

Cloudburst incidents across India

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Manifest Pedagogy:

The cloudburst is a localised weather phenomena representing highly concentrated rainfall over a small area lasting for a few hours. This leads to flash floods/ landslides, house collapse, dislocation of traffic and human casualties on a large scale. Over the years the incidents of cloud bursts are increasing not only in India but across the world. Climate change is one of the most important reasons for it. Fighting climate change along with robust structural and non structural measures is the need of the hour to mitigate the impact of cloud bursts.

In News: Over 20 people have been killed in destruction caused by cloudbursts and flash floods in different parts of Himachal Pradesh and Uttarakhand recently.

Placing it in the Syllabus: Geography , Environment and Disaster management.

Static Dimensions:

- What are cloudbursts?

Current Dimensions:

- How common are cloudbursts?
- Can cloudbursts be forecast?
- Are cloudburst incidents increasing?
- Why do cloudbursts occur in hilly areas
- Impact of Climate Change
- Impacts of Cloudburst

Content:

What are cloudbursts?

- A cloudburst is a localised but intense rainfall activity.
- Short spells of very heavy rainfall over a small geographical area can cause widespread destruction, especially in hilly regions where this phenomenon is the most common.
- Rainfall of **10 cm or more in an hour over a roughly 10 km x 10-km** area is classified as a cloudburst event.
 - By this definition, **5 cm of rainfall in a half-hour period** over the same area would also be categorised as a cloudburst.
- **Normal Year**
 - In a normal year, India, as a whole, receives about **116 cm of rainfall** over the entire year.
 - There are, of course, huge geographical variations in rainfall within the country, and some areas receive over 10 times more than that amount in a year.
- **Cloud Burst**
 - During a cloudburst event, a place receives about **10% of this annual rainfall within an hour**.
 - Mumbai had experienced on July 26, 2005, one of the most extreme instances of rainfall in India in recent years (94 cm of rain over a 24-hour period, resulting in deaths of over 400 people and more than USD 1 billion in economic losses).

How common are cloudbursts?

- Cloudbursts are not uncommon events, particularly during the monsoon months.
- Most of these happen in the Himalayan states where the

local topology, wind systems, and temperature gradients between the lower and upper atmosphere facilitate the occurrence of such events.

- Because of the nature of terrain, the heavy rainfall events often trigger landslides and flash floods, causing extensive destruction downstream.
- This is the reason why every sudden downpour that leads to destruction of life and property in the hilly areas gets described as a “cloudburst”, irrespective of whether the amount of rainfall meets the defining criteria.
- At the same time, it is also possible that actual cloudburst events in remote locations aren’t recorded.

Can cloudbursts be forecast?

- The India Meteorological Department forecasts rainfall events well in advance, but it does not predict the quantum of rainfall.
- The forecasts can be about light, heavy, or very heavy rainfall, but weather scientists do not have the capability to predict exactly how much rain is likely to fall at any given place.
- Additionally, the forecasts are for a relatively large geographical area, usually a region, a state, a meteorological sub-division, or at best a district. As they zoom in over smaller areas, the forecasts get more and more uncertain.
- It is not impossible to forecast rainfall over a very small area as well, but it requires a very dense network of weather instruments, and computing capabilities that seem unfeasible with current technologies.
- No forecast ever mentions a possibility of a cloudburst, but possibility of extremely heavy rainfall, which could result in cloudburst kind of situations, are forecast **six to 12 hours in advance.**

Are cloudburst incidents increasing?

- There is no long-term trend that suggests that cloudbursts, as defined by the IMD, are rising.
- While the overall amount of rainfall in India has not changed substantially, an increasing proportion of rainfall is happening in a short span of time.
 - That means that the wet spells are very wet, and are interspersed with prolonged dry spells even in the rainy season.
- This kind of pattern, attributed to climate change, does suggest that cloudburst events might also be on the rise.

Why do cloudbursts occur in hilly areas

- In hilly areas, sometimes saturated clouds ready to condense into rain cannot produce rain, due to the upward movement of the very warm current of air.
- Instead of falling downwards, raindrops are carried upwards by the air current.
- New drops are formed and existing raindrops increase in size.
- After a point, the raindrops become too heavy for the cloud to hold on to, and they drop down together in a quick flash.
- A study published in 2020 examined the meteorological factors behind the cloudburst over the Kedarnath region that aided the devastating 2013 floods.
 - It found that during a cloudburst, the relative humidity and cloud cover was at the maximum level with low temperature and slow winds.
 - It is expected that because of this situation a high amount of clouds may get condensed at a very rapid rate and result in a cloudburst.

Impact of Climate Change

- In May 2021, the **World Meteorological Organisation noted that there is about a 40%** chance of the annual average

global temperature temporarily reaching 1.5°C above the pre-industrial level in at least one of the next five years.

- It added that there is a **90% likelihood** of at least one year between 2021 and 2025 becoming the warmest on record and dislodge 2016 from the top rank.
- It is seen that more cloudbursts are happening in Himalayan region because the decadal temperature rise in the Himalayan region is higher than the global rate of rising temperatures.

Impacts of Cloudburst

- **Death or Serious Injury**– Since they can occur without warning, it is no surprise that people can be seriously injured or killed by these natural disasters.
- **Flooding:** A cloudburst can have a devastating impact triggering flash floods. These floods can cause uprooting of trees and movement of boulders and other debris.
- **Damage to infrastructure:** Cloudbursts can also damage houses, roads, loss of bridges because of the sheer force in which the downpour occurs.
- **Landslides:** Sudden heavy rain caused by cloudburst in hilly and mountainous areas can trigger landslides.
- The damage they can cause to trees, plants, and crops, loss of arable land, livestock.
- **Economic Losses**– Depending on the damage caused, it may prevent local businesses from opening or keep customers from getting to those businesses.

Initiatives taken in this regard

- **Flash Flood Guidance Services:** It is a robust system designed by the India Meteorological Department (IMD) to provide the necessary products in real-time to support the development of warnings for flash floods about 6-12 hours in advance at the watershed level for the flash

flood-prone South Asian countries viz. India, Nepal, Bhutan, Bangladesh, and Sri Lanka.

- **South Asian Flash Flood Guidance System (FFGS):** The India Meteorological Department (IMD) launched the South Asian FFGS. It is aimed at helping disaster management teams. Helps governments make timely evacuation plans ahead of the actual event of flooding.

Wayforward

- **Regulation of construction activities** along river banks with special consideration to water level during heavy rainfall.
- **Utilisation and leverage of local knowledge**, resources, can have a multiplier effect on mitigation.
- **Participation of local bodies** such as NGOs, Gram Sabhas, Panchayats can strengthen the entire framework of disaster management.
- **Strengthening of embankments, barrages and dams** to constrain & regulate water flow.
- **Localised planning taking** into consideration the ecologically fragile nature of the region and involving the local communities'
- **Regulate infrastructure projects** and preserve the sanctity of eco-sensitive zones.
- **Better forecasting by IMD** and incorporation of advanced technology to monitor and predict extreme weather events can enable early warning, evacuation and preparedness
- **Adoption of eco friendly policies and eco-sensitive tourism** for development of the region.
- **Incorporation of disaster management and prevention** into the developmental planning process.

Mould your thoughts

1. Cloudbursts and resulting landslides are likely to increase in future with rise in greenhouse gas emissions. Critically analyse. (250 words)

Approach to the answer

- Introduction about cloud bursts
- What are cloud bursts and causes?
- Why are cloud bursts increasing
- Impact-including land slides
- Steps to be taken to reduce such incidents
- Way Forward and conclusion