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A Comparative Study of Climate Change Policies in Disaster-Prone Indian States

Asif Ali,

Research scholar,
Department of Political Science,
Meerut College, Meerut, India

Abstract : This study systematically compares climate policy design and implementation across eight disaster-prone Indian states—Himachal Pradesh, Uttarakhand, Kerala, Odisha, Bihar, Assam, Gujarat, and Maharashtra—assessing adaptation, mitigation, governance, finance, and participation as articulated in State Action Plans on Climate Change (SAPCCs) and corroborated with national dashboards and public documents. Primary analysis draws on SAPCCs and state plans, with cross-validation via the India Climate & Energy Dashboard (ICED), MNRE physical progress, and MOSPI energy statistics to align targets with current capacity trajectories and implementation records where available. Findings indicate substantial inter-state divergence driven by hazard exposure, administrative capacity, fiscal space, and local governance, with Gujarat and Kerala exhibiting comparatively stronger institutional coherence and community-oriented delivery while Bihar and Assam face capacity and financing constraints that impede scalable action. The paper recommends standardized indicators, blended finance and budget tagging, professionalized monitoring-evaluation, and community-led mechanisms to strengthen resilience and align subnational action with national decarbonization and adaptation goals.

INTRODUCTION

Climate risks in India manifest through altered precipitation, extreme heat, accelerated cryosphere change, coastal hazards, and compounding disasters, placing stress on ecosystems and development outcomes across heterogeneous geographies and social contexts. India's national commitments combine mitigation and resilience under international agreements and domestic strategies that cascade to states via SAPCCs, where policy is localized through sectoral plans, disaster management systems, and administrative capacity constraints within a complex federal architecture. The distribution of impacts across Himalayan, coastal, and riverine regions necessitates differentiated policy mixes and institutional responses, making subnational comparative analysis essential for learning and policy transferability.

Methodology

This research employs a qualitative comparative design integrating disaster risk management concepts to evaluate how eight states structure and deliver climate policy, using a structured coding scheme for policy instruments, institutional architecture, financing, participation, and monitoring-evaluation to ensure cross-case comparability and transparency in judgments. The approach emphasizes operational definitions, explicit selection criteria, and triangulation across documentary and statistical sources to reduce bias and strengthen validity of inferences across diverse administrative and hazard contexts.

Research Design and Scope

A multi-stage comparative framework supports both cross-case synthesis and in-depth state review, focusing on adaptation-versus-mitigation balance, disaster risk reduction integration, alignment with national commitments, and the robustness of delivery and monitoring systems as stated in SAPCCs and allied plans. The scope encompasses policy instruments, institutional coordination, climate financing mechanisms, community and civil society roles, and evidence of monitoring and learning processes, with explicit attention to data limitations and update cycles across states.

Selection of States

Eight states—Himachal Pradesh, Uttarakhand, Kerala, Odisha, Bihar, Assam, Gujarat, and Maharashtra—were purposively selected to capture high multi-hazard exposure profiles, geographic and socio-economic diversity, and variation in administrative capacity and renewable energy trajectories to enable contrastive inference and cross-learning. This selection permits operational comparisons across mountain, coastal, riverine, and urban-industrial contexts with distinct adaptation and mitigation imperatives.

Data Sources

Core sources include SAPCCs and state plans, complemented by national portals—ICED, MNRE progress pages, and MOSPI energy statistics—for validation of capacity and trajectory claims, alongside independent institutional reviews for contextual interpretation and policy backgrounding. Sectoral newsletters and bulletins (for example, KSEB communications) are used where consolidated, peer-reviewed subnational datasets are not uniformly available, with limitations documented where applicable.

Analytical Framework

Five pillars structure the assessment: policy design and instrument mix; renewable deployment and mitigation intensity; institutional governance and coordination; financing architecture and tracking; and participation, equity, and monitoring-evaluation, with explicit coding to ensure consistent interpretation across states. Comparative judgments avoid impressionistic rankings by tying “leadership” to these operational dimensions and corresponding public evidence rather than to generalized assertions.

HRVCA Integration

A Hazard, Risk, Vulnerability and Capacity Assessment (HRVCA) lens aligns hazard exposure mapping, socio-economic vulnerability profiling, and institutional capacity diagnostics with NDMA-aligned practice embedded in disaster management and state planning documents to contextualize policy choices and delivery challenges. This provides a common frame for interpreting risk-tailored adaptation measures such as early warning, resilient infrastructure, and localized preparedness strategies in diverse geographies.

Triangulation and Validation

Document analysis is cross-checked against national dashboards and statistical compendia to corroborate capacity trends and policy targets, and synthesized qualitatively to identify recurring implementation motifs, governance bottlenecks, and promising practices across states. Where state-level figures are not standardized or contemporaneously updated, the analysis records data constraints and employs triangulated proxies rather than speculative precision to retain integrity and transparency.

Limitations

Public availability, update recency, and comparability of SAPCCs and state data vary, limiting like-for-like quantification and requiring careful triangulation with national dashboards and selected sectoral communications while acknowledging residual uncertainty for some measures and timelines. The study does not conduct new fieldwork, and therefore emphasizes transparent sourcing, clearly bounded claims, and the need for standardized open-data protocols in future work.

State-Wise Comprehensive Analysis

The following profiles synthesize exposure, policy orientation, delivery capacity, and implementation signals, using representative public documents and dashboards for cross-reference where direct state data are unevenly published or updated.

Himachal Pradesh

Himachal Pradesh’s strategy prioritizes high-altitude risk contexts by combining hydropower-led mitigation with watershed restoration, slope stabilization, and early warning for landslides and glacial lake outburst risks under a unified disaster–environment governance scaffold. While hydropower dominance supports low-carbon electricity and fiscal revenues, climate-sensitive hydrology necessitates diversification into distributed solar and hybrid systems, along with enhanced cryosphere monitoring and climate-informed land-use planning to manage cascading risks. Recent programmatic thrusts on rooftop solar and agricultural energy access point to a gradual broadening of the energy mix that can be accelerated through targeted grid and storage facilitation and improved community participation in risk governance.

Uttarakhand

Uttarakhand aligns its climate response with Himalayan hazard realities, emphasizing early warning dissemination, decentralized energy for remote settlements, and infrastructure resilience tailored to steep terrain and dispersed habitation patterns. Institutional developments—such as environmental climate cells working with the SDMA—have improved policy coherence but face inter-agency coordination gaps and data limitations that slow solar uptake and risk analytics, underscoring the need for shared platforms and GIS-enabled planning. Advancing microgrids, participatory hazard mapping, and integrated DRR–CCA programming can close delivery gaps and embed locally salient adaptation practices.

Kerala

Kerala blends adaptation and mitigation through coastal protection, flood management, distributed solar (e.g., SOURA), and strong local government participation that enables consistent community engagement and service integration across sectors. The state’s social institutions and self-help group networks (e.g., Kudumbashree) enhance last-mile delivery for climate-resilient agriculture and preparedness while enabling inclusion and accountability in program cycles. Physical constraints on large solar parks and urban pressures on water and drainage systems elevate the importance of demand-side management, green infrastructure for flood mitigation, and continuous capacity building for local institutions.

Odisha

Odisha’s repeated cyclone exposure catalyzed investments in shelters, embankments, and early warning that have measurably reduced mortality while enabling faster recovery, reflecting a mature DRR–CCA nexus in policy and practice. Clean energy promotion via recent policies and coastal ecosystem restoration aims to balance mitigation with resilience, though cross-sector coordination still requires strengthening to mainstream nature-based solutions at scale. Priority next steps include decentralized solar for remote coastal hamlets, floodplain zoning enforcement, and mangrove and wetland bio-shields to stabilize coastlines and attenuate surge impacts.

Bihar

Bihar’s policy emphasis is adaptation-first due to recurrent floods and drought variability, with flood-resilient cropping, agricultural risk reduction, and decentralized solar irrigation framed as practical entry points in an agrarian economy. Low installed renewable capacity, fragmented governance, and constrained fiscal space limit pace and coverage, indicating a need for capacity consolidation,

improved finance access, and participatory planning for locally relevant solutions. Scaling biomass and solar hybrids, strengthening preparedness, and broadening civil society engagement can create a more enabling environment for both resilience and equitable energy access.

Assam

Assam faces recurrent flooding, riverbank erosion, and biodiversity pressures that demand climate-sensitive land and water management, localized livelihood diversification, and better hazard data systems. Emerging efforts in climate-resilient agriculture and solar irrigation at grassroots levels point to promising models, but institutional technical capacity, finance constraints, and data gaps still hinder scale and precision in interventions. Near-term priorities include renewable microgrids for flood-prone areas, improved hydromet systems, and deeper participatory governance with local communities and civil society.

Gujarat

Gujarat's mitigation thrust features large-scale wind and solar deployment enabled by facilitative planning, transmission expansion, and public-private partnerships coordinated through specialized agencies, complemented by rooftop programs and industrial efficiency. Coastal risks and industrial growth pressures require parallel adaptation investments, environmental safeguards, and just transition planning to ensure equitable benefits and risk management across rural and urban constituencies. Continued emphasis on enabling infrastructure, land facilitation, and storage can support sustained decarbonization while integrating coastal resilience into the state's development strategy.

Maharashtra

Maharashtra integrates urban resilience—with heat, flooding, and water stress concerns—alongside renewable growth in solar and wind, reflecting a balanced mitigation-adaptation orientation for a diverse economy. Governance is anchored in environmental and disaster management entities with dedicated climate finance initiatives, though coordinating rural and urban priorities and expediting fund deployment remain recurring challenges. Nature-based solutions for urban hydrology, innovative green finance, and integrated planning across transport, buildings, and industry can elevate both resilience and emissions outcomes.

Cross-State Synthesis and Discussion

Governance and coordination are strongest where climate cells, cross-departmental committees, and embedded monitoring protocols are institutionalized, producing clearer mandates, better continuity, and more credible reporting cycles in line with SAPCC stipulations and update requirements. Financing depth—through budget allocations, centrally sponsored schemes, climate budget tagging pilots, concessional sources, and PPPs—correlates with programmatic durability and scale, although transparent climate expenditure tracking remains uneven and a priority for reform. Renewable energy trajectories are more robust where enabling policies, land facilitation, and grid and storage infrastructure are actively developed, aligning with national dashboards that record continued acceleration in solar and wind capacity additions that states must reflect in plan updates to retain credibility and feasibility.

Comparative Summary Table

State	Primary hazards and focus	Institutional features	Notable strengths	Key constraints
Himachal Pradesh	Landslides, GLOFs; diversify beyond hydro	Environment-SDMA coordination	Hydropower base, watershed work	Hydro-climate sensitivity, need for hybrid RE
Uttarakhand	Mountain hazards; decentralized energy and warnings	Climate cell with SDMA	Microgrids potential, GIS hazard mapping	Coordination and data gaps
Kerala	Coastal floods; distributed solar, local governance	Strong PRI and SHG roles	Community engagement, integrated services	Land constraints, urban water stress
Odisha	Cyclones; shelters, early warning, coastal ecosystems	DRR-CCA integration	Mortality reduction, resilient works	Cross-sector integration for NbS
Bihar	Floods/drought; adaptation-first	Fragmented governance	Climate-smart agriculture pilots	Finance and capacity constraints
Assam	Floods/erosion; data-driven planning	Environment-SDMA with NGOs	Grassroots solar irrigation models	Technical capacity and data gaps
Gujarat	Arid-coastal; high RE, PPPs	Specialized energy agencies	Transmission facilitation, rooftop growth	Coastal risk, just transition needs
Maharashtra	Urban heat/flood; balanced agenda	Climate finance cell	Nature-based urban hydrology potential	Coordination, finance deployment pace

Central Government Initiatives and Federal Dynamics

National targets articulated under the COP26 Panchamrit—such as reaching 500 GW of non-fossil capacity by 2030 and net-zero by 2070—provide directional cues and investment signals that cascade into state-level planning and execution through sectoral missions and budgetary channels (e.g., National Solar Mission, PM-KUSUM). Federal complexity introduces overlapping functions and capacity asymmetries that can delay implementation or fragment priorities, strengthening the case for structured intergovernmental coordination bodies, standardized indicators, and transparent data-sharing to align state plans with national dashboards and fiscal flows. Empowering states with climate budget tagging, green bond pipelines, and facilitative mechanisms for PPPs and concessional finance can reduce execution gaps while respecting local priorities and constraints in a diverse federation.

Policy Implications and Recommendations

Governance and coordination: Establish empowered climate cells with cross-sector mandates, institutionalize HRVCA-informed planning, and embed MRV-linked update cycles to ensure adaptive management and public accountability in SAPCCs.

Finance and risk transfer: Scale climate budget tagging, develop green financing pipelines and viability gap funding for grid, storage, and resilience infrastructure, and expand risk transfer through multi-hazard insurance for agriculture, property, and livelihoods with equity safeguards.

Sectoral acceleration: Advance early warning modernization, multi-hazard shelters, and nature-based solutions such as mangroves and wetlands for coastal and urban hydrology, while integrating demand-side management and distributed renewables to improve reliability and inclusion.

Community-centered delivery: Formalize roles for Panchayati Raj institutions, SHGs, and civil society in planning, preparedness, and monitoring to enhance uptake, equity, and social accountability at the last mile.

Data and evaluation: Align state indicators with ICED/MNRE baselines, publish annual progress updates, and commission periodic third-party evaluations to enable credible inter-state comparison and course correction over policy cycles.

Conclusion

Subnational climate policy in India demonstrates pronounced variation shaped by hazard profiles, administrative capacity, and policy design choices, with stronger performance where coherent institutions, diversified finance, and participatory delivery reinforce one another across cycles of planning, implementation, and evaluation. Aligning SAPCC updates with national evidence, professionalizing monitoring, standardizing indicators, and scaling inclusive finance can close execution gaps and accelerate resilient, low-carbon development trajectories across diverse state contexts.

References

- Government of Gujarat. State Action Plan on Climate Change (latest public version).
- Government of NCT of Delhi. Delhi State Action Plan on Climate Change (public version).
- Government of Uttar Pradesh. Uttar Pradesh State Action Plan on Climate Change (public version).
- India Climate & Energy Dashboard (ICED). National indicators and energy/climate data.
- Ministry of New and Renewable Energy (MNRE). Physical progress and year-wise achievements.
- MOSPI. Energy Statistics—Installed capacity and related indicators.
- Oxford Policy Management. India's State Action Plans on Climate Change—briefing note.
- KSEB communications/newsletter—Kerala renewable and resilience updates.
- Press Information Bureau (PIB). National climate/RE milestones and COP26 announcements.