



## Erosion in Ladakh and Zaskar

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### Why in News

The scientists and students from the **Wadia Institute of Himalayan Geology (WIHG)** have explored the **Zaskar catchment area**.

- The study was conducted to understand the landform evolution in transitional climatic zones, using **morphostratigraphy, Optically Stimulated Luminescence (OSL) dating and provenance analysis** of landforms like **valley fill terraces** and **alluvial fans**.
  - **Valley Fill Terrace:** The **fill terrace** is created either a stream or river starts to incise into the material that it deposited in the valley. Once this occurs benches composed completely of alluvium form on the sides of the valley. The upper most benches are the fill terraces.
  - **Alluvial Fans:** Triangle-shaped deposit of gravel, sand and even smaller pieces of sediment, such as silt.
- WHIG is an **autonomous institute** under the **Department of Science & Technology**, Government of India.

### Zaskar River

- It is **one of the largest tributaries** of the **upper Indus catchment**.
- It drains **transversely northward from the Higher Himalaya, dominated by the Indian summer monsoon, to flow through** the arid, westerlies-dominated, highly folded and thrust **Zaskar ranges in Ladakh**.
- The **Doda** and the **Tsarap Lingti Chu confluence** at Padam to form the Zaskar, which in turn **joins the Indus at Nimu**.
- Zaskar valley can be divided into **upper and lower divisions, separated by a gorge of nearly 60 km in length**.

**Morphostratigraphy:** The organization of rock or sediment strata into units based on their surface **morphology (landforms)**.

**Optically-Stimulated Luminescence:** It is a late Quaternary dating technique **used to date the last time a quartz sediment was exposed to light**. As sediment is transported by wind, water or ice, it is exposed to sunlight and zeroed of any previous luminescence signal.

**Provenance Analysis:** It aims to **determine the source region (provenance) of a sediment sample**. It is aimed to reconstruct the parent rock or rocks of sand bodies, the time of deposition of the sand and, if possible, the climate conditions during the formation of the sediments.

## Key Findings

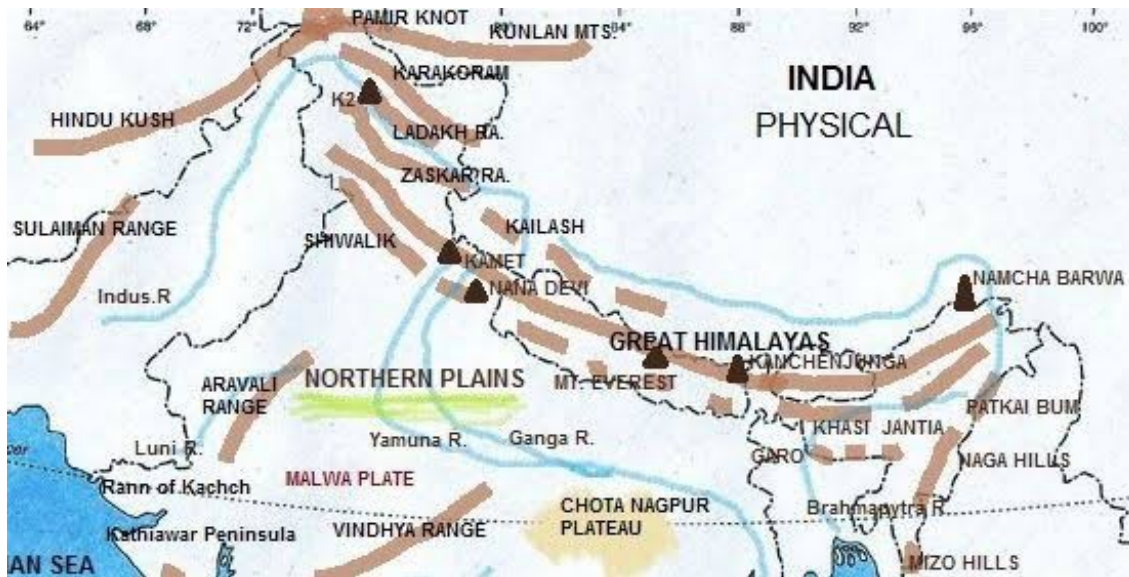
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- Scientists traced where the rivers draining Himalaya and its foreland erode the most and identified the zones which receive these eroded sediments and fill up.
- The study suggested that the **wide valley of Padam in the upper Zaskar** is a **hotspot of sediment buffering** and has stored a vast amount of sediments.  
The sediment contribution from such transient basins is significant when compared to the sediment reportedly eroded from the entire **Indus system in Ladakh**.
- Most of the sediments in the Padam valley were **derived from Higher Himalayan crystalline** that lie in the **headwater region of Zaskar**.
- The dominant **factors responsible** for sediment erosion were **deglaciation** and **Indian Summer Monsoon derived precipitation** in the headwaters.
- The provenance analysis suggested that **despite the presence of the deep narrow gorge and a low gradient**, the upper and lower Zaskar valleys remained **connected throughout their aggradational history**.

## Significance

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- The study will help to **understand river-borne erosion and sedimentation**, which are the main drivers that make large riverine plains, terraces and deltas that eventually become the evolving grounds for civilizations.
- The study brought forwards the **35 thousand-year history of river erosion and identified hotspots of erosion and wide valleys** that act as buffer zones.
- It showed **how rivers in drier Ladakh Himalaya operated on longer time scales** and how they **responded to varying climates**.  
The Ladakh Himalaya forms a **high altitude desert between Greater Himalayan ranges and Karakoram Ranges** and the Indus and its tributaries are major rivers flowing through the terrain.
- Understanding of **water and sediment routing becomes crucial** while developing infrastructure and for other development works in the river catchment area.



Source: PIB