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 i**n 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 i**n 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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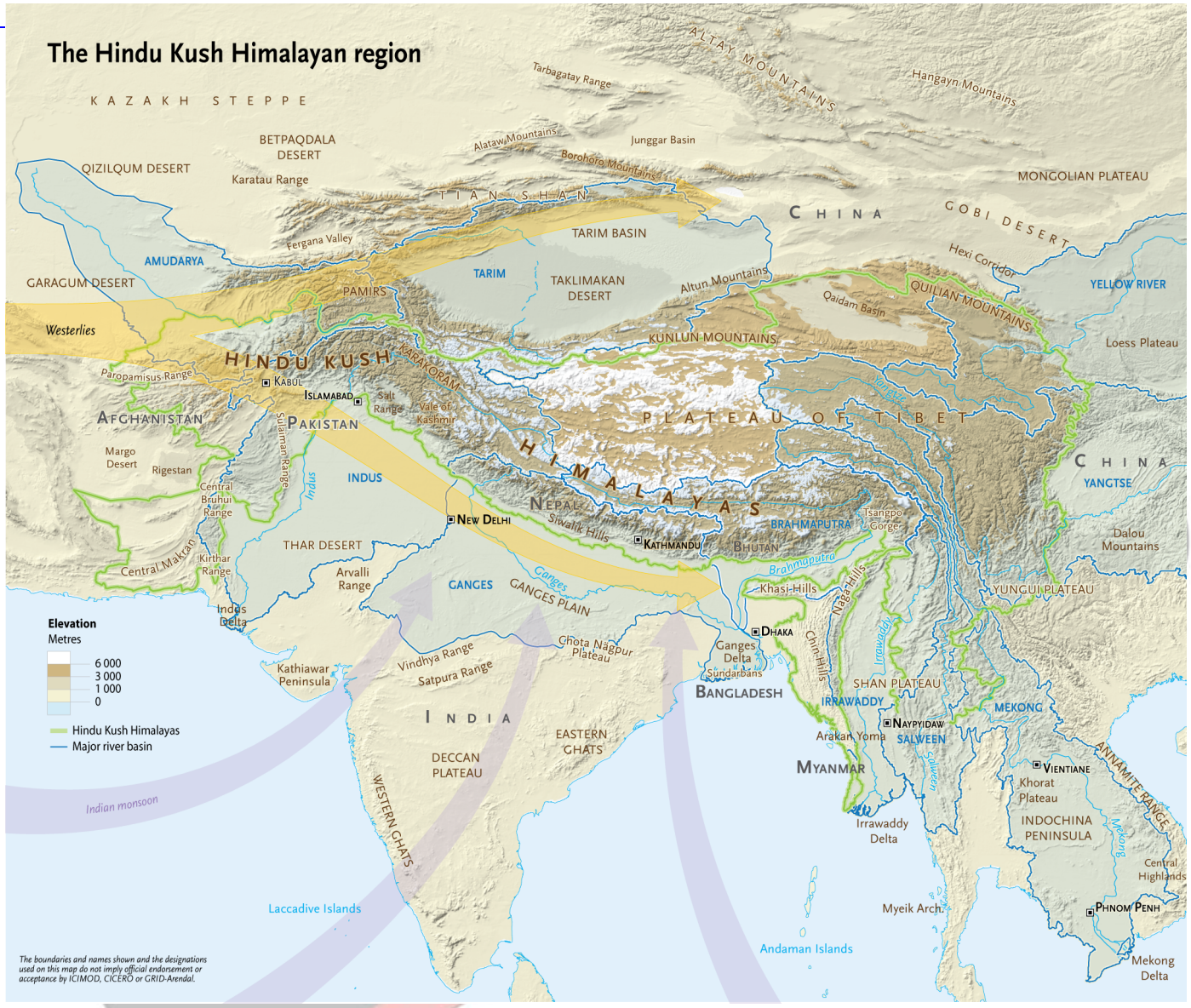

Drishti Mains Questions:

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)**