



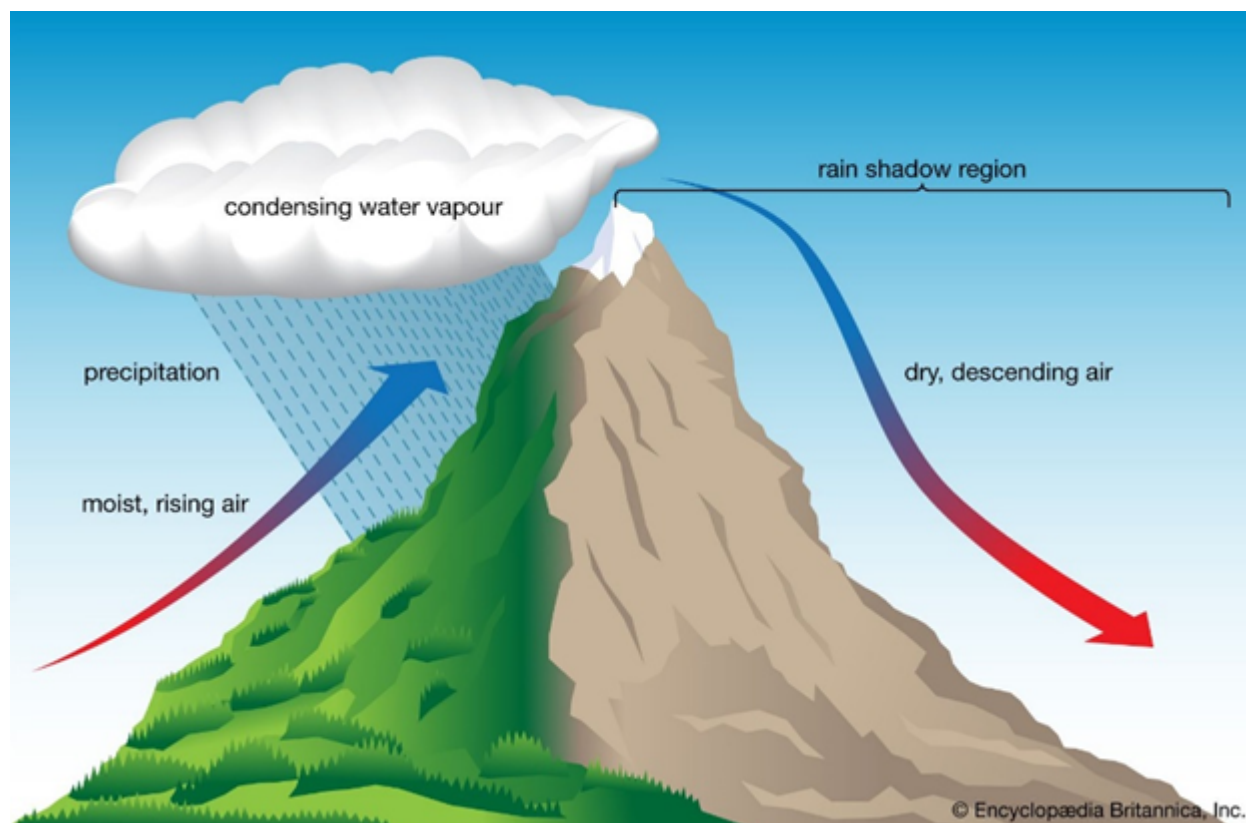
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# Cloudbursts and impact of climate change

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## Why in News:

Cloudbursts are a common occurrence in Himalayan regions but experts are alarmed by the increase in extreme weather-related events.



## About Cloud Burst

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.

Not all instances of very heavy rainfall, however, are cloudbursts.

A cloudburst has a very specific definition: 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 categorized as a cloudburst.

## Difference between rainfall and cloudburst

In a normal year, India, as a whole, receives about 116 cm of rainfall over the entire year. This means if the entire rainfall everywhere in India during a year was spread evenly over its area, the total accumulated water would be

**Kamaraj IAS Academy**

Plot A P.127, AF block, 6 th street, 11th Main Rd, Shanthi Colony, Anna Nagar, Chennai, Tamil Nadu 600040

Phone: 044 4353 9988 / 98403 94477 / Whatsapp : 09710729833

116 cm high. 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. But on average, any place in India can be expected to receive about 116 cm of rain in a year.

During a cloudburst event, a place receives about 10% of this annual rainfall within an hour. It is a worse situation than what Mumbai had experienced on July 26, 2005, which is one of the most extreme instances of rainfall in India in recent years. At that time, Mumbai had received 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.

### **Causes of Cloudburst in Himalayas**

**Orographic Effect:** The Himalayas are a massive mountain range, and when moist air masses encounter these high mountains, they are forced to rise rapidly due to the orographic effect. As the air rises, it cools, and the moisture in it condenses, leading to the formation of thick clouds. If the conditions are right, these clouds can release large amounts of rain in a short span of time.

**Monsoonal Influence:** The Indian subcontinent experiences the southwest and northeast monsoons. During the summer months, the southwest monsoon brings moisture-laden winds from the Arabian Sea and the Bay of Bengal, which can collide with the Himalayan mountains. This collision can result in the rapid uplift of air and trigger intense rainfall.

**Instability in Atmosphere:** Cloudbursts are often associated with a highly unstable atmosphere. When warm, moist air rises and encounters cooler air at higher altitudes, it becomes unstable and leads to the rapid development of towering cumulonimbus clouds, which are responsible for heavy rainfall.

**Topography and Drainage Systems:** The steep slopes and narrow valleys in the Himalayas can create channels for the rapid flow of rainwater. If the intensity of rainfall exceeds the drainage capacity of the region, it can lead to flash floods and debris flows.

### **Role of Climate change on Cloudburst**

**Increased Atmospheric Moisture:** As global temperatures rise due to climate change, the atmosphere can hold more moisture. When this moisture-laden air mass interacts with mountainous regions, such as the Himalayas, it can lead to the formation of larger and more intense clouds, increasing the potential for cloudbursts.

**Changes in Precipitation Patterns:** Climate change can alter precipitation patterns in various regions. While some areas may experience more prolonged dry spells, others may experience more intense rainfall events.

**Altered Atmospheric Stability:** Climate change can influence the stability of the atmosphere. Increased temperatures can create more unstable atmospheric conditions, leading to greater convective activity and the development of thunderstorms, which are often associated with cloudbursts.

**Glacier Retreat and Snowmelt:** The Himalayas are home to vast glaciers that act as natural reservoirs, releasing water slowly over time. However, with rising temperatures, these glaciers are melting at an accelerated rate.

**Land Use Changes:** Human activities, including deforestation and urbanization, can modify the local climate and precipitation patterns. Changes in land use can impact the microclimates in mountainous regions, potentially influencing the occurrence of cloudbursts.

### **The Way Ahead**

It's essential to recognize that while climate change plays a role in increasing the frequency and severity of cloudbursts, these events are still influenced by various local and regional meteorological factors. Therefore, understanding and mitigating the risks associated with cloudbursts require a comprehensive approach that considers both climate change impacts and local conditions.

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