

## CLOUD SEEDING TECHNOLOGY – SCI & TECH (MAINS)

**Q.** What is cloud seeding? Critically analyse the impact of cloud seeding in the present day environmental consequences. (10 marks, 150 words)

**News:** *Delhi govt plans 'cloud seeding' to induce rains amid pollution*

### What's in the news?

- Even as Delhi-NCR witnessed light showers, the Delhi government had announced earlier this week that it was considering cloud seeding or 'artificial rain' to wash away pollutants in the air.

### Key takeaways:

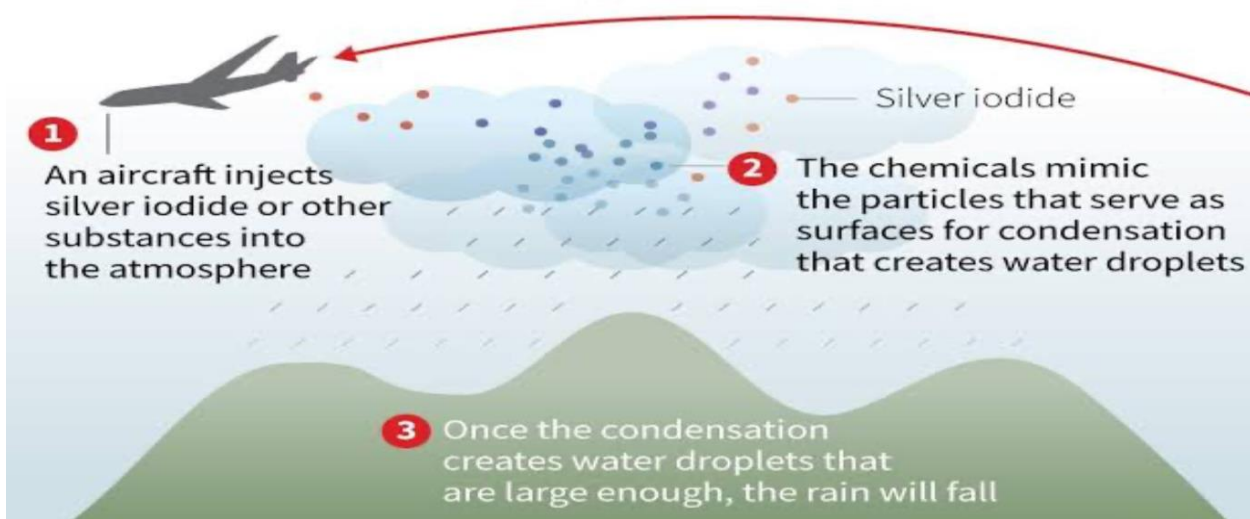
- Cloud seeding has only been done earlier with the purpose of bringing rainfall to drought-prone areas and not to mitigate pollution.

### Cloud Seeding:

- Cloud seeding is the **process of spreading either dry ice or more commonly, silver iodide aerosols, into the upper part of clouds to try to stimulate the precipitation process and form rain.**
- Cloud seeding uses planes to spray clouds with chemicals to condense smaller particles into larger rain droplets.
- Cloud seeding **increases rainfall rates by approximately 10% to 30% per year** and cloud seeding operations cost much less than the desalination process.

## Cloud seeding

Traditional method of rainmaking, in use since the 1940s



### Significance of Cloud seeding

1. Agriculture:

- It creates rain, providing relief to drought-stricken areas.
- E.g.: ‘Project Varshadhari’ in Karnataka in 2017.

## **2. Power Generation:**

- Cloud seeding experiments have shown to augment production of hydroelectricity during the last 40 years in Tasmania, Australia.

## **3. Water Pollution Control:**

- Cloud seeding can help to maintain minimum summer flows of the rivers and dilute the impact of treated wastewater discharges from municipalities and industries.

## **4. Fog Dispersal, Hail Suppression and Cyclone Modification:**

- During the winter the cloud seeding programme is used to increase the mountain snowpack so that additional runoff is received during the spring melt season.
- “Project Sky Water” of the U.S.A. in 1962 for weather modification through cloud seeding aimed at fog dispersal, hail suppression, and cyclone modification.

## **5. Tackle Air Pollution:**

- Cloud seeding can potentially be used to settle down toxic air pollutants through the rain.
- E.g.: Recently, the Central Pollution Control Board along with other researchers mulled the use of cloud seeding to tackle Delhi’s air pollution.

## **6. Tourism:**

- Cloud seeding can transform typically dry areas much more hospitable to enhance tourism.

## **7. Fight against climate change:**

- To nullify the effects of climate change induced droughts and heat waves.

## **8. Fight against Water scarcity:**

- To tackle the issues like zero water day and other water availability issues.
- Cloud seeding will induce artificial rain for storage of enough water in tanks as well as hydration of ground (recharge to groundwater).

## **Recent case study and its results regards cloud seeding which was conducted by Indian Institute of Tropical Meteorology:**

### **Challenges:**

#### **1. Potential Side-effects:**

- a. The chemicals used in cloud seeding might be potentially harmful to plants, animals and people or the environment.

#### **2. Abnormal Weather Patterns:**

- a. It might ultimately change climatic patterns on the planet.
- b. Places that normally receive moisture might start experiencing drought due to the artificial process of adding chemicals to the atmosphere to stimulate rain.

#### **3. Costly:**

- a. It involves processes such as delivering chemicals to the sky and releasing them into the air by flare shots or airplanes, which involves huge costs and logistic preparation.

#### **4. Pollution:**

- a. As artificial rain falls, seeding agents like silver iodide, dry ice or salt will also fall.
- b. Residual silver discovered in places near cloud-seeding projects is considered toxic.
- c. As for dry ice, it can also be a source of greenhouse gas that contributes to global warming, as it is basically carbon dioxide.

## Cloud seeding works if done correctly

Cloud seeding experiments were carried out in Solapur city, which gets less rainfall, from June to September in 2018 and 2019

- There was 18% increase in rainfall over a 100 sq.km area in Solapur city due to cloud seeding

- Approximate cost of producing water through cloud seeding was 18 paisa per litre. The cost can drop by over 50% if indigenous seeding aircraft are used

- 20-25% of cumulus clouds produce rainfall if cloud seeding is done correctly

- Cloud seeding alone cannot mitigate droughts but can help produce additional rainfall that can partially address water requirements

- Calcium chloride flare was used for seeding the clouds. The seeding was done at the base of the warm convective clouds and at a time when the clouds were growing

- The study was carried out for two years to understand the microphysics and characteristics of convective clouds that can be targeted to enhance rainfall

- The work provides elaborate protocols and technical guidance to plan and conduct cloud seeding in India

**Not all:**  
As microphysics of clouds vary widely, not all clouds produce rainfall through cloud seeding

