

1. Fire-Breathing Clouds

Prelims Level: Climate Change and its Impacts

Mains Level: Disaster and Disaster Management

Context:

- Australia's bushfires are growing so massive and powerful that they create their own weather phenomenon.
- According to Bureau of Meteorology office, Victoria, it has observed the **pyro-cumulonimbus clouds** above eastern part of state.
- These fire-induced storms bring little rain, but are packed with lightning that can spark new fires.

Fire making Thunderstorms:

- The bushfires in the country have reached a point where they are generating their own weather, creating a feedback loop that will make the already dire situation worse.
- Experts have still not understood the mechanism behind this weather phenomenon, but unlike regular thunderstorms, these are 'dry'.
- This means they don't produce rain, only lightning, which may spark more wildfires.
- This new weather system produces strong winds that Stoke Existing Wildfires.

Fire storm:

- The term “firestorm” is a contraction of “fire thunderstorm”. In simple terms, they are thunderstorms generated by the heat from a bushfire. Firestorms also produce dry lightning, potentially sparking new fires, which may then merge or coalesce into a larger flaming zone. The crucial difference here is that this upward movement is caused by the heat from the fire, rather than simply heat radiating from the ground.

Cycle of this weather phenomenon:



1. Pyrocumulonimbus Thunderstorms:

- It is developed to altitudes over 16km. These fire-induced storm can spread fires through lighting, lofting of embers and generation of severe wind outflows.
- It is much like a normal thunderstorm that forms on a hot summer's day. Conventional thunderclouds and pyro-cumulonimbus share similar characteristics. Both form an anvil-shaped cloud that extends high into the troposphere (the lower 10-15km of the atmosphere) and may even reach into the stratosphere beyond.
- The weather underneath these clouds can be fierce. As the cloud forms, the circulating air creates strong winds with dangerous, erratic "downbursts" – vertical blasts of air that hit the ground and scatter in all directions.
- Similar to typical thunderstorms, both are created through rapidly rising air caused by heating of the air column.

2. Smoke Plume

- In pyro-cumulonimbus, the fire heats the air so intensely that it fuels rapidly rising motion above the fire, like the updrafts in thunderstorms that can reach speeds over.

3. Plume Cools

- This propels smoke and ash several kilometres into the atmosphere, where the air cools and the available water vapour condenses into visible clouds.

4. Clouds

- The ash then helps condense the water vapour into droplets by acting as condensation nuclei- dust for the moisture to cling onto.

5. Downpour

- But the difference is that unlike real thunderstorms, the rain that falls is evaporated by the heat and dryness of the fire before it can reach the ground.

6. Thunderstor & Lighting

- The faster the process takes place the more likely the clouds are to spark lighting, just like real thunderstorms.