All About Lightning

Why in news?

Unseasonal and sudden heavy rainfall, accompanied by thunderstorms, hailstorms and lightning strikes, have claimed 27 lives in Gujarat.

What is lightning?

- It is a natural phenomenon where the *electric charges travel from one point to the other* within the clouds or between a cloud and the earth.
- It is accompanied by a bright flash and sometimes thunderstorms.
    - **Inter cloud or intra cloud lightning-** They are visible and are harmless.
    - **Cloud to ground lightning**- It is harmful as the 'high electric voltage and electric current' leads to electrocution.

- When the temperature drops, the water droplets that are held in the clouds begin to become ice crystals.
- These ice crystals will rub against one another, creating a static charge in the clouds.

Lighter positive charge	Migrate towards the higher end of the cloud
Heavier negative charge	Move towards the lower end of the cloud
Big positive charged surface	Earth's surface

- **Electrostatic discharge**- The positive and negative charges (opposite charges) attract one another. However, there will be air between the ground and the cloud.
- Because *air is a poor conductor*, it opposes the passage of charge.
- Beyond a certain point, the charge build-up gets tremendously massive and the discharge happens in a split second. This is known as an electric discharge.
- This massive charge flow generates heat and light.

Causes of Lightning in Gujarat

• **Weather system**- India Meteorological Department (IMD) has attributed the lightning flashes to 3 weather systems namely
  - Cyclonic circulation
  - Western Disturbances
  - Easterly trough
• **Cyclonic circulation**- It is over Northern Arabian Sea and adjoining Saurashtra and Kutch, which is a *low-pressure area* that draws moist air from surroundings.
• **Western disturbances**- They are storms that *originate over the Mediterranean Sea* region and may bring rainfall to North-Western India in the winter.
• They were stronger this time and descended to lower latitudes, affecting Gujarat and Madhya Pradesh.
• **Easterly trough**- It is a zone of *low pressure in the easterly winds* that flow from the east in the equatorial region throughout the year.
• **Active ITCZ**- Intertropical Convergence Zone (ITCZ, located *slightly north of the Equator*) is very active which may have provided sufficient moisture to the area, resulting in thunderstorm.

What are the impacts of lightning?

- **Loss of life-** It is one of the leading causes of weather-related deaths in India.
  - As per National Crime Records Bureau, 2,876 people died due to lightning strikes in 2019.
- **Health effects**- It can cause burns, wounds, tissue damage, scarring, cataracts, hearing loss, broken bones, and muscle pains.
- It can affect the brain and nervous system, leading to brain damage, memory loss, coma, stroke and seizures.
- It can cause heart disorder which may lead to respiratory arrest.
- **Psychological effects**- It can cause behavioural changes, emotional distress, anxiety, depression, post-traumatic stress disorder, and phobias.
- **Environmental impacts**- Lightning can cause fires, power outages, damage to buildings and structures, and ozone depletion.
- **Loss of biodiversity**- It can cause forest fires, which can destroy the habitats and food sources of many animals.
- **Positive impact**- It can also produce *nitrogen oxides* that fertilize the soil and oceans and trigger chemical reactions that *create ozone.*

Steps taken to prevent Lightning

• **Lightning alert system**- The IMD has developed a lightning alert system that uses satellite and radar data to generate lightning potential maps and issue warnings to the public through SMS, mobile apps, and social media.
• **Lightning safety awareness**- The NDMA has launched a campaign to raise awareness about lightning safety among the people.
• **30-30 rule-** It advises people to take shelter if they hear thunder within 30 seconds of seeing lightning.
• **Lightning protection devices**- The government has also encouraged the installation of lightning protection devices, such as lightning arresters, surge protectors, and earthing systems in buildings and structures.
• **Forest fire management-** The government has taken steps including monitoring, early warning, fire prevention, fire suppression, and post-fire rehabilitation to prevent and control forest fires triggered by lightning.

References

1. Indian Express- Lightning strike in Gujarat
2. NDMA- Lightning awareness

