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Himalayan Fire Shift — When Climate Change Pushes Flames to New Heights



CURATED & WRITTEN BY

**Bharat Choudhary**

UPSC Educator & Content Creator

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Himalayan Fire Shift — When Climate Change Pushes Flames to New Heights


 Down to Earth

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INTERVIEW ANGLE



"Forest fires in the western Himalayas above 2,500m have quadrupled in a decade. What does this tell us about the pace of climate change in mountain ecosystems?"

Himalayan Fire Shift — When Climate Change Pushes Flames to New Heights

Analysis of satellite data by Down To Earth, published in its March 16-31, 2026 print edition, reveals that forest fires in high-elevation areas of the western Himalayas have quadrupled over the past decade — climbing from 514 fire points at or above 2,500 metres in 2013-14 to 1,988 in the 2025-26 fire season. Separately, in February 2026, Arunachal Pradesh recorded nearly 200 times more fire incidents than the same period in the previous year, forcing the Indian Air Force to conduct aerial firefighting at altitudes exceeding 2,900 metres.

The Data — A Decade of Escalation

Satellite monitoring using NASA MODIS and SNPP-VIIRS sensors has tracked active fire points across the Himalayas since the early 2000s. The Forest Survey of India (FSI), which processes this data through its VAN AGNI geo-portal, has documented a consistent upward trend in fire frequency, particularly at higher elevations.

PARAMETER	2013-14	2025-26	CHANGE
Fire points at or above 2,500 m (western Himalayas)	514	1,988	~4x increase
Elevation range of detected fires	Below 2,000 m (predominantly)	2,000-4,000 m	Significant upward shift
Nationwide fire alerts (peak month, March 2025)	~50,000	~84,000+	~68% increase
Arunachal Pradesh fire incidents (week of Feb 13-19, 2026 vs same week 2025)	Baseline	~200x spike	Unprecedented

Historically, most Himalayan forest fires occurred below 2,000 metres, where near-surface temperatures are comparatively higher and human activity — grazing, slash-and-burn agriculture, tourism — is more prevalent. The shift to elevations between 2,000 and 4,000 metres marks a fundamental change in fire geography.

Why High-Altitude Fires Are New

The western Himalayas — spanning Uttarakhand, Himachal Pradesh, and Jammu and Kashmir — were traditionally buffered against fire at higher elevations by three natural barriers:

- ❶ **Persistent snow cover** that kept fuel moisture high well into spring
- ❷ **Lower temperatures** that slowed the drying of organic matter on the forest floor
- ❸ **Shorter dry seasons** between the end of winter snowfall and the onset of the monsoon

All three barriers are now weakening. Snowfall in the north-western Himalayas has decreased by approximately 25% over the past five years compared to the 40-year long-term average (1980-2020). The winter of 2024-25 was among the driest in recent memory for the Himalayan region, with snowfall and rain deficits reaching over 80% in Jammu and Kashmir.

This means that vegetation at 2,500-3,500 metres — subalpine forests of birch, fir, and rhododendron — is now exposed to drier conditions for longer periods, converting what was once a fire-resistant zone into combustible terrain.

Climate-Fire Nexus — Reduced Snowfall, Dry Winters, Rising Temperatures

The mechanism linking climate change to high-altitude fires operates through several interconnected pathways:

Reduced winter precipitation: Strong evidence across multiple datasets confirms that winter precipitation in the western and parts of the central Himalayas is decreasing. Less snowfall means less meltwater to keep soils moist during the pre-monsoon fire season (March-June).

Earlier spring onset: The decrease in snowfall has shortened the winter season, leading to early springs and reduced periods of snow cover. Vegetation dries out earlier in the year, extending the window of fire vulnerability.

Rising temperatures: The Hindu Kush Himalayan region is warming at a rate 0.3 degree Celsius faster per decade than the global average. North and central India experienced unusually early and intense heat waves in 2025, with New Delhi crossing 40 degrees Celsius weeks ahead of schedule. This amplified drying extends to mountain ecosystems.

Fire season expansion: Forest fire alerts are now appearing as early as mid-winter in the western Himalayan region, suggesting that the traditional fire season (March-June) is expanding both earlier and later in the calendar year.

Impact on Biodiversity and Water Security

The consequences of high-altitude fires extend far beyond the immediate burn area.

Carbon balance disruption: As fires intensify and monocultures like Chir Pine expand at lower elevations, the Himalayas are gradually shifting from a carbon sink to a carbon source. The 2023 Canadian wildfires — which burned 15 million hectares of boreal forest and released approximately 640 million metric tonnes of carbon — offer a cautionary parallel for what unchecked mountain fires can do to global carbon budgets.

Water tower at risk: The Himalayan cryosphere acts as a natural reservoir, with snow accumulated over winter melting gradually in spring and summer, feeding rivers when rainfall ebbs. Repeated fires damage the “sponge effect” of the forest floor, leading to:

- Drying up of perennial springs that communities depend on for drinking water
- Reduced reliability of water for irrigation and hydropower
- Increased flash flood risk as burned slopes lose their capacity to absorb rainfall

The Gangotri Glacier has retreated over 1,500 metres since 1935. When fire-induced soil degradation compounds glacial retreat, the water security of nearly two billion people across South and Southeast Asia comes under threat.

Biodiversity hotspot degradation: The Himalayas harbour remarkable endemic biodiversity, including flagship species such as the snow leopard, red panda, Himalayan monal, and Western Tragopan. As fire climbs to subalpine and alpine zones, it threatens:

- High-altitude medicinal plant communities
- Rhododendron forests that serve as critical corridors for wildlife movement
- Nesting habitats of pheasants and raptors unique to these elevations

Regional Breakdown — Uttarakhand, Himachal Pradesh, Jammu and Kashmir

Uttarakhand: The most fire-affected Himalayan state. Uttarakhand recorded 3,338 fire alerts during summer 2024 alone. Over 900 fire incidents damaged at least 1,100 hectares in the six months preceding early 2026. The dominance of Chir Pine (*Pinus roxburghii*) at lower elevations — whose resin-rich needle litter is highly

flammable — acts as a “ladder” for fires to climb to higher forests. The Forest Research Institute (FRI), Dehradun, attributes 95% of forest fires to human activities including grazing, slash-and-burn, and intentional burning to promote mushroom growth.

Himachal Pradesh: Forest fires increased by 1,339% compared to the previous assessment period, according to the State of Forest Report (SOFR) 2023. Vast swathes of the state are dominated by Chir Pine, and steep slopes allow surface fires to transition rapidly into crown fires. The state forest department has struggled with limited manpower — fire crews often cannot reach ignition points in rugged terrain before a fire escalates.

Jammu and Kashmir: Forest fires increased by a staggering 2,822% as per SOFR 2023. In the 2025-26 financial year (April-January), 310 forest fire incidents were recorded, affecting over 880 hectares. The snowfall and rain deficit of over 80% during the winter of 2024-25 left forests exceptionally dry, creating conditions ripe for fire even at higher elevations.

Northeast — Arunachal Pradesh: Although outside the western Himalayas, the February 2026 fires in Arunachal Pradesh illustrate the pan-Himalayan nature of this crisis. The Indian Air Force deployed Mi-17 helicopters, dropping over 139,800 litres of water at Walong and 66,000 litres in the Lohit valley. Fires reached altitudes of approximately 2,900 metres, requiring joint Army-IAF operations over five consecutive days.

Policy Response and Gaps

India has several institutional mechanisms to address forest fires, but critical gaps persist:

National Action Plan on Forest Fires (NAPFF), 2018: Provides the overarching framework. State governments prepare State Action Plans tailored to local needs. However, implementation varies widely across states, and high-altitude fire management receives no special focus.

Forest Fire Prevention and Management Scheme (FFPMS): A Centrally Sponsored Scheme that provides financial assistance for fire prevention infrastructure, early warning systems, and fire line maintenance. The scheme suffers from inconsistent funding — the 2023-24 budget was initially projected at Rs 51 crore but revised downward to Rs 40 crore, delaying planned infrastructure upgrades.

FSI VAN AGNI Portal: A real-time geo-portal that provides MODIS and VIIRS-based fire alerts at least six times every 24 hours. While detection is effective, the response mechanism on the ground — particularly in high-altitude terrain — remains inadequate.

NDRF Training: Three National Disaster Response Force (NDRF) battalions comprising 150 personnel have been trained for forest fire response. This is a minuscule force for a mountain range spanning 2,500 kilometres and multiple states.

Key gaps:

- No dedicated high-altitude fire response protocol
- Limited aerial firefighting capacity — the IAF intervenes ad hoc rather than through a structured forest fire air wing
- Chir Pine needle management remains unresolved despite pilot projects for briquetting and biochar

- Fire line maintenance budgets are routinely underspent
- Community-based fire management (Van Panchayat-level) is underfunded

International Parallels — Canada, Australia, and the Global Fire Crisis

India is not alone in confronting climate-driven fire escalation. The global pattern provides both warnings and lessons:

Canada (2023-2024): The 2023 wildfire season was the most destructive in Canadian history — 15 million hectares burned, releasing approximately 640 million metric tonnes of carbon (23% of global wildfire carbon emissions that year). The 2024 season remained severe with over 5.3 million hectares burned. Attribution analyses indicated that burned area anomalies were up to 40% higher due to anthropogenic climate change, with a 2.9-3.6-fold increase in the likelihood of extreme fire weather.

Australia (2019-2020): The “Black Summer” bushfires burned over 12 million hectares, killing an estimated 3 billion animals. Australia subsequently established a National Bushfire Recovery Agency and invested heavily in aerial firefighting — a model India could study.

Arctic fires: Even the Arctic is now experiencing wildfires, with fire-on-ice events in Siberia and Alaska becoming more frequent. This underscores that no ecosystem is immune when climate thresholds shift.

The common thread is clear: as global temperatures rise, traditional fire geographies are being redrawn. Mountains, boreal forests, and even tundra — once considered fire-safe — are now on the front line.

Way Forward

- 1 Dedicated Mountain Fire Strategy:** India needs a Himalayan Fire Management Mission distinct from the generic NAPFF. This must account for altitude-specific fire behaviour, logistical challenges of high-terrain response, and the unique ecological sensitivity of subalpine and alpine zones.
- 2 Aerial Firefighting Wing:** Establish a permanent aerial firefighting capability under the Ministry of Environment, Forest and Climate Change (MoEFCC), drawing on the Australian and Canadian models. The current reliance on ad hoc IAF deployments is neither sustainable nor scalable.
- 3 Early Warning Integration:** Link FSI VAN AGNI satellite alerts with state-level fire response teams through a unified command-and-control system. Real-time alerts are useless if ground crews take 48-72 hours to reach the fire.
- 4 Chir Pine Needle Economy:** Scale up pilot projects that convert Chir Pine needles into briquettes, biochar, and insulation material. Uttarakhand and Himachal Pradesh have tested this but need industrial-scale processing to meaningfully reduce fuel loads.
- 5 Community Fire Brigades:** Empower Van Panchayats and Joint Forest Management Committees (JFMCs) with training, equipment, and financial incentives for fire prevention and first response. Communities are the fastest responders in remote terrain.

- 6 **Snowfall and Moisture Monitoring:** Deploy automated weather stations across the 2,000-4,000 metre belt to track snowpack, soil moisture, and fuel dryness in real time. This data should feed directly into fire danger rating models.
- 7 **International Cooperation:** Join the Global Wildfire Information System (GWIS) and establish bilateral fire management agreements with Canada, Australia, and EU nations that have advanced mountain fire response capabilities.

UPSC Angle

This topic links climate adaptation, disaster management, and environmental governance — making it relevant across multiple dimensions of the UPSC examination.

UPSC RELEVANCE

FSI fire monitoring (MODIS, VIIRS, VAN AGNI portal); ISFR 2023 data; National Action Plan on Forest Fires (2018); FFPMS; NDRF forest fire training; Chir Pine fire ecology; Himalayan biodiversity hotspot; Gangotri Glacier retreat

MAINS GS-1:

Distribution of key natural resources; Himalayan geography and its significance as a water tower; impact of climate change on mountain ecosystems and downstream populations

MAINS GS-3:

Conservation of forests and wildlife; disaster management (forest fires as a recurring disaster); environmental impact assessment; climate change mitigation and adaptation in mountain regions; linkages between forest degradation and water security

★ FACTS CORNER — KNOWLEDGEPEDIA

HIGH-ALTITUDE FIRE DATA (WESTERN HIMALAYAS):

Fire points at or above 2,500 m in 2013-14: 514

Fire points at or above 2,500 m in 2025-26: 1,988 (~4x increase)

Elevation range of newly detected fires: 2,000-4,000 m

Fire season: traditionally March-June; now expanding into mid-winter

95% of Himalayan forest fires attributed to human activities (FRI, Dehradun)

SATELLITE MONITORING INFRASTRUCTURE:

FSI VAN AGNI geo-portal: real-time fire alerts using MODIS and SNPP-VIIRS sensors

Fire alert frequency: at least 6 times in 24 hours

Nationwide fire alerts in March 2025: over 84,000 incidents

MODIS satellites: Aqua and Terra (NASA)

STATE-WISE FIRE DATA:

Uttarakhand: 3,338 fire alerts in summer 2024; over 900 incidents in 6 months (2025-26)

Himachal Pradesh: fire incidents increased 1,339% (SOFR 2023)

Jammu and Kashmir: fire incidents increased 2,822% (SOFR 2023); snowfall deficit over 80% in winter 2024-25

Arunachal Pradesh: ~200x spike in fire incidents (Feb 13-19, 2026 vs same period 2025)

CLIMATE DATA:

North-western Himalayan snowfall decline: ~25% over 5 years vs 40-year average (1980-2020)

Hindu Kush Himalayan warming rate: 0.3 degree Celsius faster per decade than the global average

Gangotri Glacier retreat: over 1,500 m since 1935

Population dependent on Himalayan water systems: nearly 2 billion

POLICY AND INSTITUTIONAL FRAMEWORK:

National Action Plan on Forest Fires (NAPFF): launched 2018

Forest Fire Prevention and Management Scheme (FFPMS): Centrally Sponsored Scheme; 2023-24 budget Rs 51 crore (revised to Rs 40 crore)

NDRF forest fire battalions: 3 battalions, 150 personnel trained

Forest Survey of India (FSI): under MoEFCC; headquartered in Dehradun

India State of Forest Report (ISFR) 2023: total forest and tree cover 8,27,357 sq km (25.17% of geographical area)

INTERNATIONAL PARALLELS:

Canada 2023 wildfires: 15 million hectares burned; 640 million metric tonnes of carbon released (23% of global wildfire emissions)

Canada 2024 wildfires: over 5.3 million hectares burned

Australia Black Summer (2019-20): over 12 million hectares burned; ~3 billion animals killed

Climate attribution: 2.9-3.6x increase in likelihood of extreme fire weather due to anthropogenic climate change (Canada)

IAF FIREFIGHTING OPERATIONS (FEBRUARY 2026, ARUNACHAL PRADESH):

Aircraft deployed: Mi-17 helicopters

Water dropped at Walong: 139,800 litres

Water dropped in Lohit valley: 66,000 litres

Altitude of operations: approximately 2,900 m (9,500 feet)

Duration: 5+ consecutive days of joint Army-IAF operations

OTHER RELEVANT FACTS:

Chir Pine (*Pinus roxburghii*): dominant fire-prone species in western Himalayas; resin-rich needle litter is highly flammable

Van Panchayats: community-level forest management institutions in Uttarakhand

Joint Forest Management Committees (JFMCs): participatory forest governance bodies under National Forest Policy

Global Wildfire Information System (GWIS): international wildfire monitoring platform

Himalayan biodiversity hotspot: home to snow leopard, red panda, Himalayan monal, Western Tragopan

MODIS fire data available since 2001; VIIRS since 2012 — enabling long-term trend analysis

Sources: [Down to Earth](#) , [Forest Survey of India](#) , [PIB](#) , [Mongabay India](#) , [ORF](#)



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