

---

## GEOGRAPHY OF PAKISTAN

Pakistan's physical landscape directly dictates its geopolitical strategy, agricultural capacity, and vulnerability to natural disasters. Stretching over 881,913 km<sup>2</sup> from the Himalayas in the north to the Arabian Sea in the south, its geography acts simultaneously as a strategic fortress, an economic lifeline, and an ecological vulnerability.

### Geographic Framework

- Northern & Western Highlands: Home to the junction of the Himalayas, Karakoram, and Hindu Kush ranges. This region features the world's highest concentration of glaciers outside the polar regions, including peaks like K2 (8,611 m). To the west lies the rugged terrain of Khyber Pakhtunkhwa and the Balochistan Plateau.
- Indus River System & Basin Plains: The Indus River and its eastern tributaries (Jhelum, Chenab, Ravi, Sutlej) flow down to form the agricultural heartland across the fertile Punjab and Sindh plains.

- Arid Deserts: Arid zone terrain dominates eastern and southwestern Pakistan, including the Thar Desert (Sindh), Cholistan and Thal (Punjab), and the high-altitude Kharan Desert (Balochistan).
- Southern Coastal Belt: A 1,046 km coastline along the Arabian Sea, divided into the Sindh Coast and the Makran Coast. Key maritime infrastructure includes Karachi Port, Port Qasim, and the deep-sea Gwadar Port.

**[ North ]** Himalayas / Karakoram / Hindu Kush <-- Glaciers & Water Sources

**[ Indus Basin ]** Punjab & Sindh Agricultural Plains <-- Agricultural Heartland

**[ South Coast ]** Arabian Sea / Gwadar & Karachi Ports <-- Trade Access Routes

## Comprehensive Risk Analysis

Pakistan's geographic location exposes it to severe seismic, hydrometeorological, and geopolitical risks.

Risk Level Breakdown

|                                     |          |
|-------------------------------------|----------|
|                                     |          |
| Hydrometeorological (Floods/GLOF) : | CRITICAL |
| Tectonic & Seismic Hazards          | : HIGH   |
| Water Stress & Aridity              | : HIGH   |
| Geopolitical Border Constraints     | : SEVERE |
|                                     |          |

1. Hydrometeorological & Climate Vulnerabilities

- Glacial Lake Outburst Floods (GLOFs): Accelerated glacier melt in Gilgit-Baltistan and Upper Chitral due to warming temperatures triggers sudden GLOFs, threatening downstream communities.
- Monsoonal & Riverine Flooding: Low-lying Indus basin plains face severe flooding during amplified monsoon seasons. The catastrophic 2022 floods affected over 33 million people and submerged one-third of the country.
- Coastal Risks: Sindh and Balochistan coastal zones are exposed to tropical cyclones, sea-level rise, and saltwater intrusion into the Indus Delta.

## 2. Seismic & Tectonic Hazards

Pakistan sits directly on the active collision zone of the Indian and Eurasian tectonic plates.

- Main Boundary Thrust (North): Bisects Azad Kashmir and Khyber Pakhtunkhwa, responsible for devastating events like the 2005 Kashmir earthquake ( $M_w$  7.6).
- Chaman & Ornach-Nal Fault Systems (West): Active strike-slip faults running through Balochistan, generating high-magnitude quakes near Quetta and along the Makran subduction zone.

## 3. Hydrological & Agricultural Bottlenecks

- Upstream Hydro-Dependency: The Indus River relies on water originating outside Pakistan's immediate administrative control or within glacier-heavy regions sensitive to climate shifts.
- Transition to Water Scarcity: Per capita water availability has dropped below  $1,000 \text{ m}^3/\text{year}$  threshold, shifting Pakistan into water-stressed status and threatening agricultural yields.

## 4. Geopolitical & Frontier Vulnerabilities

- Eastern Border Friction: The border with India remains a militarized boundary dominated by the unresolved Jammu & Kashmir dispute.

- Western Border Instability: The Durand Line separating Pakistan and Afghanistan runs through mountainous terrain, complicating border management and cross-border security dynamics.

| Risk Matrix       | Trigger Mechanism               | Highly Impacted Zones            | Key Impact                             |
|-------------------|---------------------------------|----------------------------------|----------------------------------------|
| Monsoon Flooding  | Heavy rainfall & glacier runoff | Indus Basin (Punjab & Sindh)     | Agricultural destruction, displacement |
| Seismic Activity  | Indian-Eurasian plate collision | KP, Azad Kashmir, Balochistan    | Structural collapse, landslide events  |
| Glacial Outbursts | Thermal glacier retreat & GLOFs | Gilgit-Baltistan, Chitral        | Sudden infrastructure destruction      |
| Drought & Aridity | Failed monsoon cycles           | Balochistan Plateau, Thar Desert | Crop failure, livestock mortality      |