



## Low Snow Persistence in Hindu Kush Himalayas

**For Prelims:** [International Centre for Integrated Mountain Development \(ICIMOD\)](#), [Ganga, Brahmaputra, and Indus basins](#), [western disturbances](#) Mediterranean, [Caspian, Black Seas](#), [winter precipitation](#), [snowfall](#), [Paris Agreement](#), [La Niña and El Niño events](#),

**For Mains:** Hindu Kush Himalayas region and related issues.

[Source: TH](#)

### Why in News?

The recent report from the [International Centre for Integrated Mountain Development \(ICIMOD\)](#) has shown that the snow persistence in the [Ganga, Brahmaputra, and Indus basins](#) of the [Hindu Kush Himalayas \(HKH\)](#) has reached record low levels.

- **ICIMOD** is a regional intergovernmental organisation established in **1983** and working **towards a greener, more inclusive, and climate-resilient** Hindu Kush Himalaya.

### What are the Findings of the Report?

- **Global Findings:**
  - The **Amu Darya river basin** in Afghanistan reported its lowest snow persistence, the **Helmand River**, crucial for Iran and Afghanistan's drinking water supply, saw its snow persistence nearly 32% below normal.
  - China's **Yellow River basin** exceeding normal levels by **20.2%**, is influenced by the interaction of **cold air from the east asian winter monsoon** with moist air from the **Pacific Ocean**.
- **India's Context:**
  - The report analysed data from 2003 to 2024, revealing that the Ganga River basin experienced its **lowest snow persistence in 22 years**, and the Brahmaputra basin recorded a **14.6% decrease** in snow persistence compared to normal levels.
- **Reason Behind Low Snow Persistence:**
  - **Impact of Weakened Western Disturbances and Global Warming:**
    - This study reveals that weakened [western disturbances](#) from warmer seas in the Mediterranean, [Caspian, and Black Seas](#) have reduced [winter precipitation and snowfall](#) in the Hindu Kush Himalaya region.
    - Additionally, global warming has intensified [La Niña and El Niño events](#), further decreasing the region's snow persistence capacity.
    - The **1.5°C global temperature limit** set under the [Paris Agreement](#) may not be sufficient for the Hindu Kush Himalayan (HKH) region, as this area is expected to experience higher temperature increases than the global average.
  - **Environmental Degradation:**
    - Environmental degradation in the HKH region, driven by [deforestation](#), [overgrazing, unsustainable land practices](#), and infrastructure development, is

leading to profound impacts such as [soil erosion, loss of biodiversity, and water pollution](#) in the region.

- **The Proliferation of Invasive Species:**
  - The proliferation of invasive species such as *Cirsium arvense* (**Canada thistle**) and *Trifolium repens* (**white clover**) poses a significant threat to native Himalayan species, upsetting the delicate balance of the region's ecosystem.
- **Key Recommendations:**
  - **Long-term Strategies:**
    - This study suggests that **reforestation** with native species such as **Cirsium arvense** improves **snow retention** in the HKH region.
    - Enhanced **weather forecasting** and **early warning systems**.
    - Improved **water infrastructure** and enact protective policies for snow-receiving areas.
    - **Community involvement** in decision-making along with promoting regional cooperation will help restore the HKH region.
  - **Climate Change Mitigation:**
    - Reduce emissions to mitigate rising temperatures and focus on [G-20 countries](#) as they are responsible for 81% of global emissions
    - Shift away from [fossil fuels](#) towards [cleaner energy sources](#).

## What is Snow Persistence?

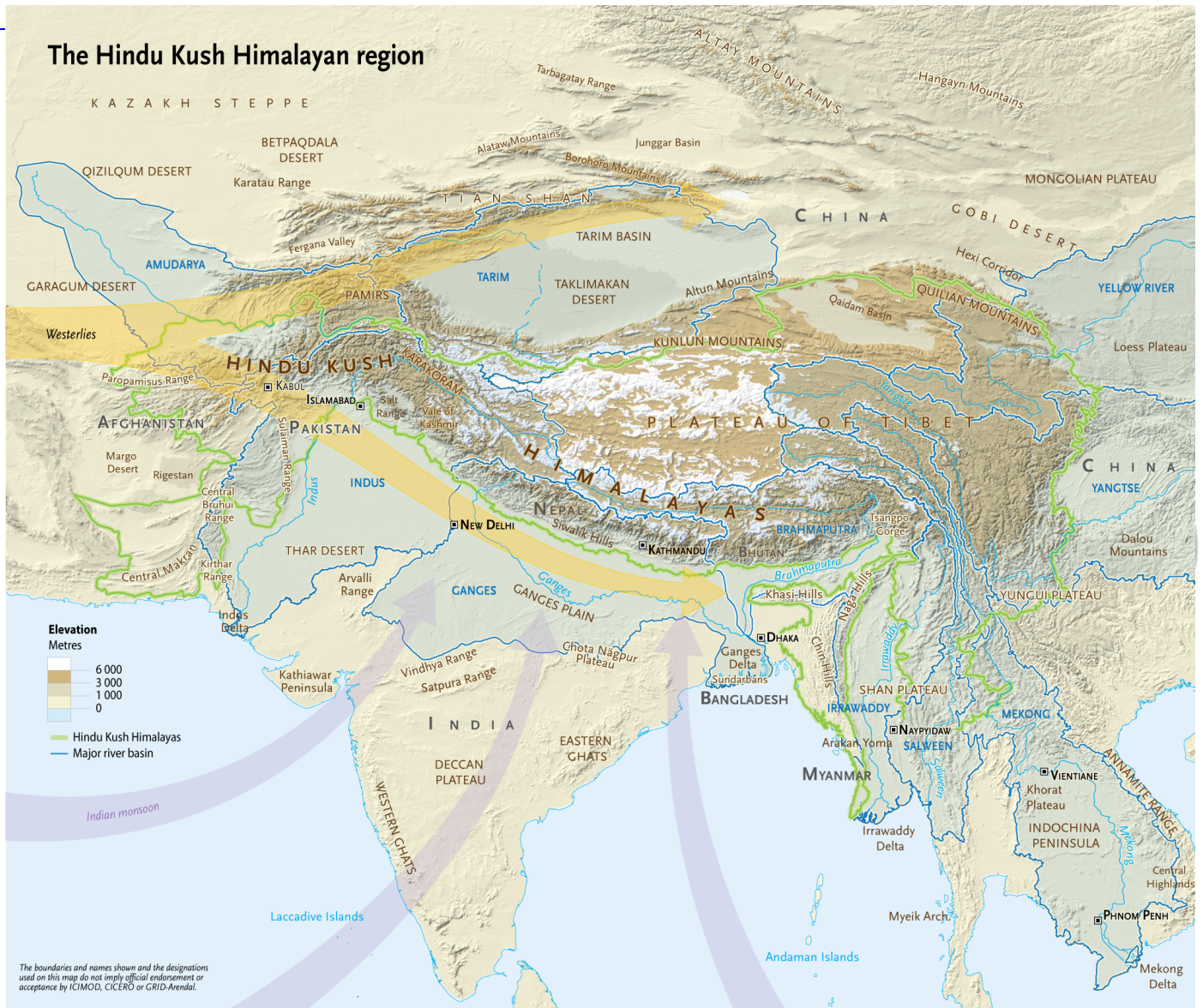
- **About:**
  - Snow persistence refers to the **duration that snow remains on the ground**. When this snow melts, it crucially contributes water to both people and ecosystems.
- **Significance**
  - In the **Hindu Kush Himalaya (HKH) river basins**, snowmelt represents the largest water source for streams, **contributing 23%** of the annual runoff across the region's 12 major river basins.
    - These river basins provide water to almost one-fourth of the world's population and are a significant freshwater source for **240 million people** in the HKH region.
  - In the **Ganga River basin**, the persistence of snow on the ground is particularly significant because its melt **contributes 10.3%** of the Ganga's water, whereas glacier melts contribute only 3.1%.
  - Similarly, in the Brahmaputra and Indus river basins, snowmelt provides **13.2% and approximately 40%** of their respective water supplies, in contrast to 1.8% and 5% from glaciers.

## What is the Hindu Kush Himalaya Region?

- **Geographical Spans of HKH:**
  - The Hindu Kush Himalayan (HKH) region spans **Afghanistan, Bangladesh, Bhutan, China, India, Kyrgyzstan, Mongolia, Myanmar, Nepal, Pakistan, Tajikistan, and Uzbekistan**.
- **Third Pole:**
  - Often referred to as the **Third Pole** due to its **vast ice and snow reserves**, it holds immense climatic significance.
  - This region hosts the largest concentration of ice and snow outside the **Arctic and Antarctica**.
  - The **ice and snow** from the HKH region serve as crucial water sources for **major rivers**, which flow through 16 countries across Asia.
- **Key River Systems and their Destinations from HKH:**
  - **South Asia:**
    - Indus, Ganga, Brahmaputra → Arabian Sea and Bay of Bengal
  - **Central Asia:**
    - Syr Darya, Amu Darya → former Aral Sea basin

- **East Asia:**
  - Tarim → Taklamakan Desert
  - Yellow River → Gulf of Bohai
  - Yangtze → East China Sea
- **Southeast Asia:**
  - Mekong → South China Sea
  - Chindwin, Salween, Irrawaddy → Andaman Sea

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**Drishti Mains Questions:**

Q. What are the key challenges facing the Hindu Kush Himalaya region, and how can it be protected by following various climate-friendly practices?

**UPSC Civil Services Examination, Previous Year Questions (PYQ)**

**Prelims**

**Q. When you travel in Himalayas, you will see the following: (2012)**

1. Deep gorges

2. U-turn river courses
3. Parallel mountain ranges
4. Steep gradients causing land sliding

**Which of the above can be said to be the evidence for Himalayas being young fold mountains?**

- (a) 1 and 2 only  
(b) 1, 2 and 4 only  
(c) 3 and 4 only  
(d) 1, 2, 3 and 4

**Ans: (d)**

**Mains:**

**Q.1** Briefly mention the alignment of major mountain ranges of the world and explain their impact on local weather conditions, with examples. **(2021)**

**Q.2** How will the melting of Himalayan glaciers have a far-reaching impact on the water resources of India? **(2020)**

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