

1. Discuss how dust storms are formed? Examine the impact of climate change in formation of dust storms? (250 words)

**Answer:**

**Background:-**

- Over the past few years, rise in the global temperature has set new records and that is leading to increase in the number of extreme weather events.
- India may also witness an increase in the severity and frequency of the dust storms and thunderstorms similar to what the northern Indian states experienced recently.

**Dust storm :-**

- Dust storm can be explained as a phenomenon when strong winds carry dust over an extensive area.
- A dust storm is a meteorological phenomenon common in arid and semi-arid regions. Dust storms arise when a gust front or other strong wind blows loose sand and dirt from a dry surface. Fine particles are transported by saltation and suspension, a process that moves soil from one place and deposits it in another.
- They are usually caused by thunderstorms or strong pressure gradients associated with cyclones which increase wind speed over a wide area.
- These strong winds lift large amounts of sand and dust from bare, dry soils into the atmosphere, transporting them hundreds to thousands of kilometres away.

**How are they formed :-**

- Dust storms are a result of nearly similar weather conditions, like intense heat. Areas which don't have moisture experience dust storms.
- Reason for this particular 'severe dust storm and thunderstorm' activity in India was due to very high temperatures in Rajasthan and presence of western disturbance that led to the atmosphere becoming unstable.
- Moreover, easterly winds from the Bay of Bengal were also increasing the moisture over the area. The combination of all these factors resulted in this severe dust storm and thundershower activity
- Scientists say high temperatures, moisture and an agitated atmosphere make a perfect combination for storms of this type.
- As the force of wind passes over loosely held particles and increases its pace, the particles of sand first start to vibrate and then start to saltate. Since they repeatedly strike the ground due to the wind, they loosen and break off into smaller particles of dust that begin to travel in the suspension.
- On the other hand, at wind speeds above this pace, it causes even the smallest particles to suspend and there will be a population of dust grains which will be moving by a range of mechanisms known as suspension, saltation, and creep.

- The initial saltation between sand particles induces a static electric field through friction. Saltating sand acquires a negative charge which is relative to the ground that in turn loosens more sand particles, all of which then begin saltating. This process is said to double the number of particles which were predicted by previous theories.
- In such situations, particles become loosely held due to drought or arid conditions along with varied wind causes. Gust fronts might be produced by the outflow of air cooled by recent rains from an intense thunderstorm. However, the wind gusts might also be produced by a dry cold front which is a cold front that moves into a dry air mass while producing no precipitation, which is similar to the recent storm in Delhi/NCR.

### **Impact of climate change on the formation of dust storm :-**

- **Increase in the sudden increase of surface temperature:-**
  - As the climate gets warmer the temperature gradient is going to become very steep. This steep increase in temperature gradient will lead to heat waves and sand storms.
  - In the context of climate change, we can say that in north India the temperature is increasing more compared to south India. Increase in temperature means an increase in heating which means there will be more heat wave days and more reasons for occurrence of dust storm and thunderstorms.
- With the rise in global temperature the soil is going to become drier:-
  - So, the amount of soil that wind can carry is also increasing. With both the intensity of the wind and dryness of the soil increasing, the intensity of dust storm is going to further increase in the future.
- Drought and wind also contribute to the emergence of dust storms along with poor farming and grazing practices which expose the dust and sand to the high-speed winds.
- Increasing desertification would mean more intense and damaging dust storms.
- Poor management of the Earth's drylands, such as neglecting the fallow system, are increasing dust storms size and frequency from desert margins and changing both the local and global climate, and also impacting local economies.
- Dust storm that blanketed seven nations in the Middle East in late summer 2015 was caused by climate factors and unusual weather.

## **PRACTICE QUESTIONS**

### **Answer the following Questions**

1. Examine how Subhash Chandra Bose tried to give the Indian National Congress a socialist direction? (250 words)
2. What do you understand by cryosphere. Discuss how it affects the earth's climate.

(250 words)