Report on Lightning Strikes

Why in News

According to a report published by the **Climate Resilient Observing Systems Promotion Council (CROPC),** the number of **deaths due to lightning strikes reduced by nearly 37%** in 2019-20.

> CROPC is a **non-profit organisation** that works with the **India Meteorological Department (IMD).**

Key Points

- **Data Analysis:**
  Lightning-linked fatalities formed **33% of total deaths in natural disasters** in **2019-20.**
- **Factors Responsible:**
  The rapid **degradation of environment** like **global warming**, **deforestation, depletion of water bodies, concretisations, rising pollution and aerosol levels** have cumulatively pushed the environment to extremes. And lightning is direct promulgation of these climatic extremities.

- **Suggestions:**
  - States should participate in **Lightning Resilient India Campaign** and undertake lightning risk management more comprehensively.
    - IMD has launched a joint campaign named Lightning Resilient India Campaign along with CROPC and duly supported by Indian Meteorological Society (IMS), NGOs, IIT Delhi and other concerned institutions.
  - **Early lightning warning** to farmers, cattle grazers, children and people in open areas.
    - Lightning strikes around a fixed period and almost similar geographical locations in similar patterns.
    - **Kalbaishakhi - Norwesters,** which are violent thunderstorms with lightning - claims life in **eastern India** and **pre-monsoon lightning deaths** occur mostly in **Bihar, Jharkhand, Chhattisgarh and UP.**
  - **Implement a local lightning safety action plan** like installing Lightning Protection Devices.
  - **Lightning fatalities** should be notified **as a disaster to prevent losses.**
    - It needs to be noted that the **Centre has not notified lightning as a disaster.**
  - Although the **National Disaster Management Authority (NDMA)** has issued comprehensive guidelines for action plans to states, a large number of losses show that the implementation needs a more **"scientific and focused community-centric approach",** besides convergence of various departments.
  - **Mapping of lightning** is a major breakthrough in identifying the precise risk in terms of lightning frequency, current intensity, energy content, high temperature and other adverse impacts.
    - With continuous mapping for at least three years, **a climatology can be established.** This would yield a **Lightning Risk Atlas map** for India which will form the basis for a lightning risk management programme.

Lightning

- **Meaning:**
  - It is a very **rapid and massive discharge of electricity in the atmosphere.** It is the **process** of occurrence of **a natural 'electrical discharge of very short duration and high voltage between a cloud and the ground or within a cloud',** accompanied by a bright flash and sound, and sometimes thunderstorms.
  - **Inter cloud or intra cloud (IC) lightning** are visible and **harmless.**
  - It is **cloud to ground (CG) lightning,** which is **harmful** as the 'high electric voltage and electric current' leads to **electrocution.**

- **Process:**
  - It is a **result of the difference in electrical charge between the top and bottom of a cloud.**
    - The lightning-generating clouds are typically about 10-12 km in height, with their base about 1-2 km from the Earth's surface. The temperatures at the top range from -35°C to -45°C.
  - As **water vapour moves upwards** in the cloud, it **condenses into water** due to decreasing temperatures. A huge amount of heat is generated in the process, pushing the water molecules further up.
  - As they **move to temperatures below zero,** droplets **change into small ice crystals.** As they continue upwards, they gather mass, until they become so heavy that they start descending.
  - It **leads to a system** where smaller ice crystals move upwards while larger ones come down. The **resulting collisions trigger release of electrons,** in a process very similar to the generation of electric sparks. The moving free electrons cause more collisions and more electrons leading to a chain reaction.
  - The process **results in a situation in which the top layer of the cloud gets positively charged while the middle layer is negatively charged.**
  - In little time, **a huge current,** of the order of lakhs to millions of amperes, starts to **flow between the layers.**
    - It produces heat, leading to the heating of the air column between the two layers of cloud.
    - It is because of this heat that the **air column looks red during lightning.**
    - The heated air column expands and produces shock waves that result in **thunder sounds.**

- **Strikes Earth's Surface:**
    - The **Earth is a good conductor of electricity.** While electrically neutral, it is **relatively positively charged compared to the middle layer of the cloud.** As a result, an estimated **20-25% of the current flow is directed towards the Earth.**

        It is this current flow that results in **damage to life and property.**
    - Lightning **has a greater probability of striking raised objects** on the ground, such as trees or buildings.

        Lightning Conductor is a device used to protect buildings from the effect of lightning. A metallic rod, taller than the building, is installed in the walls of the building during its construction.
    - The **most lightning activity** on Earth is seen on the shore of **Lake Maracaibo in Venezuela.**

        At the place where the Catatumbo river falls into Lake Maracaibo, an average 260 storm days occur every year, and October sees 28 lightning flashes every minute - a phenomenon referred to as the **Beacon of Maracaibo or the Everlasting Storm.**

Concretisation

- Concretisation or the **increase in paved surfaces** has a **suffocating impact on trees** and turns a city into an **urban heat island** with **extremely low ground water** and **threats of floods** looming large in monsoons due to surface run-off.

    The concrete surface, be it buildings or roads or footpaths **radiate heat waves in the evening,** making nights as hot as days and decreasing the difference between the maximum and the minimum temperatures, resulting in urban heat island effect.
- During concretisation, the **carbon stored in the soil escapes into the atmosphere,** which then gets oxidised to form **carbon dioxide,** a major **greenhouse gas** leading to temperature escalation.

Source: IE