FLASH FLOODS: GEOGRAPHY

NEWS: Himachal Pradesh flood: Death toll rises to five; rescue operations underway

WHAT'S IN THE NEWS?

Multiple cloudbursts triggered flash floods in Himachal Pradesh, causing severe damage to life, infrastructure, and projects like the Indira Priyadarshini Hydroelectric Plant; experts link increased frequency of such events to climate change and unplanned development.

Context

- Himachal Pradesh has experienced devastating flash floods triggered by multiple cloudbursts during heavy monsoon rains, causing widespread destruction to properties, infrastructure, and significant loss of life.
- The Indira Priyadarshini Hydroelectric Project, a 4.8 MW run-of-the-river plant on the Manuni Khad stream, has also been impacted.

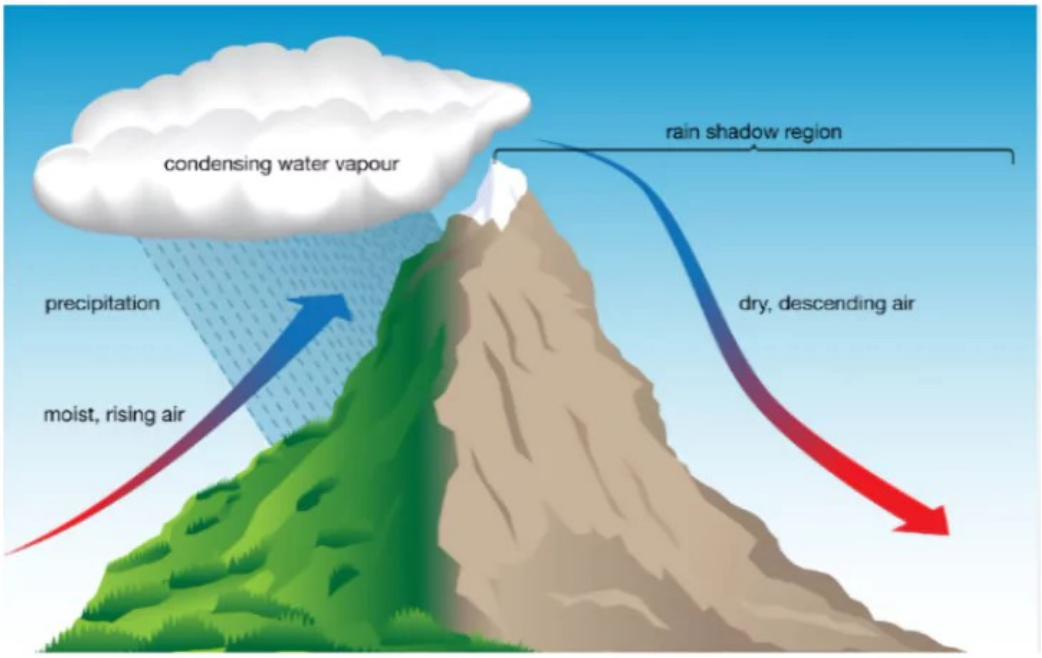
About Cloudburst

- A cloudburst is defined as rainfall of 10 cm or more within an hour over an area roughly 10 km x 10 km.
- *Mechanism*:
    - Particularly common in hilly regions due to orographic lift.
    - Moist warm air rises along mountain slopes, expands and cools at higher altitudes, leading to condensation.
    - Continuous rise delays rainfall, resulting in a sudden release of large volumes of rain over a short period.
- *Occurrence*: Frequent during monsoon season, especially in the Himalayas, Western Ghats, and northeastern hill states.
- *Impacts*: Causes sudden, intense rainfall leading to flash floods, landslides, and large-scale damage.
- *Prediction*: Extremely difficult due to the small area affected and rapid development of such events.

Flash Floods

- According to IMD, flash floods are rapid flooding events occurring within less than 6 hours due to intense rainfall, often linked with cloudbursts.
- *Other Causes*:
    - Dam or levee failures causing massive downstream flooding.
    - Melting glaciers leading to glacial lake overflows.

- Debris flows and mudslides diverting water channels.
- Urbanization and poor drainage exacerbating flood risk by preventing water infiltration and increasing runoff.
- Steep topography and poor soil absorption increasing vulnerability.



Causes of Increased Cloudbursts and Flash Floods in Himalayan Regions

1. **Orographic and Topographical Factors**
   - The steep slopes and narrow valleys in the Himalayas make them particularly vulnerable to intense cloudbursts.
   - Moist air from the Bay of Bengal rises, cools, and condenses rapidly over these mountains, leading to sudden downpours.
   - *Recent Example*: June 2025 cloudbursts in Himachal Pradesh (Kullu and Kangra) caused severe flash floods and destruction.
2. **Climate Change and Global Warming**
   - Rising global temperatures intensify the water cycle, increasing atmospheric moisture and rainfall extremes.
   - The Himalayan region is warming faster than the global average, worsening cloudburst frequency and intensity.
   - *Recent Example*: Lhonak Lake outburst in Sikkim (October 2023) linked to glacial melt and increased rainfall intensity.
3. **Glacial Lake Outburst Floods (GLOFs)**

- Melting glaciers create unstable glacial lakes, whose natural dams can fail unexpectedly.
- GLOFs release massive water volumes downstream, causing catastrophic floods.
- *Recent Example*: Lhonak Lake outburst in 2023 caused significant flooding and damage in Sikkim.

4. **Deforestation and Land Use Changes**
    - Deforestation, unregulated construction, and encroachment on riverbeds reduce land's ability to absorb rainwater.
    - Urban expansion and infrastructure development in flood-prone areas increase surface runoff and worsen flood damage.
    - *Recent Example*: August 2024 flash floods in the Kullu-Manali region were aggravated by such unplanned development.

Way Forward

- **Enhanced Weather Forecasting and Monitoring**:
    - Invest in advanced meteorological technologies to provide real-time weather updates and early warnings to authorities, communities, and tourists.
- **Emergency Response Drills**:
    - Regularly conduct mock drills involving government, civil society, and local communities to improve preparedness and response capabilities.
- **Community Awareness**:
    - Implement educational programs to inform local populations about cloudburst risks, evacuation procedures, and safety measures.
- **Infrastructure Planning**:
    - Enforce strict environmental guidelines for construction in the Himalayan region to ensure development does not increase disaster risks.
- **International Cooperation**:
    - Collaborate with other countries and global organizations to exchange best practices and technologies in disaster risk reduction and climate adaptation.

Conclusion

- The rising frequency and severity of cloudbursts and flash floods in the Himalayan region underscores the urgent need for comprehensive disaster management strategies and sustainable, climate-resilient development practices to protect lives, livelihoods, and critical infrastructure in the future.

Source: https://www.thehindu.com/news/national/himachal-pradesh/himachal-pradesh-floods-cloudburst-weather-death-toll-rises-rescue-operations-underway/article69742646.ece