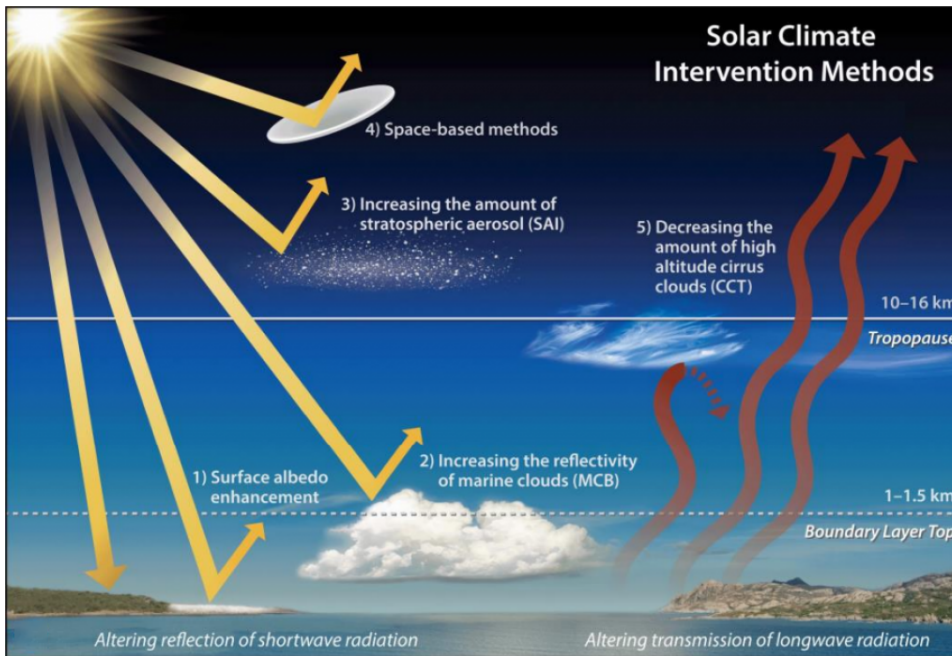
## Why in News?

**Solar radiation management (SRM)** has emerged as a potential tool to counter the effects of global warming by **reflecting sunlight back into space**.

- A recently released report by the US government highlights the **need for comprehensive research and a governance framework to assess the risks and benefits associated with SRM**.

## What is Solar Radiation Management?

- **About:**
  - **Solar radiation management** is a form of **climate engineering** that aims to **reduce global warming by reflecting some of the sun's energy back** into space before it can heat up the Earth.
  - SRM is an **idea born of desperation**, as the world faces an ongoing and accelerating climate crisis that threatens human well-being and planetary health.
- **Some of Most Discussed Methods of SRM:**
  - **Stratospheric Aerosol Injection (SAI):** This involves **injecting reflective particles**, such as **sulfate aerosols**, into the upper atmosphere (stratosphere), where they would scatter some of the incoming solar radiation back into space.
    - This would **mimic the cooling effect of volcanic eruptions**, which also release aerosols into the stratosphere.
  - **Marine Cloud Brightening (MCB):** This involves **spraying fine droplets of seawater or other substances into low-level clouds (marine stratocumulus)** over the oceans, where they would act as cloud condensation nuclei and increase the reflectivity and persistence of the clouds.
    - This would enhance the cooling effect of clouds, **which already reflect about 20% of the incoming solar radiation**.
    - MCB is considered to be more localized and reversible than SAI, but also more technically **challenging** and dependent on weather conditions.
  - **Space Sunshades:** This involves **placing large mirrors or screens in orbit around the Earth** or at a **stable point between the Earth and the sun (Lagrange point 1)**, where they would block or deflect some of the incoming solar radiation.
    - This would **reduce the amount of solar energy reaching the Earth's surface**.
    - Space sunshades are considered to be more controllable and adjustable than SAI or MCB, but also more expensive and complex to deploy and maintain.



▪ **Advantages:**

- SRM could potentially provide a **quick reduction in global temperatures**, providing temporary relief from extreme climate events.
- It could be cost-effective compared to other options, depending on the method used and the scale required.
- **SRM could be reversible on short timescales** if stopped or adjusted.

▪ **Disadvantages:**

- SRM **could not address all aspects of climate change**, such as [ocean acidification](#), **biodiversity loss**, or sea level rise due to thermal expansion.
- It could have negative or unintended side effects on regional or global climate systems, such as **altering precipitation patterns, affecting monsoons, droughts, storms, or crop yields.**
- SRM could pose **ethical or geopolitical challenges**, such as creating winners and losers among countries or regions, raising questions of justice, equity, consent, liability, or responsibility.

**UPSC Civil Services Examination Previous Year Question (PYQ)**

**Q. In the context of which of the following do some scientists suggest the use of cirrus cloud thinning technique and the injection of sulphate aerosol into stratosphere? (2019)**

- (a) Creating the artificial rains in some regions
- (b) Reducing the frequency and intensity of tropical cyclones
- (c) Reducing the adverse effects of solar wind on the Earth
- (d) Reducing the global warming

**Ans: (d)**

**Source: DTE**

