

Non Traditional Security Digest

Impacts of Climate Change
in the Himalayas

Vol 3 | Issue 3 | May - June 2024



MANOHAR PARRIKAR INSTITUTE FOR
DEFENCE STUDIES AND ANALYSES

मनोहर पर्रिकर रक्षा अध्ययन एवं विश्लेषण संस्थान

Impacts of Climate Change in the Himalayas

Introduction

The Himalayas stretch across the northeastern portion of India. They cover approximately 1,500 miles (2,400 km) and pass through the nations of India, Pakistan, Afghanistan, China, Bhutan and Nepal. The Himalayan range is made up of three parallel ranges often referred to as the Greater Himalayas, the Lesser Himalayas, and the Outer Himalayas. The Himalayas, like the Arctic and the Antarctic, plays an important role in regulating the global temperatures. Climate change and the ongoing geophysical transformations occurring in the Himalayas have implications not only for South Asian states but also globally. This issue of NTS digest aims to highlights all such recent trends of climate change in the Himalayas.

90% of Himalayas face year-long drought at 3 degrees global warming: study

Research published in published in the journal Climatic Change has highlighted that that 80% of the increased human exposure to heat stress in India can be avoided by adhering to Paris Agreement's

temperature goals of limiting global warming to 1.5 degrees Celsius, compared to 3 degrees Celsius warming. This [study](#) has emphasized that about 90% of the Himalayan Region will experience drought lasting over a year if global warming increases by 3 degrees Celsius, according to new research.

Climate Change and issues of human health in Himalayas

Climate change poses serious implications for human health in the Himalayan regions. A [report published in February 2024](#) highlighted that as a result of decline in the snow from the peaks of Himalayan Mountains, residents in the Himalayan valley are showing symptoms respiratory diseases. As per the experts these growing signs of respiratory diseases among the people are as a result of prolonged dry conditions caused in these region due to warming temperatures. These dry conditions results in existence of particulate pollution in the air for longer period of time that create hazy conditions and results in difficulty in breathing. Dr Naveed Nazir Shah, Head of Department at Srinagar's Chest Diseases Hospital [highlights that](#) they have observed that patients suffering from bronchitis and asthma are at high risk

of developing exacerbation because of poor air quality, while the number of chest diseases patients increases exponentially from November onwards in Kashmir, especially when the weather stays dry for longer durations.

Water Shortage Feared As Snow Persistence in Himalayas Hits Record Low

A latest report by the leading experts from the [International Centre for Integrated Mountain Development \(ICIMOD\)](#), highlighted the issue of water shortage in near future due to alarming low levels of snow in Himalayas and the Hindu Kush Mountains (HKH). This reports suggests that this could threaten water security of the larger region as an "extraordinary below normal snow year" could have devastating consequences for large downstream population centers that rely on runoff water for their primary needs.

HKH region heavily depends on the cryosphere -- frozen water on the Earth's surface, including snow, permafrost, and ice from glaciers, lakes and rivers. This frozen water is a critical source of freshwater for around 240 million (24 crore) people living in the HKH region and

has far-reaching benefits for around 1.65 billion (165 crore) people downstream.

This [report suggests](#) that snowmelt accounts for around 23 per cent of the total water flow of 12 major river basins originating in the HKH. However, its contribution varies from river to river, representing 74 per cent of the Amu Darya's flow, 77 per cent of the Helmand's flow, and 40 per cent of the Indus' flow. Monitoring shows snow levels are almost a fifth below normal across the region this year, with the most dramatic declines in the west, where its contribution to water supply is the highest.

This [report highlights](#) that snow persistence dropped 17 per cent below normal in the Ganga basin and 14.6 per cent below normal in the Brahmaputra basin.

Impacts of climate change on Himalayan farmers and agriculture

As a result of warming of climate with emerging scarcity of water farmers in Uttarakhand are making a [strategic transition](#) to livestock farming and forestry and experimenting with new agricultural practices to overcome the climate

sensitivity of agricultural farming. Farmers along with cows and buffaloes, have also begun to raise various species of chickens, like the indigenous breed Kadaknath, which has become a valuable source of income.

According to a study by [Indian Council of Agricultural Research \(ICAR\)](#), global warming is having a huge impact on agriculture in the Himalayan region and the rainfall patterns are becoming non supportive to local farming. This study suggests that the crops grown in the Himalayan region will be severely affected by the end of this century. The report further highlights that this will have negative implications for India's wheat yield that may decrease by up to [12 per cent](#).

In order to shield themselves from these emerging potential vulnerabilities, farmers in Uttarakhand are rethinking traditional agricultural practices. They are experimenting with new crops and species and branching into animal husbandry, poultry and fish farming. Many people have also started taking up beekeeping and goat rearing, with the latter offering lucrative profits.

Climate change is further prompting migration from Uttarakhand villages. According to the [state government data](#), 1,500 villages are either completely vacant or have just a handful of families left. Along with a lack of good education and health facilities, the agricultural crisis is becoming one of the important reason for this rural to urban migration.

Scientists declare Hindu Kush Himalaya a biosphere on brink of 'collapse'

The International Centre for Integrated Mountain Development (ICIMOD) issued the call as more than 130 global experts convened in Kathmandu, Nepal, in February, 2024 for the Third Lead Authors meeting of the [Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services \(IPBES\)](#) nexus assessment to examine the linkages between food and water security, health, biodiversity and climate change. During this meeting the scientists declared the Hindu Kush Himalaya region a biosphere on the [brink of collapse](#) and called for bold action and urgent finance to prevent nature loss in one of the most biodiverse areas on Earth.

Impacts of Climate change on Himalayan bird migration

A [study in 2023](#) examined seasonal elevational shifts among 302 Himalayan bird species using eBird, a community science dataset, for the years 2011 through 2022. It found out that 65 per cent of the species in the eastern and western Himalayas displayed seasonal elevational shifts within their species range compared with other bird communities reported in high seasonality or the peak season. The researchers also believe that climate change might have an impact on their behaviour.

The data of 37,944 birds from the western Himalayas and 9,992 from the eastern regions, totalling 47,936 were examined. In the eastern Himalayas, the elevational distribution among 198 species showed that 55 per cent of the birds had significant lower shifts while 59 per cent reflected median shifts and 56 per cent recorded upper elevations limits, the study found.

Similarly, [another study](#) conducted in 2022 pointed that Himalayan birds are more likely to lose traits that are unique to them than other birds inhabiting other parts of the world.

Increasing incidents of forest fires in Himalayas

Incidents of Forest fire in Himachal's several districts have been on a significant rise due to low moisture in air and lack of precipitation. [Data](#) from the Forest Survey of India (FSI) suggest that there have been 2,050 incidents of forest fires between October 16, 2023 and January 16, 2024. This number was just 296 during the same period last year. Uttarakhand and Himachal, two of India's Himalayan states, ranked first and second among states where most fire alerts had been sounded in 2023-2024.

How forest fires worsen flash floods in the Himalayas

According to [Global Forest Watch data](#), between 2001 and 2021, more than 35,000 hectares of tree cover were lost to wildfires in the Himalayas. Analysis of this data shows that the total area of forest that was burned to some degree was 1.4% greater in 2011-2020 than in the previous decade, rising from over 7,200,000 hectares to more than 7,300,000 hectares.

Scientific communities are of the view that, intense wildfires damage soil on the forest

floor, thereby contributing to dangerous flash floods across the mountains of South Asia.

The two phenomena are connected more than anything what one might think. Experts believe that more intense forest fires are a [major reason for the rise in flash floods](#) in the Himalayas over the past 20 years.

Experts highlights that in a healthy forest, the forest floor is covered with vegetation and dead plant material. Animals like worms aerate the top layer of soil as they burrow through it, making it permeable and able to [soak up water](#).

During cloudbursts and extreme rainfall events, biomass present on the forest soil acts as a sponge and soaks up the water. This water, instead of flowing downhill, seeps into the ground. Plant roots and organic matter also hold the soil together when there is strong wind or heavy rainfall.

All this biomass is destroyed during a high-intensity forest fire. Whenever there is a forest fire it desecrates the top layer of the soil, which is full of nutrients and usually takes [200-300 years to form](#).

The biggest impact fires have on soil is that they make it less permeable. An intense forest fire burns the top layer of the soil, which changes the structure and reduces porosity of soil. The soil particles bind together more closely and compactly, making the top layer of soil water repellent. This hinders water infiltration and contributes to erosion and runoff.

IPCC Sixth assessment Report on Himalayas

The Sixth Assessment Report (AR6) of the [Intergovernmental Panel on Climate Change](#) (IPCC) which was published in August 2021 highlighted that the glaciers in the Hindu Kush Himalayan (HKH) region will keep shrinking and the snow cover will retreat to higher altitudes. The Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC), approved by 195 member countries, warned that extreme precipitation is projected to increase in major mountainous regions with potential cascading consequences of floods, landslides and lake outbursts in all scenarios.

[A 2019 IPCC report](#) on oceans and the cryosphere in a changing climate had

revealed that the HKH region, an area covering high mountain chains of central, south and inner Asia, faces the risk of losing over 60 per cent of its glaciers by 2100.

Climate Resilient Development in Indian Himalayan Region discussed at Indian side event at CoP 28

Impacts and implications of Climate Change Vulnerability in the Himalayan Region and ways of creating ‘Climate Resilient Development in Indian Himalayan Region by making mountain communities green and resilient were discussed the side event hosted at the India pavilion at the UN Climate Conference COP 28 on December 3, 2023. The delegates at COP 28 also discussed adaptation and mitigation efforts in order to achieve the significant positive outcomes in the coming years towards tackling climate change.

It was emphasized that the Indian Climate system remains [highly dependent on Himalayan range](#) and Indian Himalayan region (IHR) has been a shelter for more than 50 million people. Any impact in the Himalayas would mean an effect on the life of millions of people not only of India but

also of entire subcontinent. The experts at the side event elaborated on the importance of the [National Mission for Sustaining the Himalayan Ecosystem](#) (NMSHE) launched as part of National Action Plan on Climate Change (NAPCC), to better understand the linkages between climate change and the Himalayan ecosystem for improved adaptation.

Some latest suggested readings

Baniya, R., Regmi, R. K., Talchabhadel, R., Sharma, S., Panthi, J., Ghimire, G. R., & Tamrakar, J. (2024). Integrated modeling for assessing climate change impacts on water resources and hydropower potential in the Himalayas. *Theoretical and Applied Climatology*, 1-16.

Barman, S., Singh, W. R., Kalita, B., & Tyagi, J. (2024). A combined impact assessment of climate and land use/land cover change in an Eastern Himalayan watershed in northeast India. *Environmental Monitoring and Assessment*, 196(3), 294.

Chandra, A., Gupta, Y., Dinakaran, J., Raina, N., Hanif, M., Meena, A., & Rao, K. S. (2024). Climate Change and Biodiversity in the Himalaya: Trends and Perception. In *Biodiversity Hotspot of the*

Himalaya (pp. 439-458). Apple Academic Press.

Das, S. (2024). Harmonizing tradition and climate resilience: traditional food practices for food security in the Himalayas. *Environment, Development and Sustainability*, 1-22.

Das, S. (2024). Women's experiences and sustainable adaptation: a socio-ecological study of climate change in the Himalayas. *Climatic Change*, 177(4), 59.

Dhimal, M., Bhandari, D., & Lamichhane Dhimal, M. (2024). Climate Change and Human Health: Vulnerability, Impact and Adaptation in Hindu Kush Himalayan Region. In *Climate Change and Human Health Scenarios: International Case Studies* (pp. 159-169). Cham: Springer Nature Switzerland.

Hazarika, A., Nath, A. J., Reang, D., Pandey, R., Sileshi, G. W., & Das, A. K. (2024). Climate change vulnerability and adaptation among farmers practicing shifting agriculture in the Indian Himalayas. *Environmental and Sustainability Indicators*, 100430.

Mehboob, M. S., & Kim, Y. (2024). Impact of climate change on the hydrological

projections over a western Himalayan river basin and the associated uncertainties. *Journal of Hydrology*, 628, 130460.

Poornima, R., Ramakrishnan, S., Priyatharshini, S., Poornachandhra, C., John, J. E., Ramya, A., & Dhevagi, P. (2024). Climate Change Implications in the Himalayas. In *The Himalayas in the Anthropocene: Environment and Development* (pp. 237-277). Cham: Springer Nature Switzerland.

Shah, R. A., Paul, O. J., Dar, R. A., & Romshoo, S. A. (2024). Impact of climate change and anthropogenic activities on lacustrine ecosystems of the Kashmir Valley, NW Himalaya, India. *Environmental Quality Management*.

Sharma, A., & Masiwal, R. (2024). Climate Crisis in the Indian Himalayas: An Introduction. In *Addressing the Climate Crisis in the Indian Himalayas: Can Traditional Ecological Knowledge Help?* (pp. 1-30). Cham: Springer Nature Switzerland.

Sigdel, S. R., Dyola, N., Pandey, J., & Liang, E. (2024). Impact of Climate Change on Plants in the Nepal Himalayas.

In *Flora and Vegetation of Nepal* (pp. 361-381). Cham: Springer International Publishing.

Syldon, P., Shrestha, B. B., Miyamoto, M., Tamakawa, K., & Nakamura, S. (2024). Assessing the impact of climate change on flood inundation and agriculture in the Himalayan Mountainous Region of Bhutan. *Journal of Hydrology: Regional Studies*, 52, 101687.

Yıldırım, D. Ç., Yıldırım, S., & Bostancı, S. H. (2024). Anthropogenic Impacts in the Himalayas and the Sustainable Development Goals (SDGs). In *The Himalayas in the Anthropocene: Environment and Development* (pp. 279-291). Cham: Springer Nature Switzerland.

Zhou, B., Zou, Q., Jiang, H., Yang, T., Zhou, W., Chen, S., & Yao, H. (2024). A novel framework for predicting glacial lake outburst debris flows in the Himalayas amidst climate change. *Science of The Total Environment*, 174435.

Non-Traditional Security Centre

This digest has been prepared by the Non-Traditional Security Centre, Manohar Parrikar Institute for Defence Studies and Analyses, New Delhi.



MANOHAR PARRIKAR INSTITUTE FOR
DEFENCE STUDIES AND ANALYSES
मनोहर पर्रिकर रक्षा अध्ययन एवं विश्लेषण संस्थान

Manohar Parrikar Institute for Defence Studies and Analyses

No.1, Development Enclave, Rao Tula Ram Marg,
Delhi Cantt., New Delhi - 110 010

Tel.: (91-11) 2671-7983 Fax: (91-11) 2615 4191

Website: <http://www.idsa.in>