

Himachal Pradesh's Climate Policy: Aligning with the Paris Agreement 2015

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Abstract

The combined impact of over-population, misuse of natural resources and unsustainable farming practices has made the Himalayan ecosystem fragile. Climate change has led to increase in temperature affecting the weather-cycle with abrupt rainfall patterns, the delayed winter and the harsher summer. The variations brought upon by climate change in Himachal Pradesh is of particular significance as the economy of the state relies heavily on agriculture, horticulture and forestry. All these sectors are facing the consequences of climate change, putting the economy and people of the state in a flux. Himachal Pradesh has frequently experienced natural disasters such as floods, droughts and cloud bursts which has led to biodiversity loss and lower harvest resulting into poverty and deprivation. Nearly 63% of the workforce in the state relies on agriculture or horticulture for their livelihoods, making rural communities especially vulnerable to extreme weather events. The article delves into key initiatives, schemes, and policies undertaken by the Himachal Pradesh government, particularly since 2010, to address climate change and promote sustainable living. It also critically examines and evaluates the extent to which these policies align with the objectives of the Paris Agreement within the broader framework of the Sustainable Development Goals.

Keywords: *Climate Change, Global Warming, Environment, Paris Agreement and Kyoto Protocol*

Introduction

Known for its mountain ranges such as the Shivalik, the Lesser Himalayas and the Great Himalayas, the state of Himachal Pradesh is located in the northern part of India. Having picturesque mountainous landscapes and varied climate, the state also boasts diverse range of flora, fauna and bio-diverse ecosystem. Bordering with Jammu and Kashmir to the north and Punjab to the west, the state also shares its boundaries with Haryana to the south-west, Uttarakhand to the south-east, and the Tibetan region to the east. The physical geography of the state is dominated by high hills as well as deep valleys. Located in the fragile Himalayan eco-system which is readily susceptible to global climate change, Himachal Pradesh's climate change concerns get further aggravated by reckless deforestation, rapid urbanization, and neglect of its forests and ecosystems. The state recorded the sharpest increase in average temperature in India between 1951 and 2010 (Rathore, Attri & Jaswal, 2013). The widespread concerns around the climate-change and its multi-faceted impacts have prompted the state government of Himachal Pradesh, particularly in the last fifteen years, to formulate and implement several policies to combat the challenges of climate change. This has led to the implementation of policies such as Himachal Pradesh State Action Plan on Climate Change (HP-SAPCC) and the Climate Resilient Sustainable Agriculture Project (CRSAP) (NITI Aayog, 2017), both aimed at addressing climate-related challenges, especially in agriculture.

The impact of climate change has been broader, ranging from reduced agricultural productivity for farmers to the frequent landslides that have resulted in significant loss of human lives and property (Kaur, Kaur, Tiwana, & Gupta, 2022). As climate change has affected all facets of human, animals and plants lives, the formulated policies have been layered and intricate, providing remedial measures for all the domains. The policies focus on cutting carbon emissions, encouraging the use of renewable energy, promoting sustainable farming for better land management, protecting biodiversity, and strengthening climate resilience. Central to this framework are the Himachal Pradesh Climate Change Policy from 2013 and the action plans that follow (Ugupta, Sharma, Jayaraman, Kumar, & Ravindranath, 2015). These plans outline specific strategies for both mitigation and adaptation (Rawal, Antany, Kumar, Pottakkal, & Linda, 2025). The government has prioritized broad involvement of citizens

and civil society groups, working alongside state institutions to achieve lasting outcomes. It also requires the active engagement of research institutes to design innovative strategies and policies that can help restore the environment to its fullest potential (Baloch, 2025).

The state's economy relies heavily on sectors such as hydropower generation, horticulture, agriculture, forestry, and tourism, all of which are considered vulnerable under the current climate change scenario. Any disruption in these sectors due to climate change is highly likely to have far-reaching impacts, not only for people living in the mountainous hilly areas but also for those living down below in the plains (Department of Environment, Science and Technology, Government of Himachal Pradesh, 2012). With summer temperatures seldom exceeding 25–30 °C and harsh winters, the region's socio-economic activities, primarily agriculture and tourism, are vulnerable to resource scarcity as a result of climate change. Consequently, the state formulated a Climate Policy to address these pressing concerns. (Kumari et al., 2023). Himachal Pradesh's Climate Challenge and Sectoral Impacts document meticulously examines the intricate nexus between the region's environmental fragility and the manifold repercussions of climate change across critical sectors. By focusing attention on immediate risks, it lays the groundwork for formulating suitable resilience strategies.

By aligning with national and global climate endeavors, Himachal Pradesh aims to navigate the challenges posed by a changing climate, to safeguard its ecological heritage, and foster sustainable socioeconomic development. This study aims to analyze the causal factors driving climatic shifts in Himachal Pradesh, explore the extant climate policies implemented by the state, and assess their conformity with the objectives outlined in the 2015 Paris Agreement, a seminal international agreement combatting climate change (Chaudhry, Mukhopadhyay, & Guin, 2025).

Material and Methods

The methodology employed to assess Himachal Pradesh's climate challenges and sectoral impacts entailed a comprehensive approach, integrating various elements, such as the analysis of climatic data, scientific research, stakeholder consultations, and policy reviews. The data presented in this study predominantly originated from authoritative government sources.

Within the framework of understanding climate variability in Himachal Pradesh, this study was meticulously designed to ascertain the overall ramifications of fluctuations in climatic parameters, particularly temperature and rainfall, on agricultural crop productivity. By employing a synthesis of quantitative and qualitative methodologies, the document amalgamated diverse information sources to discern vulnerabilities, delineate the impacts on key sectors, and evaluate existing initiatives. This holistic methodology served as the foundation for formulating strategic recommendations and guiding the policy directions delineated in the analysis.

State of Environment Report-2022

The Department of Environment, Science & Technology of the Government of Himachal Pradesh revised and published the State of Environment Report (SoER) 2022, encompassing a wide array of sectors, including physiography, agriculture, horticulture, biodiversity, energy, land use, forest, health, industry and mining, tourism and culture, transport, water resources, environmental pollution and management, society and environment, and natural disasters. The SoER aligns with the framework established by the Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India, based on the pressure, state, impact, and response (PSIR) model. This comprehensive report was unveiled to coincide with World Environment Day on June 5, 2022 (Eco-Survey-2022-23 - Economic & Statistics Department, HP, India).

Climate Change Challenges in Himachal Pradesh

Himachal Pradesh faces a multitude of climate change challenges, including glacial retreat, unpredictable and sporadic rainfall patterns (Kumar et al., 2025), landslides, forest fires, and a heightened frequency of extreme weather events. An earlier study documented changes across various glaciers in the Bhaga Basin within the Himachal Pradesh from 1979 to 2017 (Kaushik et al., 2020). Utilizing Landsat satellite imagery, the authors observed variations in the glacier extent across different elevation zones (Yousuf, Shukla, Garg, & Bangroo, 2025), notable snout retreat, and decadal alterations. Their findings underscored the alarming rate of glacier retreat, averaging 12m annually, with an accelerated recession observed at lower elevations and smaller glaciers.

According to the Indian Meteorological Department, in 2023, Himachal

Pradesh has witnessed abrupt changes in climate patterns with drastic and sporadic snowfall, rainfall, and significant changes in temperature. Owing to extreme climate changes in 2023, Himachal Pradesh witnessed a 20% surplus in rainfall (Lohan, Kumar, Singh, Gupta, & Tiwari, 2025).

Figure 1

*Anomalies in climate of Himachal Pradesh in 2023
(Himachal Headlines, 2024).*

Rainfall	884.8mm
Landslides	168
Cloudburst	52
Flash floods	72
Precipitation (Deficit)	-85 %

Moreover, analysis of long-term statistical data revealed a decreasing trend in annual precipitation (-2.724 mm per year, 1951–2017), alongside a concurrent rise in mean annual temperature (0.021°C per year).

The agricultural landscape in the Himalayan region has undergone a transformative shift from traditional cereal crops to cash crops, such as fruits and vegetables. This transition is intricately linked with seasonal climatic variables, including minimum and maximum temperatures, diurnal temperature ranges, and rainfall patterns, which directly affect the state's agricultural sector. Given that approximately 71% of Himachal Pradesh's 7.80 million residents rely on agriculture (Shah & Vijayshankar, 2021) for income and employment, they are disproportionately affected by climate-induced variations within the sector. Studies have shown that even a small increase in temperature during the Rabi season can greatly lower crop yields. Wheat production can drop by as much as 10% with a 1°C rise in maximum temperature and by 6% with the same increase in minimum temperature (Singh & Sharma, 2018).

These climate challenges have significant effects on the state and its people. Sharp fluctuations in temperature and humidity negatively influence land use patterns tied to agriculture and animal husbandry. Since crop and livestock management are highly dependent on weather conditions, extreme variations—

particularly in the heat-prone districts of Solan, Una, and Bilaspur—could lead to reduced agricultural and livestock productivity. This decline would likely affect the per capita income of the state's residents. Additionally, increased out-of-pocket spending on climate-induced health issues may emerge as a significant challenge. In turn, this would reduce the available labour hours necessary for ensuring food security and proper nutrition. Consequently, such a chain of impacts could severely strain the livelihoods and well-being of people in the affected areas (Ministry of Health and Family Welfare, Government of Himachal Pradesh, 2022).

Proactive Measures in Himachal Pradesh's Climate Policy

Himachal Pradesh was among the earliest states in India to formulate its own Climate Change Policy in 2008, even before the central government issued guidelines for State Action Plans on Climate Change in 2009. This policy largely emphasized creating a pathway to secure carbon credit benefits through the Clean Development Mechanism (CDM). Significantly, Himachal Pradesh became the first state in the country to sell carbon credits from community lands under the UNFCCC's CDM framework. It also emerged as one of the pioneers in adopting a carbon-neutral state policy (Department of Environment, Science and Technology, Government of Himachal Pradesh, 2015). The state's forward-looking approach is further reflected in its proposed 'State Action Plan on Climate Change and Human Health (SAPCCHH)', which envisions a comprehensive strategy to tackle health challenges linked to climate change. The plan aims to safeguard public health—particularly that of vulnerable groups such as children, women, and marginalized communities—against climate-sensitive illnesses. Its broader goals include reducing morbidity, mortality, injuries, and overall health risks caused by climate variability and extreme weather events, while also enhancing the resilience and capacity of healthcare services to address these emerging threats.

Paris Agreement

The Paris Agreement, which was signed on the Paris Agreement on 12 December 2015, is an important milestone in the global effort to fight climate change. Signed under the United Nations Framework Convention on Climate Change (UNFCCC), the agreement committed to keeping the rise in global average temperature well below 2 °C above pre-industrial levels, while striving to limit

it to 1.5 °C, recognizing that this would greatly reduce the risks and impacts of climate change (UNFCCC, 2016). Prior to the Paris Agreement, the Kyoto Protocol was the primary international climate treaty, establishing binding emission reduction targets for developed industrialized countries and the European Union. Adopted in 1997, it reinforced the principle of “common but differentiated responsibilities” obligating developed nations to cut greenhouse gas (GHG) emissions, while transitional and developing economies were not bound by treaty commitments. Under the Protocol, industrialized countries collectively pledged to reduce GHG emissions by an average of five percent between 2009 and 2012 compared to 1990 levels. The agreement emphasized domestic emission reductions but also offered flexibility through market-based mechanisms, including carbon trading and joint implementation projects, to help countries meet their targets (Safari, 2024).

Nationally Determined Contributions (NDCs) are central to the Paris Agreement, which was adopted at COP21 in 2015. The Agreement commits countries to limit global warming to well below 2 °C above pre-industrial levels and to actively pursue efforts to restrict the temperature rise to 1.5 °C. It is legally binding and operates on a five-year cycle, requiring countries to submit progressively more ambitious climate action plans. This iterative process is known as the “ratchet mechanism”, where nations gradually strengthen their commitments over time to achieve the long-term goal of net-zero emissions by 2050. Each NDC outlines a country’s specific commitments to reduce greenhouse gas (GHG) emissions, including concrete targets, adaptation measures, implementation strategies, and timelines for achieving these goals. They are tailored to the unique circumstances, capabilities, and priorities of each nation, reflecting the principle that climate action must account for differences in national contexts while contributing to the global effort to combat climate change (World Economic Forum, 2015).

India has committed to reducing its GDP’s emissions intensity by 33–35% by 2030 compared to 2005 levels under the terms of the Paris Climate Agreement. As per its INDC, by 2030, 40% of installed electricity capacity must come from non-fossil fuel-based energy sources. Further, India aims to establish an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through forest and tree cover by 2030. Adaptation forms an integral part of India’s INDC, to be addressed by enhancing investments in development programs

for sectors most vulnerable to climate change, including agriculture, water resources, Himalayan and coastal regions, health, and disaster management. Acknowledging existing resource gaps, India plans to mobilize extra funding from domestic and developed country sources to implement mitigation and adaptation measures. It also intends to strengthen capacities, develop a domestic framework, and leverage international mechanisms for rapid dissemination of climate technologies, along with establishing joint collaborative research and development facilities for future technologies (Gupta & Gupta, 2016).

Himachal Pradesh's Climate Policy

The Government of India has introduced several initiatives to tackle the impacts of climate change, including the National Action Plan on Climate Change (NAPCC), the National Adaptation Fund on Climate Change (NAFCC), the Climate Change Action Programme (CCAP), and the State Action Plan on Climate Change (SAPCC), all aimed at addressing climate concerns at the national level. One of the NAPCC's most creative initiatives to address ecological issues in the Himalayas is the National Mission for Sustaining the Himalayan Ecosystem (NMSHE). The government has also started a number of initiatives aimed at ensuring the sustainability of the Himalayan ecosystem, including the National Mission on Himalayan Studies (NMHS), the Indian Himalayas Climate Adaptation Programme (IHCAP), the Climate Change Adaptation Project (CCAP), the Hill Area Development Programme (HADP), and Governance for Sustaining Himalayan Ecosystem (G-SHE). When taken as a whole, these programs support climate change adaptation and mitigation strategies (Kaur, Kaur, Tiwana & Gupta, 2022)

In addition to the above-mentioned Centre's policies, schemes and initiatives, the state government of Himachal Pradesh has also launched some important projects such as Himachal Pradesh State Action Plan on Climate Change (HP-SAPCC) and the Climate Resilient Sustainable Agriculture Project (CRSAP), as well as key initiatives such as Carbon Neutral Policy. These projects aim to tackle climate challenges, especially in agriculture. Himachal Pradesh takes a proactive approach to climate change by focusing on sustainable development. This includes initiatives that promote renewable energy, afforestation, sustainable agriculture, waste management (Jasrotia, Maheshwari, Ngelambong, & Singh, 2025), and water conservation measures.

While Himachal Pradesh has various departmental policies covering industries, mining, forests, tourism, and power, it currently does not have a separate Environmental Policy. However, the state has developed environmental policy guidelines to encourage sustainable practices. Although these policies provide safeguards and regulations for ecological issues, gaps remain that need addressing to promote sustainable development effectively. Himachal Pradesh emphasizes the need for humane, ecologically friendly, and sustainable development. The state has set ambitious targets to become a 'Green State' by 2025, aiming to meet 100 percent of its energy needs through renewable sources. Projects like adding 150 megawatts of solar capacity aim to significantly reduce greenhouse gas emissions and strengthen the state's commitment to environmental sustainability - India: World Bank Approves \$200 Million to Increase Renewable Energy Penetration in Himachal Pradesh, 2023 (Singh & Kumari, 2024).

Furthermore, Himachal Pradesh's vast potential for hydroelectricity underscores its capacity to generate surpluses for sale, thereby reducing reliance on traditional fuelwood sources and alleviating pressure on forest resources. Leveraging non-conventional sources and technologies, such as solar passive housing, further underscores the state's proactive approach towards achieving sustainability.

Solar Energy Program

The establishment of the Himachal Pradesh Solar Energy Program is a crucial element of the state's strategic energy plans aimed at harnessing the immense potential of solar energy. As part of a broader objective, this program underscores the state's dedication to sustainable growth and the transition towards renewable energy sources. In alignment with India's aim of achieving 100 GW of solar power (Hairat & Ghosh, 2017), the program contributes to the national goal. The state's efforts also emphasize the vital role of regional contributions in fulfilling India's pledge to increase its renewable energy capacity and mitigate the effects of climate change globally. The State Government has successfully completed the process of setting up ten demonstration Municipal Solid Waste management facilities as pilot projects under the National Mission for Himalayan Studies scheme, with a budget of 4.48 crores sanctioned by the Ministry of Environment (Singh et al., 2023), Forest and Climate Change,

Government of India.

National Adaptation Fund for Climate Change (NAFCC)

The state government has undertaken a project in the drought-prone areas of three developmental blocks in the Sirmaur district, investing 20.00 crore under the National Adaptation Fund for Climate Change (NAFCC) (Prasad & Sud, 2019). The primary objectives of this program were to reduce the vulnerability of rural small and marginal farmers, including women, to climate-related issues and enhance their adaptive capacity. Moreover, the program aimed to improve food security and provide better livelihood options to increase resilience. The state has also effectively completed a training program for 30,880 farmers on climate change adaptation in drought-prone areas of the Sirmaur district (Rani, 2023). The project's achievements were showcased at the 27th Conference of the Parties (COP-27) of the United Nations Framework Convention on Climate Change (UNFCCC) held in Egypt from November 6, 2022, to November 18, 2022 (Muigua, 2023).

In addition, the Department of Environment, Science, and Technology, Himachal Pradesh, has established a State Knowledge Cell on Climate Change (KCCC) under the National Mission for Sustaining Himalayan Ecosystems (NMSHE) with a funding of 1.12 crore from the Government of India. The KCCC aims to create a comprehensive database of geological, hydrological, ecological, social, cultural, and traditional ecosystem preservation and conservation information. This database will enable monitoring and analyzing data to develop a knowledge base for climate change policies. The KCCC has prepared Climate Change Vulnerability Assessment and Adaptation Plans for Kinnaur and Lahaul-Spiti districts, and plans for Shimla, Kullu, and Mandi are in progress (Anjanappa, 2024).

Plastic Waste Management

The state government of Himachal Pradesh prohibited the use and disposal of plastic items through the Himachal Pradesh Non-Biodegradable Garbage (Control) Act, 1995 (Dadwal & Singh, 2023). During the fiscal year 2022-23, a total of 1,224 violators were fined 13.50 lakh. (Government of India Ministry of Environment, 2023). The Act bans polythene bags, plastic cutlery, and single-use plastic spoons, stirring sticks, forks, knives, and straws in the state (Siddiqui

& Pandey, 2013). In the same year, 42.17 lakh was paid to households and registered rag pickers for purchasing 29,965 kg of specified plastic waste at 75 per kg under the Buy-back Policy for non-recyclable plastic waste (Briassoulis, Pikasi, & Hiskakis, 2019). The state government has also established Special Task Forces at the state level under the Chief Secretary to take measures in mission mode to eliminate single-use plastic (Singh & Biswas, 2023).

Figure 12

Fund Release for Implementation of Projects in HP State Under National Adaptation Fund on Climate Change (Mishra et al., 2019)

YEAR	FUNDS	RELEASED TO
2015-2016	100.000.000 ₹	NABARD
2018-2019	50.000.000 ₹	NABARD
2019-2020	46.907.812 ₹	NABARD

Conclusion

The formulation of Himachal Pradesh's SAPCC represents an important advancement in the state's climate strategy, reflecting a deep understanding of both the environmental and socio-economic dimensions of climate change. The plan's shift toward decentralized governance, diversification of renewable energy, and community-led adaptation highlights a forward-looking and inclusive approach to building climate resilience. Grounded in relevant social science principles such as climate adaptation, sustainability, and participatory governance, the SAPCC exemplifies how state-level climate policies can promote sustainable development and social equity.

Furthermore, SCCCs (State Climate Change Cells) (Kumar & Mohanasundari, 2025) have been established in 13 states to promote climate change adaptation and mitigation efforts, including Madhya Pradesh, Punjab, Chhattisgarh, Karnataka, Kerala. While Himachal Pradesh may not have an Environmental Policy of its own, these steps taken by the state government demonstrate their commitment to aligning with the targets set in the Paris Agreement. However, to ensure effective implementation and long-term success, the state government must continue to monitor and evaluate the policy's outcomes while considering

the socio-economic factors of the region (Sharma et al., 2025).

However, addressing the remaining challenges—particularly financing, gender inclusivity, and effective implementation at the local level—will be crucial for realizing the plan's full potential. By focusing on these areas, Himachal Pradesh has the golden opportunity to serve as a model for climate resilience and social adaptation not only for India's mountainous regions but also beyond.

References

- Anjanappa, J. (2024). *Strengthening India's adaptation finance: Introducing the national adaptation finance framework*. SSRN.
- Baloch, M. R. (2025). Community participation with special reference to joint forest management. In *Textbook of forest science* (pp. 287–314). Springer.
- Bhutiyan, M. R., Kale, V. S., & Pawar, N. J. (2010). Climate change and the Himachal Himalayas: A case study of Bharmour region. *Current Science*, 98(1), 73–78.
- Briassoulis, D., Pikasi, A., & Hiskakis, M. (2019). End-of-waste life: Inventory of alternative end-of-use recirculation routes of bio-based plastics in the European Union context. *Critical Reviews in Environmental Science and Technology*, 49(20), 1835–1892.
- Chaudhry, D., Mukhopadhyay, I., & Guin, P. (2025). A mixed-method evaluation of climate change-health action plans and health expenditures for four Indian states. *Mitigation and Adaptation Strategies for Global Change*, 30(1), 1–28.
- Dadwal, L., & Singh, M. (2023). Legal control and mechanism for waste management in India generally and Himachal Pradesh particularly. *Indian Journal of Legal Research*, 5(1), 1.
- Department of Environment, Science and Technology, Government of Himachal Pradesh. (2012). *State strategy & action plan on climate change: Himachal Pradesh*. https://dest.hp.gov.in/sites/default/files/PDF/HPSCCAP_A1b.pdf

- Department of Environment, Science and Technology, Government of Himachal Pradesh. (2015). *Green growth and climate change mitigation in Himachal Pradesh*. <https://www.teriin.org/projects/green/pdf/HP-Mitigation.pdf>
- Economic & Statistics Department, Government of Himachal Pradesh. (1970). *Eco-Survey 2022–23*.
- Government of Himachal Pradesh, Department of Environment, Science & Technology. (2021). *Climate change*.
- Government of India, Ministry of Environment, Forest and Climate Change. (2023, July 24). *Funds for climate change*.
- Government of India, Ministry of Environment, Forest and Climate Change. (2024). *We 4 climate*.
- Gupta, H., & Gupta, R. K. (2016). The Paris Agreement: Indian perspectives and pledges. *Research Journal of Social Sciences*, 24, 109–128.
- Hairat, M. K., & Ghosh, S. (2017). 100 GW solar power in India by 2022 – A critical review. *Renewable and Sustainable Energy Reviews*, 73, 1041–1050.
- Himachal Pradesh State Council for Science, Technology, and Environment (HIMCOSTE). (2013). *Himachal Pradesh State Action Plan on Climate Change* (HP-SAPCC) [Government report].
- Jasrotia, A., Maheshwari, A., Ngelambong, A., & Singh, P. (2025). Implementing sustainable waste disposal solutions in rural touristic regions: A case study of Spiti Valley, Himachal Pradesh. In *Solid waste management and disposal practices in rural tourism* (pp. 383–394). IGI Global.
- Kaur, S., Kaur, D., Tiwana, A. S., & Gupta, S. (2022). Climate change-related governance and policies in Indian Himalayas. In *Climate change: Impacts, responses and sustainability in the Indian Himalaya* (pp. 309–330). Springer.
- Kaushik, S., Dharpure, J. K., Joshi, P. K., Ramanathan, A. L., & Singh, T. (2020). Climate change drives glacier retreat in Bhaga Basin located in Himachal Pradesh, India. *Geocarto International*, 35(11), 1179–1198.

- Kumar, A., & Mohanasundari, T. (2025). Assessment of livelihood vulnerability to climate change among tribal communities in Chhindwara and Dhar District, Central India. *Scientific Reports*, 15(1), 8843.
- Kumar, M. (2023). Forestry policies and practices to promote climate change adaptation in the Indian Western Himalayan states. In *Climate change adaptation, risk management and sustainable practices in the Himalaya* (pp. 65–87). Springer.
- Kumar, P., Deka, D., Husain, M. A., Kumar, M., Choudhari, P., Singh, S., Kamil, A., & Banerjee, A. (2025). Trend analysis of precipitation and temperature in Lahaul-Spiti district, Himachal Pradesh, India. *Frontiers in Climate*, 6, 1348132.
- Kumar, P., Sharma, P. K., Kumar, P., Sharma, M., & Butail, N. P. (2021). Agricultural sustainability in Indian Himalayan region: Constraints and potentials. *Indian Journal of Ecology*, 48(3), 649–661.
- Kumar, S. (2023). Rural Himachal Pradesh: A strategic approach for solving socioeconomic challenges. In *Sustainable rural tourism in Himalayan foothills: Environmental, social and economic challenges: A study of Himachal Pradesh* (pp. 79–100). Springer.
- Kumari, N., Thakur, K., Kumar, R., Kumar, S., Mahajan, D., Brar, B., Sharma, D., & Sharma, A. K. (2023). Freshwater lakes in the Western Himalayan region: An analysis of the present situation. *Water–Energy Nexus*, 6, 18–31.
- Lohan, N., Kumar, S., Singh, V., Gupta, R. P., & Tiwari, G. (2025). Analyzing an extreme rainfall event in Himachal Pradesh, India, to contribute to sustainable development. *Sustainability*, 17(5), 2115.
- Ministry of Environment, Forest and Climate Change, Government of India. (2015). *India's intended nationally determined contributions: Working towards climate justice*. Ministry of Environment, Forest and Climate Change, Government of India. (2019). *State action plan on climate change (SAPCC): Himachal Pradesh*.
- Ministry of Health and Family Welfare, Government of Himachal Pradesh. (2022). *State action plan on climate change and human health, 2022–*

2027. https://ncdc.mohfw.gov.in/wp-content/uploads/2025/01/10_SAPCCHH_Himanchal-Pradesh_21-10-24.pdf

- Mishra, A., Appadurai, A. N., Choudhury, D., Regmi, B. R., Kelkar, U., Alam, M., Chaudhary, P., Mu, S. S., Ahmed, A. U., Lotia, H., Fu. C., Namgyel, T., & Sharma, U. (2019). Adaptation to climate change in the Hindu Kush Himalaya: Stronger action urgently needed. In *Hindu Kush Himalaya Assessment* (pp. 457–490). Springer.
- Muigua, K. (2023). COP 27 and biodiversity: Towards an integrated approach to climate change mitigation and biodiversity conservation.
- National Institute of Disaster Management (NIDM). (2018). *Climate change adaptation strategies: Case studies from Himachal Pradesh*.
- NITI Aayog. (2017). *Appraisal document of Twelfth Five Year Plan 2012–2017*. Government of India.
- Panwar, T. S., & Bhardwaj, S. (2018). Climate change impact on forests in Himachal Pradesh: A case study of Indora Forest Division. *Indian Forester*, 144(10), 930–937.
- Parmar, K. S., & Sharma, V. (2016). Climate change and its impact on agriculture in Himachal Pradesh. *International Journal of Agricultural Science and Research*, 6(2), 229–235.
- Planning Commission, Government of Himachal Pradesh. (2018). *Himachal Pradesh state action plan on climate change*.
- Planning Commission, Government of Himachal Pradesh. (2019). *Economic survey of Himachal Pradesh* [Government report].
- Prasad, R. S., & Sud, R. (2019). Implementing climate change adaptation: Lessons from India's National Adaptation Fund on Climate Change (NAFCC). *Climate Policy*, 19(3), 354–366.
- Rani, S. (2023). Initiatives on climate change mitigation. In *Climate, land-use change and hydrology of the Beas River Basin, Western Himalayas* (pp. 177–202). Springer.
- Rathore, L. S., Attri, S. D., & Jaswal, A. (2013). *State level climate change trends in India* [Meteorological Monograph, Technical Report]. India

Meteorological Department.

- Rawal, S., Antany, R., Kumar, S., Pottakkal, J. G., & Linda, A. (2025). The perils of open landfill: A study on environmental risk assessment in Dharamshala, Himachal Pradesh, India. *Environmental Monitoring and Assessment*, 197(2), 177.
- Safari, J. (2024, March 13). *The 2015 Paris Agreement on climate change: Towards a better world?* World Mediation Organization. <http://worldmediation.org/the-2015-paris-agreement-on-climate-change-towards-a-better-world-better-world/>
- Shah, M., & Vijayshankar, P. S. (2021). *Indian agriculture towards 2030*. Food and Agriculture Organization.
- Sharma, K., Devi, N., Raj, D., Sood, S., Sethi, D., & Chauhan, M. (2025). Socio-economic status and constraints faced by farmers practicing natural farming in Himachal Pradesh, India. *Plant Archives*, 25(1), 628–636.
- Siddiqui, J., & Pandey, G. (2013). A review of plastic waste management strategies. *International Research Journal of Environmental Science*, 2(12), 84–88.
- Singh, A. K., & Sharma, P. (2018). Measuring the productivity of food-grain crops in different climate change scenarios in India: Evidence from time series investigation. *Climate Change*, 4(16), 661–673.
- Singh, K., Meena, R. S., Kumar, S., Dhyani, S., Sheoran, S., Singh, H. M., Pathak, V. V., Khalid, Z., Singh, A., & Chopra, K. (2023). India's renewable energy research and policies to phase down coal: Success after Paris Agreement and possibilities post-Glasgow Climate Pact. *Biomass and Bioenergy*, 177, 106944.
- Singh, S., & Biswas, M. K. (2023). Management strategies for single-use plastics: Lessons to learn from Indian approach of minimizing microplastic waste. *Environmental Science Advances*, 2(12), 1680–1695.
- Singh, S., & Kumari, P. (2024). An overview of the potential for renewable energy in Himachal Pradesh. *IOSR Journal of Humanities and Social Science*. 69-76.

- TERI (The Energy and Resources Institute). (2016). *Mapping of climate initiatives in Himachal Pradesh* [Research report].
- Thakur, S. K. (2023). *Growth of tourism in Himachal Pradesh: A study of district Shimla in Himachal Pradesh*. Academia.edu.
- UNFCCC. (2015). *Paris Agreement*.
- Ungupta, S., Sharma, J., Jayaraman, M., Kumar, V., & Ravindranath, N. H. (2015). Climate change impact and vulnerability assessment of forests in the Indian Western Himalayan region: A case study of Himachal Pradesh, India. *Climate Risk Management*, 10, 63–76.
- World Bank. (2016). *India – Himachal Pradesh development policy loan for climate resilient forest management* [Project document].
- World Bank. (2018). *Himachal Pradesh – climate and development knowledge network*.
- World Bank. (2023, July 3). India: World Bank approves \$200 million to increase renewable energy penetration in Himachal Pradesh.
- World Economic Forum. (2015). Paris Agreement: What are NDCs and why do they matter?
- Yousuf, B., Shukla, A., Garg, S., & Bangroo, S. A. (2025). Cryokarst-induced dynamics of the Gangotri Glacier, Central Himalaya. *Geomorphology*.