



EXTREME HEAT IN INDIA

A Review of the Evolving Policy
and Practice Landscape



Authors:

Dr. Ritika Kapoor, Dr. Sri Saahitya Uppalapati, Rohan Mishra, Anshima Mishra

Suggested citation:

Ritika Kapoor, Sri Saahitya Uppalapati, Rohan Mishra, Anshima Mishra. 2026. Extreme Heat in India: A Review of the Evolving Policy and Practice Landscape. New Delhi: Natural Resources Defence Council (NRDC)

Peer reviewers:

Dr Roxy Mathew Koll, Indian Institute of Tropical Meteorology ; Aditya V. Pillai Sustainable Futures Collaboratives; Tammana Dalal, Sustainable Futures Collaboratives

Acknowledgments:

We thank Prima Madan, Dr. Vijay Limaye, Dr. Vandana C Padmanabhan, Dr. Abhiyant Tiwari, Harshit Gupta for their for their expert comments and inputs during the review process.

Organisation:

NRDC (Natural Resources Defense Council) is an international nonprofit environmental organization with more than 3 million members and online activists. Established in 1970, NRDC uses science, policy, law, and people power to confront the climate crisis, protect public health, and safeguard nature. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Bozeman, MT, Beijing and Delhi (an office of NRDC India Pvt. Ltd). Visit us at www.nrdc.org and follow us on Instagram @nrdc_org.

NRDC Chief Communications Officer:

Kristin Wilson-Palmer

NRDC Senior Policy Publications Editor:

Leah Stecher NRDC

Director of Peer Review, Science Office:

Laurie Geller

Cover image:

shutterstock

Design and layout:

Aspire Design, New Delhi

© Natural Resources Defense Council 2026

EXTREME HEAT IN INDIA

A Review of the Evolving Policy
and Practice Landscape



The International Labour Organization (ILO) projects that 5.8% of total working hours could be lost to heat stress by 2030, equivalent to approximately 34 million jobs.



Rising Extreme Heat Risks in India

The world is approaching the 1.5°C global warming threshold far more rapidly than previously anticipated, with 2024 emerging as the hottest year on record both globally and in India.¹ This accelerated warming has pushed extreme heat to the forefront of climate risk, transforming it from a seasonal concern into a persistent and systemic challenge. Globally, heatwaves cause an estimated 489,000 deaths each year between 2000 and 2019, with Asia accounting for nearly 45% of this toll, highlighting the region's high exposure and vulnerability to extreme heat.² Extreme heat is often described as an invisible disaster. Unlike floods or cyclones, it rarely leaves behind physical destruction, yet its impacts are widespread and cumulative. Across geographies, heat is increasingly shaping public health outcomes, economic productivity, infrastructure stress, and environmental stability.

Within this global context, India represents a critical geography of risk. In 2025, India's annual mean temperature was 0.28°C above the 1991–2020 average, making it the eighth warmest year on record since 1901.³ Projections indicate that heatwaves are expected to occur three to four times more frequently compared to the 1976–2005 baseline, with their durations nearly doubling by the end of the 21st century.⁴

Exposure to heat is also widespread. Around 57% of districts fall within high to very high heat risk categories,

exposing nearly 76% of the population to extreme heat conditions.(Fig.1) Large parts of western and central India—including Gujarat, Maharashtra, and adjoining regions emerge as concentrated hotspots, with a high proportion of districts in the very high-risk category. Similarly, districts across the Indo-Gangetic plains, particularly in Uttar Pradesh and Bihar, exhibit elevated risk levels, driven by a combination of high population density, rising temperatures, and underlying vulnerabilities.⁵ In contrast, relatively lower risk levels are observed across parts of the northeastern region. These spatial disparities underscore that heat risk in India is not uniform but shaped by the interaction of climatic, geographic, and socioeconomic factors across regions.

Between 1992 and 2015, more than 24,000 heat-related deaths were recorded⁶ and recent estimates indicate that more than 1,000 deaths occur annually due to heatwaves, with severe events capable of causing substantial mortality over short durations.⁷ Beyond mortality, heat stress is projected to impose substantial economic costs. The International Labour Organization (ILO) projects that 5.8% of total working hours could be lost to heat stress by 2030, equivalent to approximately 34 million jobs.⁸ India also shows the highest overlap between population and heat-related limitations, with around 100 billion lost safe hours for younger adults and over 1 trillion for older adults.⁹

India shows the highest overlap between population and heat-related limitations, with around 100 billion lost safe hours for younger adults and over 1 trillion for older adults.

57% of Indian districts, home to three-fourths of the population, now face high to very high heat risk

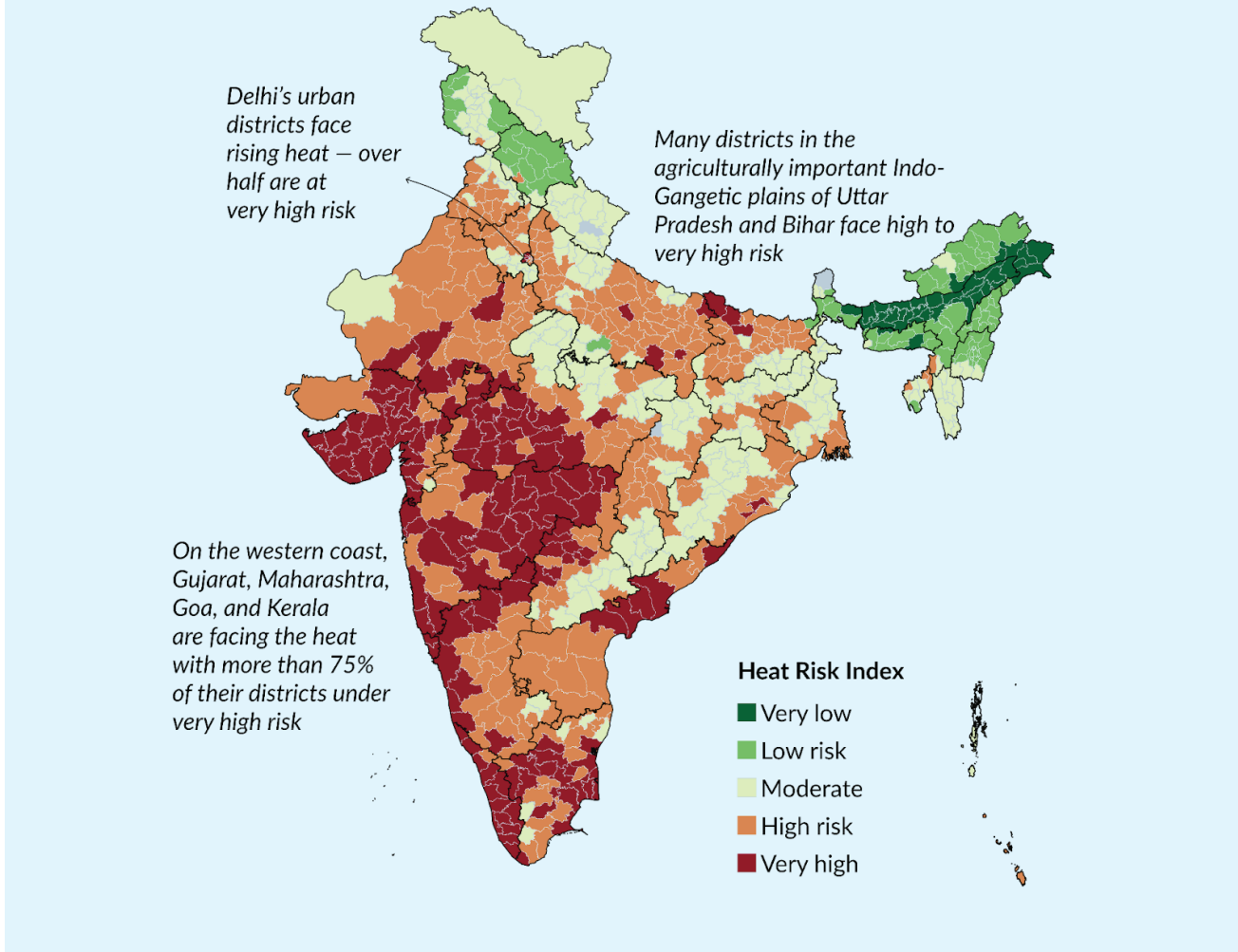


Fig. 1: District Level Heat Risk in India (Source: CEEW District Heat Risk Assessment, 2025)

Heatwave occurrence in India has traditionally been concentrated in the pre-monsoon period (March to June), with central and northwestern regions exhibiting higher frequency relative to the rest of the country. However, recent years have demonstrated a marked shift in both the intensity and spatial distribution of heat events. In 2024 alone, India recorded 536 heatwave days across meteorological subdivisions, with several regions experiencing temperatures exceeding 40°C for prolonged periods that resulted in over 44,000 reported cases of heatstroke.¹⁰ These trends indicate that extreme heat is no longer confined to specific geographies but is emerging as a nationwide public health and development challenge.

Climate projections further reinforce this trajectory. Under an intermediate scenario (RCP 4.5), India’s average temperature could increase by 2.4°C by the end of the century, accompanied by a 55% rise in warm days and a 70% rise in warm nights under RCP 8.5 scenario.¹¹ These changes are likely to exacerbate existing vulnerabilities, particularly for informal workers, urban poor populations, and climate-exposed sectors. Collectively, these trends underscore a fundamental shift: extreme heat is no longer an environmental issue alone - it is now a mainstream public health, economic, and governance challenge.

IMD Seasonal Outlook for 2026

Each year, between March and May, the India Meteorological Department (IMD) releases seasonal outlooks that provide early indications of temperature trends and heatwave likelihood, increasingly serving as

a key tool for anticipatory planning. These outlooks are updated on a monthly basis during the heat season to reflect the most accurate forecasts. The latest seasonal outlook for 2026 was updated on 31st March, 2026.

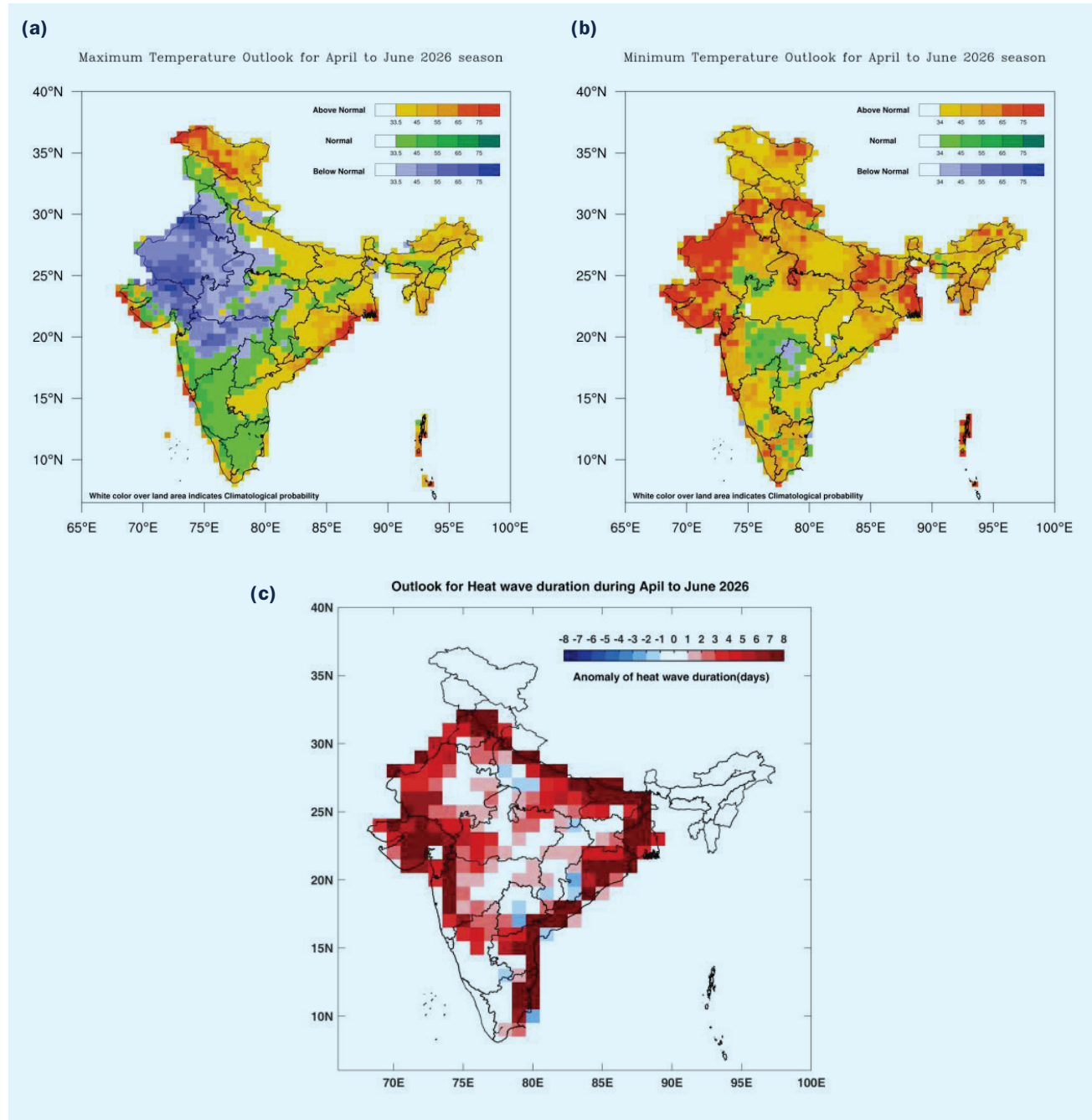


Fig 2: Probability forecast of April to June 2026 (a) Maximum Temperature, (b) Minimum Temperature (c) Anomaly of Heat Wave Duration¹²

Probability forecasts for the April-June 2026 hot weather season indicate that maximum temperatures are likely to remain normal to below normal across much of India, except in eastern, northeastern, and parts of central and adjoining peninsular regions where above-normal temperatures are expected (Fig 2a). Minimum temperatures are projected to be above normal over most

parts of the country, with some regions of Maharashtra and Telangana likely to experience normal to below-normal conditions (Fig 2b). Additionally, an above-normal number of heatwave days is expected across parts of eastern, central, and northwestern India, as well as the southeastern peninsula (Fig 2c).

Evolution of Heat Action Planning in India

India's journey toward institutionalised heat governance began with early state-level efforts, notably in Odisha in 1999 following more than 2,000 heatwave-related deaths in 1998.¹³ This was followed by a landmark shift in April 2013, when Ahmedabad became the first city in South Asia to adopt a formal Heat Action Plan (HAP) - a coordinated framework combining early warning systems, health-sector preparedness, and community outreach, developed in partnership with the Indian Institute of Public Health-Gandhinagar (IIPH-G) and the Natural Resources Defense Council (NRDC).¹⁴ A follow-up evaluation of the HAP in 2018 found the plan may have contributed to approximately 1,190 fewer deaths per year on hot days in the years following its full implementation, with mortality on the hottest days ($\geq 45^{\circ}\text{C}$) declining by around 27% relative to pre-HAP baselines.¹⁵ The Ahmedabad model diffused rapidly: both national and state governments have worked with over 100 cities and districts to develop HAPs, with more than 20 states adopting some version of a seasonal heat preparedness framework.

A March 2023 assessment by the Centre for Policy Research (CPR), the first systematic review of HAPs in India, documented substantial gaps in plan design and implementation. Reviewing 37 plans at the state (15), district (13), and city (9) levels across 18 states, the study found that most plans were insufficiently grounded in local context and relied on an oversimplified understanding of heat hazards.¹⁶ Only 2 HAPs explicitly conducted and presented vulnerability assessment, while only 11 referred to funding sources, of which 8 directed implementing departments to self-allocate resources without dedicated budget. Critically, none of the plans articulated a clear legal mandate, undermining administrative accountability and weakening incentives for implementation, particularly within resource-constrained implementation agencies.

Aspect	Traditional HAPs	Evolving HAPs
Institutionalisation	No clear legal authority; weak enforcement and accountability mechanisms	Increasing integration within State Disaster Management Authority (SDMA) frameworks and alignment with the Disaster Management Act, 2005. Maharashtra State Disaster Management Authority (MSDMA) led the rollout of localized Heat Action Plans. ¹⁷
Financing Mechanisms	No dedicated budget lines; reliance on ad hoc departmental resources	Early efforts to identify structured financing pathways through suggestive Centrally Sponsored Scheme (e.g., Varanasi, Churu HAP)
Approach to Heat Risk	Treated as a short-term, seasonal emergency	Transition toward before heat season preparedness and long-term resilience planning
Risk Assessment & Data Use	Limited use of localized data; absence of formal risk assessments	Growing inclusion of Heat Vulnerability and Risk Assessments (HVRA) for ward-level planning - Jodhpur, Thane, Varanasi, Churu and Mahesana HAP
Monitoring & Accountability	No national repository; limited mechanisms to track implementation	Continued absence of a national repository and implementation tracking, alongside a shift from health department-led plans to broader cross-departmental ownership for HAPs
Technical Thresholds	Standardized IMD thresholds with minimal regional adaptation	Continued lack of localized, health-based thresholds, despite more targeted and refined IMD forecasts
Nature of Interventions	Focus on immediate response (awareness, advisories, emergency actions)	Expansion toward structural and preventive measures (cool roofs, passive cooling, greening, shading)
Governance & Ownership	Predominantly state-led; limited role of local governments	Greater district and municipal ownership; rise of city-level HAPs (e.g., Jodhpur, Churu, Varanasi)

Table 1: Transition in Heat Action Planning in India: Comparing Traditional Frameworks with Emerging Practices

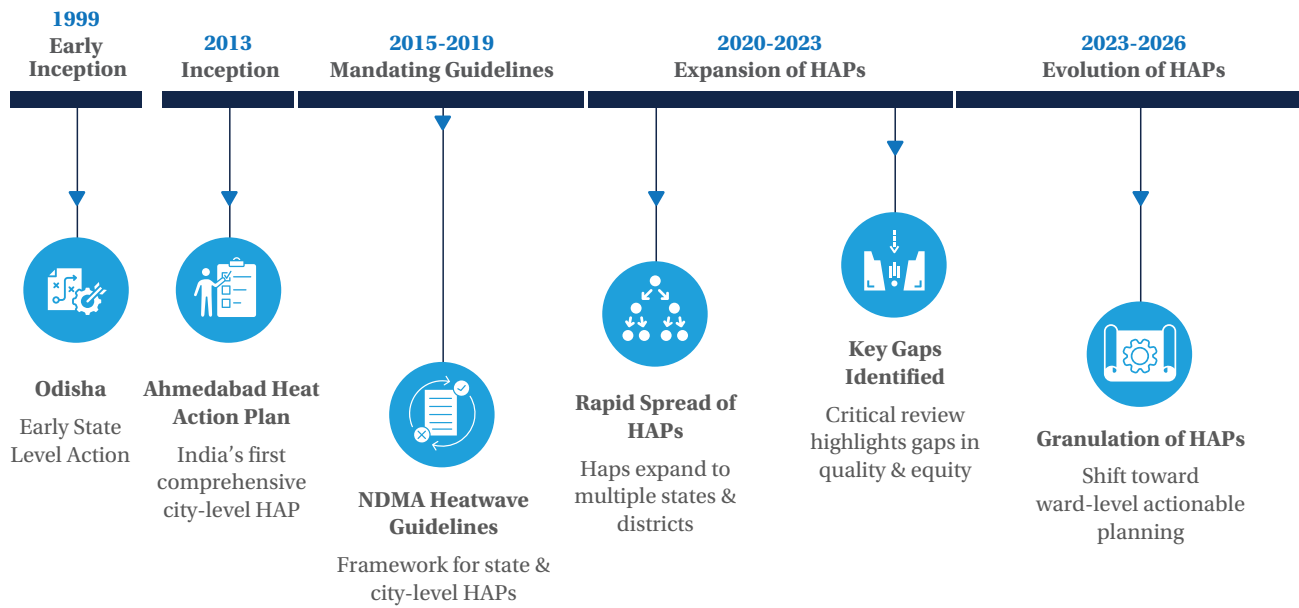


Fig. 3: Evolution of Heat Action Plans in India

Advancing Heat Action Planning in India: Emerging Components and Approaches

Over time, HAPs in India have evolved from primarily response-oriented documents to more comprehensive, risk-informed planning tools. This section outlines the key shifts and emerging components that define next-generation HAPs. The evolving scope of HAPs is reflected in the structure of recent plans, such as the Varanasi HAP (Figure 4).

Building on this evolution, present-day HAPs go beyond early warning and awareness to incorporate risk-informed planning, targeted interventions, community engagement, and institutional mechanisms.

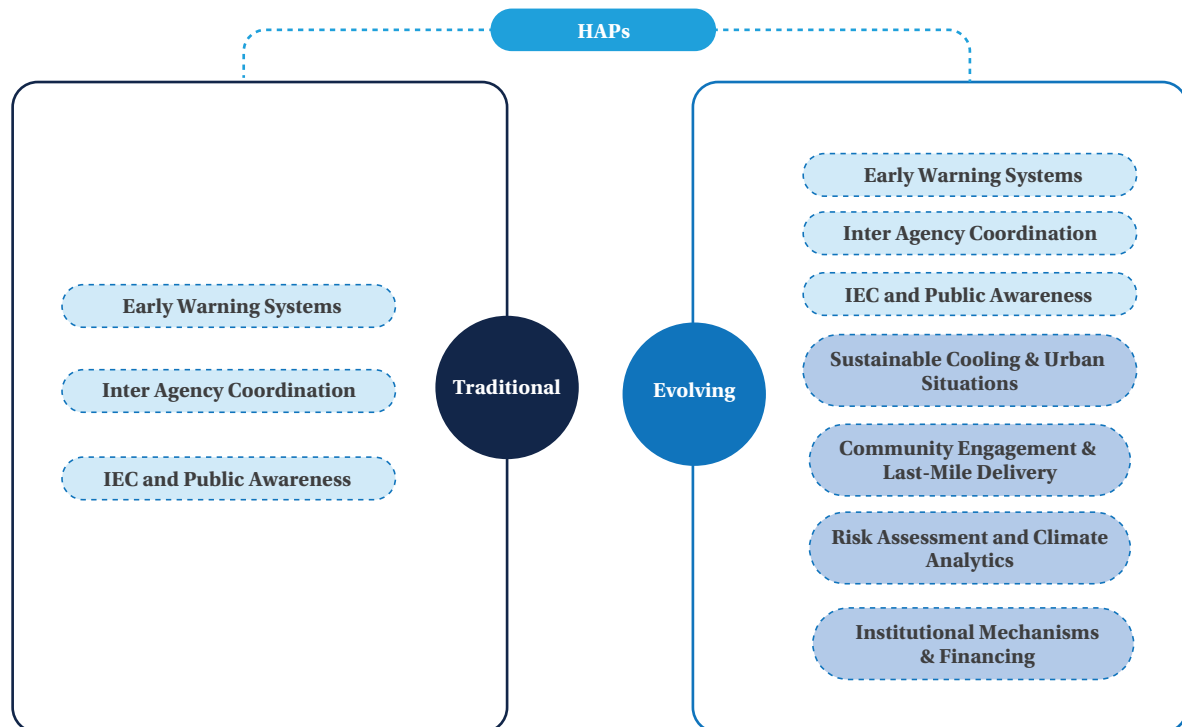


Figure 4: Core Components of Traditional and Evolving Heat Action Plans

1. Risk Assessment & Climate Analytics

A defining feature of next-generation HAPs is the integration of HVRA, informed by the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6, 2022) framework where heat risk is conceptualized as a function of interaction between hazard, exposure, and vulnerability. The hazard component refers to the occurrence, intensity, and duration of extreme heat events. Exposure captures the spatial coincidence of populations, infrastructure, and assets with these hazardous conditions. (e.g. Population Density, Land Surface Temperature). Vulnerability is determined by two underlying dimensions: Sensitivity and adaptive capacity. Sensitivity reflects the degree to which populations are likely to be adversely affected by heat, shaped by physiological, demographic, and socioeconomic

characteristics. (e.g. Slum population density, Built Up) Adaptive Capacity denotes the ability of individuals, communities, and institutions to anticipate, respond to, and recover from heat-related impacts. (e.g. Green Cover, Healthcare Access)

These components do not operate in isolation. Risk is further amplified in contexts where high sensitivity coincides with low adaptive capacity. This approach recognises that heat risk is uneven and shaped by environmental, social, and infrastructural factors, enabling targeted interventions such as cooling, water access, and outreach in high-risk wards including measures like the installation of a net zero cooling station under the Jodhpur HAP in a high-risk ward.¹⁸

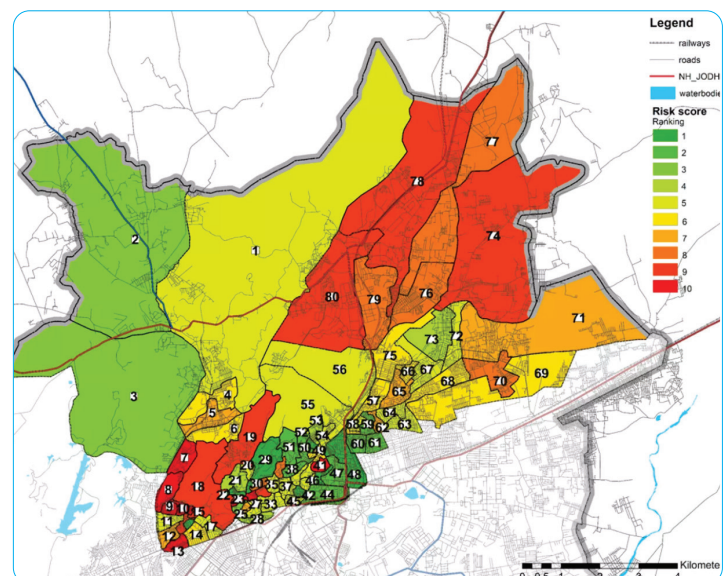
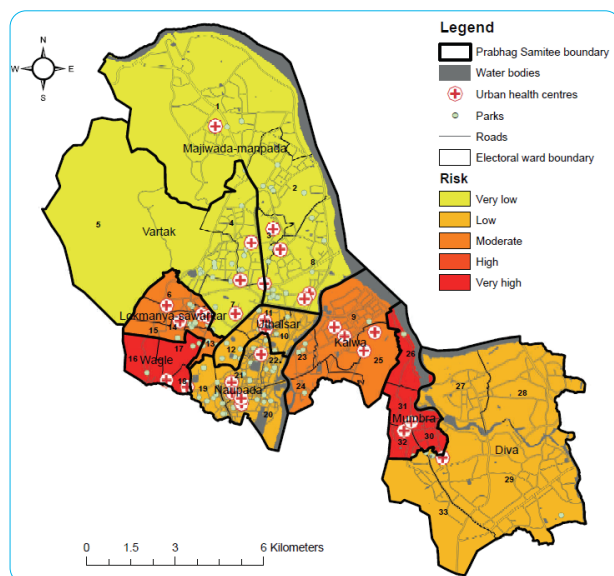
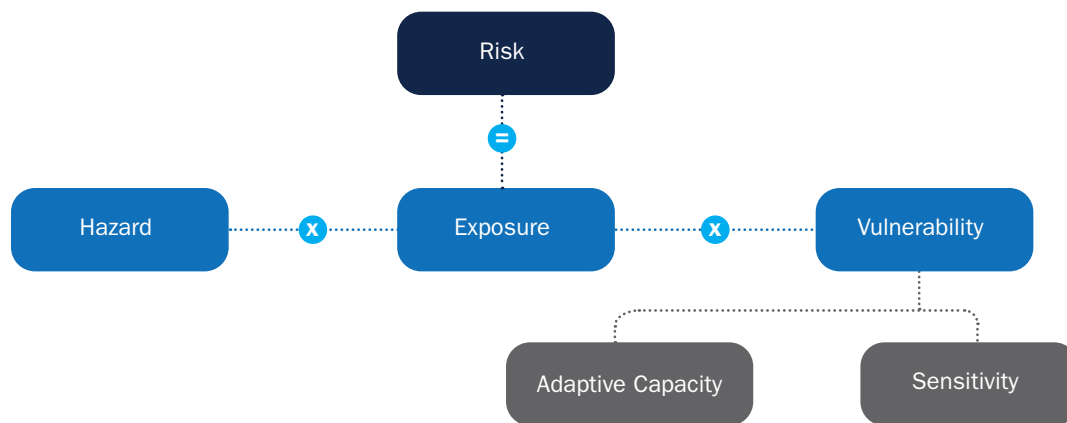


Figure 5 (a): IPCC's AR5 risk assessment framework equation¹⁹ (b) HVRA maps from Thane and Jodhpur HAPs²⁰

Increasingly, HAPs incorporate climate trends and projections, including near-surface temperature, humidity, and the National Oceanic and Atmospheric Administration (NOAA) Heat Index, enabling cities to anticipate future risks. For instance, the Thane HAP highlights that extreme warm nights are projected to increase more than extreme hot days, with felt temperatures up to 3°C higher than dry temperatures due to humidity, alongside future projections under RCP 4.5 and 8.5 scenarios.²¹

2. Sustainable Cooling & Urban Solutions

Cooling is emerging as a central pillar of heat risk reduction. National frameworks such as the India Cooling Action Plan (2019), supported by updates to Model Building By-Laws incorporating passive design measures like high-albedo materials, improved ventilation, and permeable surfaces, along with state initiatives such as Telangana’s Cool Roof Policy, are driving the adoption of energy-efficient cooling strategies.²² City-level HAPs

are increasingly integrating cool roofs, shading, cooling centers (Jodhpur HAP) and are now advancing towards introduction of blue-green infrastructure interventions to reduce ambient temperatures and improve thermal comfort. Evidence from Hyderabad shows these measures can deliver 20–22 kWh/m² in annual energy savings and reduce AC demand by 14–26%, with added air quality and emissions benefits.²³

3. Community Engagement & Last-Mile Delivery

HAPs are also moving beyond awareness campaigns toward active community participation and last-mile implementation. Early warnings are increasingly translated into locally accessible formats and disseminated through community networks, ensuring usability for vulnerable groups, as seen under the Jodhpur HAP.²⁴ Partnerships with community-based organizations and community-led approaches are also informing solution design, particularly in informal settlements.



Img 1: Community-based dissemination of colour-coded heat early warnings under the Jodhpur HAP led by Mahila Housing Trust

4. Institutional Mechanisms & Financing

Recent HAPs reflect stronger government ownership and institutional coordination, with the establishment of steering committees and pre-season stocktaking processes (Thane, Varanasi and Churu HAP). There is increasing alignment across departments and integration within SDMA frameworks, bringing labour, health, urban development, water supply, housing, municipal administration, education, transport, power, public

works, and social welfare organisations into formal coordination mechanisms for more integrated and cross-sectoral planning and implementation (Uttar Pradesh State Disaster Management Authority [UPSDMA] HAPs). Importantly, HAPs are beginning to identify financing pathways including convergence with centrally sponsored schemes, municipal budgets, and Corporate Social Responsibility (CSR) funding to support implementation of proposed interventions (Varanasi, Churu and Mahesana HAPs).

PREPAREDNESS RESPONSE AND MITIGATION STRATEGIES									
Strategy	Description	Implementation			Funding				
		Short/ Long Term	Implementing / Supporting Authority	Timeline	Estimated budget	Municipal Fund allocation	SDRF/ SDMF support	NDRF/ NDMF support	Other funding source
Cool Roof	Implement a cool roofs program using innovative technologies such as reflective paints to help regulate indoor temperatures, especially in urban heat hotspots.	Long-term	Varanasi Nagar Nigam	3-4 years	-	Municipal funds	-	-	PM Awas Yojna-U 2.0, AMRUT 2.0

Table 2: Preparedness measures, timelines, and financing provisions (Varanasi HAP)

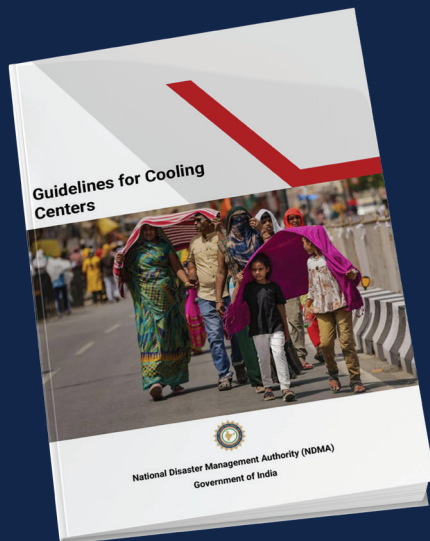
Together, these components mark a shift from reactive heat management to initiating proactive, risk-informed and implementation-oriented planning.

Evolving National Framework for Heat Risk Management

India's heat risk governance framework has been progressively formalized under the leadership of the National Disaster Management Authority (NDMA), particularly through the National Guidelines for Heatwave Management (2016, revised in 2017 and 2019), which outline key components including prevention, preparedness, response, public awareness, and inter-agency coordination.²⁵ The guidelines also extend beyond emergency response to incorporate medium- and long-term measures such as urban heat mitigation, built environment adaptation, and strengthening of institutional systems. Implementation is supported through pre-season preparedness activities, national and state-level reviews, seasonal advisories, and risk communication campaigns. In parallel, coordination with the IMD has strengthened early warning systems through impact-based forecasting at city and district levels, with an extended 5-day prediction window enabling more timely activation of HAPs and targeted response measures.²⁶

Additionally, NDMA has introduced a suite of targeted advisories and handbooks designed to protect the most at-risk populations and infrastructure. This includes an Advisory for Protecting Informal Workers²⁷, which identifies them as a priority group and recommends measures such as heat-safe working hours, access to drinking water, and shaded rest areas for the outdoor workforce, alongside an Advisory on Heatwave Protection in Housing and Human Settlements²⁸ which integrates passive cooling and nature-based solutions into urban and rural settlement planning. Furthermore, the House Owners' Guide to Alternate Roof Cooling Solutions²⁹ provides a technical toolkit for citizens to implement affordable and easy-to-adopt measures that can reduce indoor temperatures by up to 5°C, highlighting that roofs can contribute up to 70% of building heat gain and can be mitigated through reflective and insulation-based interventions. This is further complemented by NDMA's 2025 cooling shelter guidelines, which strengthen the focus on scalable cooling solutions within India's heat action planning.³⁰

NDMA Cooling Centre Guidelines



Purpose:

Provide safe, thermally comfortable spaces during extreme heat events

What the Guidelines Cover:

- Site selection in high-risk areas
- Retrofitting of existing buildings
- Ventilation & cooling design
- Capacity planning
- Operations & maintenance protocols

Why it Matters:

Supports immediate, community-level heat relief, especially for populations lacking access to indoor cooling.

Box 1 – Key Highlights of NDMA Cooling Centre Guidelines

Strengthening Financing Pathways for Heat Resilience

A major advancement in national heat governance has been the expansion of financing mechanisms to support both immediate response and long-term risk reduction. Under the Disaster Management Act, 2005 and the Fifteenth Finance Commission (2021–26), dedicated mitigation funds such as the National and/ State Disaster Mitigation Funds (NDMF/SDMF) have been operationalised, marking a shift from post-disaster relief

spending to pre-disaster investments that reduce risk and impacts.³¹ In September 2024, the Ministry of Home Affairs (MHA) issued a notification enabling the states to utilise mitigation funds for heatwave-related interventions.³² This enables states to design and implement projects that reduce heat exposure and vulnerability, including climate-resilient and community-level interventions.

In parallel, states that have notified heatwave as a state-specific disaster can utilise the SDRF provision for heat-related preparedness, relief, and compensation. Currently, 11 states have already notified heatwaves as state-specific disasters.³³ States are permitted to use up to 10% of SDRF allocations for locally notified disasters that are not included in the national list, subject to approved norms and guidelines. This enables support for ex-gratia assistance, compensation for crop and livestock losses, and capacity-building of frontline responders³⁴.

Further, the Sixteenth Finance Commission (2026–31) has recommended the inclusion of heatwave in the national list of notified disasters, which would expand access to financing for relief, preparedness, and mitigation, while reinforcing recognition of heat as a major disaster risk.³³

Emerging National Frameworks and Operational Guidance

Building on earlier guidelines, NDMA is currently advancing a new generation of operational frameworks aimed at making HAPs more locally owned, implementation-focused, and financially viable. The proposed National Heat Mitigation Framework is expected to provide a structured menu of interventions that can be integrated into state, district, and city planning processes, while also aligning these interventions with available financing streams.

In parallel, NDMA is developing detailed guidance on the utilization of SDMF and NDMF for heat mitigation projects, which will clarify procedures for project identification, fund access, monitoring, and evaluation. This is expected to address a critical gap by enabling states to convert HAPs into bankable and scalable investment pipelines.

Altogether, these developments signal a marked strengthening of national leadership in heat risk governance. The convergence of policy frameworks and financing mechanisms has enabled a transition from fragmented and reactive responses toward a more institutionalized, anticipatory, and implementation-driven approach to heat resilience.

State and City Leadership Case Studies

India's strengthening of national framework for heat risk management has enabled several states and cities to move toward more institutionalized, finance-linked, and implementation-oriented approaches. While levels of maturity vary, several states and Urban Local Bodies (ULBs) demonstrate emerging models of leadership through legal recognition of heat risk, integration with disaster financing, scaling of HAPs, and adoption of built environment and community-level interventions. The following examples highlight distinct pathways through which sub-national governments are advancing heat resilience.

▶ **Tamil Nadu: Institutionalising Heat Resilience**

In 2024, the Government of Tamil Nadu notified heatwave as a state-specific disaster, enabling the use of SDRF resources for relief, compensation, and preparedness.³⁵ Building on this, the state has initiated development of a state-level HAP along with city-level plans across major municipal corporations, with provisions for expansion to additional jurisdictions.³⁶ In addition, Tamil Nadu has also outlined heat mitigation and urban cooling strategies through state-level guidance documents, including a Heat Mitigation Strategy and Urban Cooling Guidelines, which emphasise measures such as passive cooling, cool roofs, urban greening, and climate-responsive planning to reduce heat exposure and improve thermal comfort.³⁷ Central to this strategy is the Tamil Nadu Urban Greening Policy 2026, which mandates that ULBs maintain at least 15% of their total municipal area under green cover, ensuring every resident has access to shade and nature within their immediate neighbourhood.³⁸ Furthermore, the state recently expanded its "Green Schools" initiative to 300 government schools, implementing cool roof coatings that have successfully reduced indoor temperatures by 3–4°C and occupied-hour classroom temperatures from 31°C down to 27°C.³⁹

In November 2025, the Government of Tamil Nadu, in collaboration with the Government of the United Kingdom, announced the establishment of a Heat Resilience Centre to strengthen institutional capacity for heat risk management.⁴⁰ The Centre is envisaged as a nodal platform to support cross-sector coordination, capacity building, and development of technical knowledge and tools to enhance heat resilience planning and implementation across the state.

▶ **Maharashtra: Integrating Heat into Disaster Management Systems**

Maharashtra State HAP (2024) adopts a multi-sectoral approach, incorporating early warning systems, public health preparedness, infrastructure adaptation, water and energy security measures, and targeted communication

strategies. A key feature of the state's approach is the identification of region-specific vulnerability, with districts in Vidarbha, Marathwada, and Khandesh recognized as high-risk zones.⁴¹ Recently, Amravati Municipal Corporation notified the "Cool Roof Bylaws 2025," making high-reflectance roofing mandatory for all new government and commercial buildings, as well as residential structures exceeding 500 sq. m., to reduce indoor temperatures.⁴²

Further strengthening its institutional framework, Maharashtra is establishing a Centre of Excellence for Heat Resilience and Sustainable Cooling (CEHSC) within the upcoming State Institute of Disaster Management.⁴³ This initiative is designed to serve as a central platform for technical guidance, applied research, capacity building, and inter-departmental coordination. By institutionalizing a dedicated knowledge and coordination hub, the state is moving toward sustained, system-level capacity for heat resilience.

▶ **Uttar Pradesh: Scaling District-Level Heat Action Planning**

Uttar Pradesh has expanded HAP coverage across most of its districts, reflecting a state-wide approach to heat risk management.⁴⁴ The state has also introduced district-specific heatwave thresholds to improve the accuracy of early warning systems. These thresholds support classification of alerts (yellow, orange, red) based on regional climatic conditions, enabling targeted and anticipatory response.⁴⁵ Complementing these efforts, the state recently approved the Uttar Pradesh Urban Green Policy 2025, which includes a three-tiered intervention strategy at the city, neighborhood, and building levels to mitigate the Urban Heat Island effect. Key features of the policy include the large-scale development of "Miyawaki" mini-forests and "sponge parks" to enhance natural cooling and climate resilience across urban local bodies, alongside the integration of passive cooling measures like green roofs and vertical gardens.⁴⁶

▶ **Telangana: Linking Cooling Policy with Disaster Governance**

Telangana has adopted a policy-led approach to heat mitigation through the implementation of the Cool Roof Policy (2023–2028), which promotes cost-effective measures to reduce indoor heat exposure, particularly in low-income and high-density areas. In 2025, the state further strengthened its approach by declaring heatwaves as state-specific disasters, enabling SDRF-based compensation and response measures. The state is also implementing large-scale environmental initiatives such as the Telanganaku Haritha Haram afforestation programme and Mission Kakatiya for water body restoration, which contribute to broader climate resilience

and offer co-benefits for reducing heat stress as noted in the Telangana State Action Plan on Climate Change and Human Health.⁴⁷

Delhi: Operationalising Heat Action through Urban Disaster Management Systems

The Delhi HAP 2025, implemented under the Delhi Disaster Management Authority (DDMA), defines and operationalizes graded heat alert levels that trigger corresponding actions across departments, improving inter-agency coordination and enabling timely interventions. The plan also includes targeted measures for outdoor workers and informal settlements. In addition, it incorporates longer-term measures such as cool roofs, passive cooling, and urban greening within its broader approach to reducing heat exposure.⁴⁷ Progressing on this front, the Government of Delhi has initiated two Cool Roof pilot projects at the Kashmere Gate ISBT and Anand Vihar ISBT, serving as the foundation for a planned city-wide scale-up of high-reflectance coatings across municipal buildings to enhance indoor thermal comfort.⁴⁸

Rajasthan: Enabling Localised Heat Action Implementation

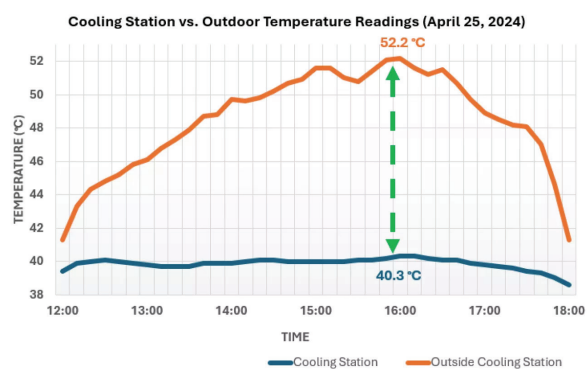
In Rajasthan, heatwave has been notified as a state-specific disaster, enabling the use of SDRF provisions for preparedness, relief, and response.⁴⁹ The state has expanded HAPs across districts, with several city- and district-level plans now under implementation. For instance, the Bikaner district HAP explicitly includes worksite shading, drinking water provision, rescheduling of outdoor work during peak heat hours, and public awareness campaigns, particularly targeting vulnerable populations such as outdoor workers. These plans also emphasize department-wise roles and pre-season preparedness measures, indicating a shift toward operational, on-ground implementation.⁵⁰

Complementing these efforts, early warning systems and communication strategies are evolving to improve last-mile reach and effectiveness. In several cities, including Jodhpur as part of HAP, heat alerts issued by the IMD are being translated into locally accessible formats and disseminated through community-based channels such as meetings, posters, and digital platforms. Capacity-building initiatives and partnerships with community-based organizations have enabled wider outreach, with such models reaching over 25,000 residents across informal settlements.²⁴ These efforts are further supported by the integration of on-ground heat relief infrastructure in high-exposure areas. Cities are introducing cooling centers, shaded public spaces, hydration points, and temporary shelters to reduce immediate heat exposure. A notable example is the establishment of a net-zero cooling station in 2024, designed for the informal sector. The facility integrates passive cooling techniques, renewable

energy systems, and public health provisions, achieving temperature reductions of up to 8–12°C compared to ambient conditions during peak heat periods.¹⁸



Img. 2: Jodhpur's First Net- Zero Cooling Station (above) and Comparative plot showing Surface Temperature Reductions (below)



While cooling interventions are now a visible component of India's heat governance landscape spanning policy, pilots, and community-scale implementation their scale, standardization, and financing integration within HAPs continue to evolve.

Kerala: Decentralising Heat Resilience

Kerala has formally recognized heatwaves as a state-specific disaster, a move that enables the state to leverage the SDRF for heat-mitigation activities.⁵¹ Following this notification, the state launched the Kerala State Heat Action Plan in 2020 to institutionalize heat-health protocols.⁵² A landmark localized development is the 'Greeshman' HAP implemented by the Moodadi Grama Panchayat in Kozhikode, which serves as one of a kind village-level heat action plan.⁵³ To facilitate an immediate field-level response, the State Government has allocated 1 crore to each District Collector specifically for heat protection measures, such as drinking water kiosks and cooling centers. Furthermore, the government has directed all local bodies to develop decentralized heat action plans.⁵⁴ These efforts are holistically integrated into the State Action Plan on Climate Change (2023–2030), which prioritizes long-term climate resilience and public health.⁵⁵

Comparative Matrix of State and City Leadership on Heat Resilience

State / City	Legal Status	Planning Scale & Coverage	Distinctive Governance / Institutional Feature
Tamil Nadu	Heatwave notified as a state-specific disaster	State-level HAP and city-level plans initiated, with expansion provisions	Heat Resilience Centre with UK collaboration, supporting institutionalised coordination and capacity building
Maharashtra	Heatwave notified as a state-specific disaster	State-level HAP complemented by multiple city-level HAPs across urban areas	Centre of Excellence under development, strengthening long-term institutional capacity and coordination
Uttar Pradesh	Heatwave notified as a state-specific disaster	Extensive planning ecosystem with state-level coordination, covering all 75 district HAPs and multiple city-level HAPs	District-specific thresholds and decentralised implementation enabling large-scale standardised planning
Telangana	Heatwave notified as a state-specific disaster	State-level HAP complemented by a dedicated state-wide Cool Roof Policy	Policy-led integration of cooling interventions with disaster risk management
Delhi	Heat managed through DDMA-led disaster management system	City-level Heat Action Plan	Trigger-based alert system enabling coordinated operational response
Rajasthan	Heatwave notified as a state-specific disaster	Multiple city- and district-level HAPs under implementation and expansion	District-led planning with defined roles supporting localised implementation
Kerala	Heatwave notified as a state-specific disaster	State-level HAP with decentralised planning through district and local body-level HAPs	Decentralised heat planning with a unique village-level HAP model

Note: The table highlights distinctive leadership approaches and is not an exhaustive inventory of all heat actions undertaken by each state.

Way Forward: Operational Pathways for Strengthening Heat Governance

Despite significant progress in the expansion of HAPs, structural gaps continue to constrain their effectiveness, scalability, and equity. Recent assessments indicate that while the number of plans has increased, a large share of actions remain short-term and response-oriented, with limited emphasis on sustained risk reduction.⁵⁶ Addressing these gaps will require a shift from plan formulation to operationalization anchored in stronger systems, clearer institutional mandates, and improved last-mile delivery. Building on the encouraging expansion of HAPs, the next phase must focus on implementation-oriented improvements, including strengthening the availability and quality of data for decision-making, enhancing financing mechanisms to support sustained and scalable action, and reinforcing operational linkages across administrative levels.

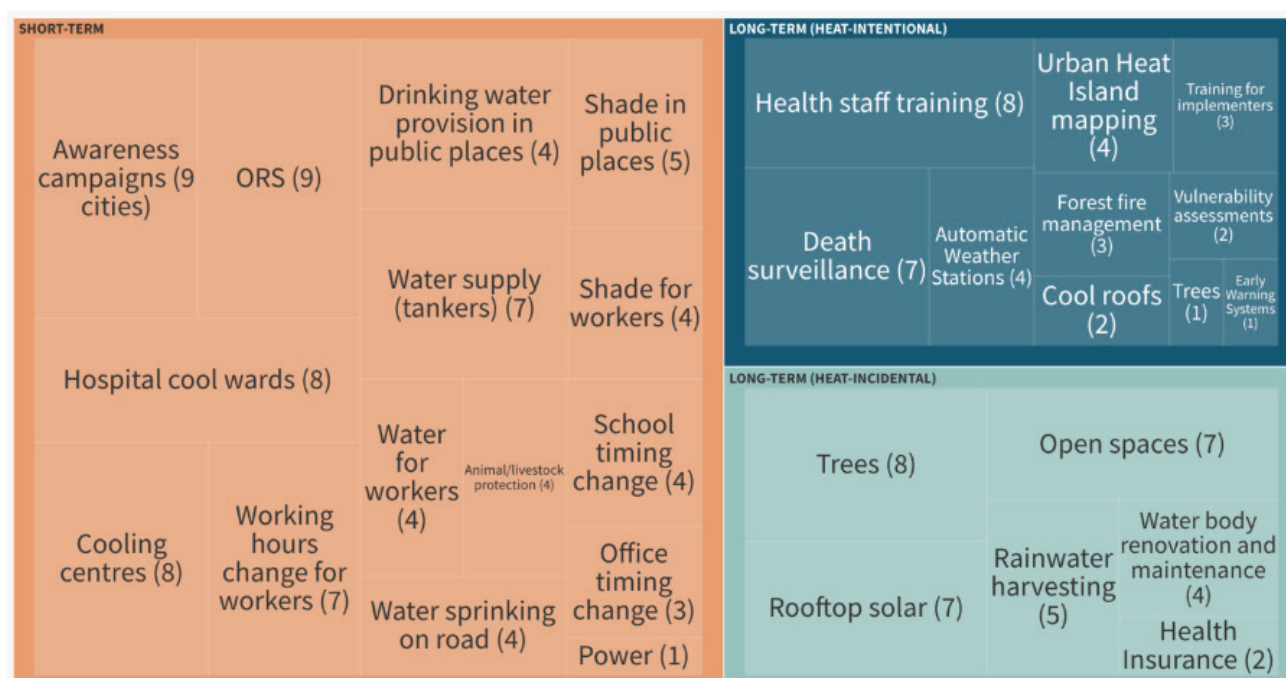


Fig 6: Reported heat actions (n=150) are largely short-term, with many long-term measures being incidental rather than targeted. Intentional, risk-focused actions remain limited across cities. Figures in brackets indicate the number of cities (out of nine) where each action is observed. (SFC Report, 2025)



Expanding Coverage: A critical starting point lies in addressing the uneven spatial coverage of HAPs. While urban centres have led the expansion of heat action planning, district-level plans often lack functional linkages to blocks and gram panchayats. This disconnect limits the reach of interventions to rural population. Strengthening vertical integration across administrative tiers and embedding heat planning within local governance systems will be essential to ensure equitable coverage and effective last-mile delivery.



Building Awareness: The continued perception of heat as a routine seasonal phenomenon rather than a systemic risk constrains both public and institutional response. There is a need to move toward sustained, targeted risk communication that enables behavioural change, particularly among high-exposure groups such as outdoor workers, construction labour, frontline personnel and home-based workers. Institutionalising awareness through workplace advisories, community-based outreach, and partnerships with educational and training institutions can help translate risk information into preventive action.



Improving Data and Planning: Effective implementation is contingent on the availability of robust, integrated, and granular data systems. Current planning is constrained by fragmented and inconsistent data on heat exposure, health outcomes, and vulnerability. Strengthening heat governance will require integrating meteorological data, morbidity and mortality records, and socioeconomic indicators into a unified decision-making framework. This includes improving heat-related health surveillance, standardizing reporting protocols, and incorporating climate projections, heat indices, and spatial mapping of intra-city and regional variations. Building technical capacity within government systems to collect, interpret, and apply such data will be critical for enabling evidence-based planning.



Strengthening Institutions: The integration of heat within existing disaster risk management systems through clearer roles, responsibilities, and financing pathways can support timelier and more accountable implementation. In many cases, HAPs continue to function as advisory documents with limited administrative backing. Embedding heat risk within formal governance structures, supported by defined mandates, nodal officers, and inter-departmental coordination mechanisms, can strengthen ownership and enable more consistent implementation. Enhancing technical capacity within government and fostering collaboration with academic and research institutions will further support this transition.



Improving Coordination: Given the cross-cutting nature of heat risk, greater alignment across sectors such as health, power, water, labour, and urban development is essential. Current coordination mechanisms remain limited, leading to fragmented responses. Operationalizing joint planning processes, shared data systems, and clearly defined responsibilities across departments can improve coherence and effectiveness.



Monitoring Progress: Most HAPs lack structured monitoring and evaluation frameworks. There is a need to develop clear indicators, baseline data, responsible agencies, and review timelines to track implementation and outcomes. Embedding monitoring systems within state and national governance structures, supported by health surveillance and expenditure data can enable periodic assessment, course correction, and accountability. More systematic monitoring and review processes will be essential to ensure that response measures remain adaptive to the growing threat of heat.



Focusing on Long-Term Solutions: Enhancing financing mechanisms remains central to operationalizing heat action. Current implementation is heavily reliant on ad hoc allocations, limiting both scale and continuity. There is a need to move toward convergent and blended financing approaches, leveraging centrally sponsored schemes, municipal budgets, and disaster mitigation funds, alongside private and climate finance. Strengthening access to State Disaster Mitigation Funds and emerging financing windows can help support long-term, risk-reduction investments. Finally, greater emphasis on long-term mitigation efforts will be critical for building sustained heat resilience. This includes climate-responsive urban planning, expansion of blue-green infrastructure, and adoption of passive and energy-efficient cooling strategies. Embedding these interventions within planning, financing, and governance systems can help shift from short-term response toward sustained risk reduction.

References

1. World Meteorological Organization. "WMO Confirms 2024 as Warmest Year on Record at about 1.55°C above Pre-Industrial Level." Press Release, January 10, 2025. <https://wmo.int/news/media-centre/wmo-confirms-2024-warmest-year-record-about-155degc-above-pre-industrial-level>; India Meteorological Department. "Press Release: Seasonal Outlook and Temperature/Rainfall Conditions for India." January 15, 2025. https://internal.imd.gov.in/press_release/20250115_pr_3554.pdf.
2. United Nations. UN Secretary-General's Call to Action on Extreme Heat. New York: United Nations, 2024. https://www.un.org/sites/un2.un.org/files/unsg_call_to_action_on_extreme_heat_for_release.pdf; World Health Organization. "Climate Change, Heat and Health." Fact Sheet, May 28, 2024. <https://www.who.int/news-room/fact-sheets/detail/climate-change-heat-and-health>.
3. India Meteorological Department (IMD). 2026. "Statement on the Climate of India during 2025." Ministry of Earth Sciences. <https://wmo.int/media/news-from-members/statement-climate-of-india-during-2025>
4. Government of India, Ministry of Earth Sciences. Rajya Sabha Unstarred Question No. 1782: Heat Waves Across India. Answered December 22, 2022. <https://sansad.in/getFile/annex/258/AU1782.pdf?source=pqars>.
5. How Extreme Heat Is Impacting India: Assessing District-Level Heat Risk. <https://www.ceew.in/sites/default/files/mapping-climate-risks-and-impacts-of-extreme-heatwave-disaster-in-indian-districts.pdf>
6. Natural Resources Defense Council (NRDC). Expanding Heat Resilience Across India: Heat Action Plan Highlights. New York: NRDC, 2020. <https://www.nrdc.org/sites/default/files/india-heat-resilient-cities-ib.pdf>.
7. de Bont, J., et al. 2024. "Impact of Heatwaves on All-Cause Mortality in India: A Comprehensive Multi-City Study." *Environmental International* 184: 108461. <https://doi.org/10.1016/j.envint.2024.108461>; Gadgil, Ashok, and Piyush Narang. 2024. "Lost in the Heat: The Critical Miscalculation in India's Heatwave Mortality Data." *Down To Earth*, June 5, 2024. <https://www.downtoearth.org.in/climate-change/lost-in-the-heat-the-critical-miscalculation-in-indias-heatwave-mortality-data>
8. International Labour Office. Working on a Warmer Planet: The Impact of Heat Stress on Labour Productivity and Decent Work. Geneva: International Labour Organization, 2019.
9. Parsons, L. A., J. W. Baldwin, G. Guzman-Echavarria, O. Jay, P. Kalmus, H. Staudmyer, J. K. Vanos, and N. H. Wolff. "Intensifying global heat threatens livability for younger and older adults." *Environmental Research: Health* 4, no. 1 (2026): 015013.
10. Patel, Purvi, Tanya Sharma, Manushi Thakur, Shubhra Joshi, Sandhya Ahuja, and Aakash Shrivastava. Heat-Health Preparedness & Response Activities: Report. New Delhi: Ministry of Health and Family Welfare, 2024.
11. Ministry of Earth Sciences (MoES). 2020. Assessment of Climate Change over the Indian Region. New Delhi: Government of India. https://cerca.iitd.ac.in/uploads/Reports/15941862512020_Book_AssessmentOfClimateChangeOverI.pdf
12. India Meteorological Department (IMD), Updated Seasonal Outlook for Hot Weather Season (April to June), 2024. <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=2016857>
13. Swain, S., et al. 2019. "Vulnerability and Adaptation to Extreme Heat in Odisha, India." *International Journal of Environmental Research and Public Health*; Das, Saudamini. 2016. Do Awareness Campaigns Save Lives? Assessing the Odisha Heatwave. <https://doi.org/10.3390/ijerph16245065>
14. Kim Knowlton, Shubhayu P. Kulkarni, Gulrez S. Azhar, et al., "Development and Implementation of South Asia's First Heat-Health Action Plan in Ahmedabad (Gujarat, India)," *International Journal of Environmental Research and Public Health* 11, no. 4 (2014): 3473–3492, <https://doi.org/10.3390/ijerph110403473>
15. Hess, Jeremy J., et al., "Building Resilience to Climate Change: Pilot Evaluation of the Impact of India's First Heat Action Plan on All-Cause Mortality," *Journal of Environmental and Public Health* (2018): <https://doi.org/10.1155/2018/7973519>

16. Pillai, A. V., and T. Dalal, How Is India Adapting to Heatwaves? An Assessment of Heat Action Plans with Insights for Transformative Climate Action, Centre for Policy Research, <https://cprindia.org/briefsreports/how-is-india-adapting-to-heatwaves-an-assessment-of-heat-action-plans-with-insights-for-transformative-climate-action/>.
17. Pathak, Vishal. 2025. "Extreme Heat-Related Cooling Measures in Maharashtra, India: Building Resilience in 2025." All India Disaster Mitigation Institute (AIDMI), November 25, 2025. <https://aidmi.org/blog/extreme-heat-related-cooling-measures-in-maharashtra-india-building-resilience-in-2025/>
18. Limaye, Vijay, et al. 2024. "Jodhpur, India Unveils Its First Net-Zero Cooling Station." Natural Resources Defense Council (NRDC). <https://www.nrdc.org/bio/vijay-limaye/jodhpur-india-unveils-its-first-net-zero-cooling-station>
19. Intergovernmental Panel on Climate Change (IPCC), "Chapter 1," in Climate Change 2022: Impacts, Adaptation and Vulnerability, <https://www.ipcc.ch/report/ar6/wg2/chapter/chapter-1/>
20. TMC and CEEW. 2024. Heat Action Plan for Thane City 2024. Thane: Thane Municipal Corporation, Thane; and Council on Energy, Environment and Water (CEEW): <https://www.ceew.in/publications/how-can-thane-city-tackle-heatwaves-risks-with-heat-action-plan>; Natural Resources Defense Council (NRDC) India, "Jodhpur Heat Action Plan," <https://www.nrdcindia.org/publications>.
21. TMC and CEEW. 2024. Heat Action Plan for Thane City 2024. Thane: Thane Municipal Corporation, Thane; and Council on Energy, Environment and Water (CEEW): <https://www.ceew.in/publications/how-can-thane-city-tackle-heatwaves-risks-with-heat-action-plan>
22. Government of India, India Cooling Action Plan, <https://ozonecell.nic.in/wp-content/uploads/2019/03/INDIA-COOLING-ACTION-PLAN-e-circulation-version080319.pdf>; Ministry of Housing and Urban Affairs (MoHUA), "Chapter 4," <https://mohua.gov.in/upload/uploadfiles/files/Chap-4.pdf>; Government of Telangana, Telangana Cool Roof Policy 2023–2028, <https://telangana.gov.in/wp-content/uploads/2023/05/Telangana-Cool-Roof-Policy-2023-2028.pdf>
23. Akbari, Hashem, Mattheos Santamouris, and Apostolos Synnefa, "Quantifying the Direct Benefits of Cool Roofs in an Urban Setting: Reduced Cooling Energy Use and Lowered Greenhouse Gas Emissions," Energy and Buildings (2008), https://www.researchgate.net/publication/230887933_Quantifying_the_direct_benefits_of_cool_roofs_in_an_urban_setting_Reduced_cooling_energy_use_and_lowered_greenhouse_gas_emissions.
24. "Jodhpur Heat Action Plan," Connective Cities, <https://vunity.connective-cities.net/system/files/2024-12/Jodhpur%20Heat%20Action%20Plan.pdf>.
25. National Disaster Management Authority, Heat Wave Guidelines, <https://ndma.gov.in/sites/default/files/PDF/Heat-Wave.pdf>.
26. Extended Range Heat Wave Outlook for the next 2 weeks, India Meteorological Department (IMD), 2026. https://mausam.imd.gov.in/pdfs/heatcolduser/heat_extended.pdf
27. National Disaster Management Authority (NDMA), Advisory for Informal and Gig Workers, https://ndma.gov.in/sites/default/files/PDF/Reports/Advisory_for_Informal_and_Gig_Workers.pdf.
28. National Disaster Management Authority (NDMA), House Owners' Guide to Alternate Roof Cooling Solutions, <https://ndma.gov.in/sites/default/files/PDF/Guidelines/Cool-Roof-Handbook.pdf>
29. National Disaster Management Authority (NDMA). 2025. Guidelines for Cooling Centers. Government of India. <https://heathealth.info/wp-content/uploads/NDMA-Cooling-centre-guidelines.pdf>
30. National Disaster Management Authority (NDMA). 2025. Guidelines for Cooling Centers. Government of India. <https://heathealth.info/wp-content/uploads/NDMA-Cooling-centre-guidelines.pdf>
31. Fifteenth Finance Commission, Finance Commission in Covid Times: Report for 2021–26 (2020), <https://fincomindia.nic.in/asset/doc/commission-reports/XVFC%20VOL%20I%20Main%20Report.pdf>
32. Ministry of Home Affairs, Government of India, Amendment to Guidelines on Constitution and Administration of State Disaster Mitigation Fund (SDMF) Based on the Recommendations of the Fifteenth Finance Commission 2021–22 to 2025–26 (September 2024), <https://ndmindia.mha.gov.in/ndmi/viewUploadedDocument?uid=NEW2203>.

33. Sixteenth Finance Commission Report 2026-31, Government of India. <https://fincomindia.nic.in/asset/doc/commission-reports/16th-FC/reports/Vol1-Main-Report.pdf>
34. Ministry of Home Affairs, Government of India, Guidelines on Constitution and Administration of the State Disaster Response Fund and National Disaster Response Fund Based on the Recommendations of the Fifteenth Finance Commission 2021-22 to 2025-26 (January 2022), https://srcodisha.nic.in/dmrule/Guidelines%20SDRF%20&%20NDRF_compressed.pdf.
35. "G.O. Ms. No. 419: Notifying Heat Wave as a State-Specific Disaster for Providing Relief under State Disaster Response Fund." Revenue and Disaster Management Department, 15 October 2024. https://www.stationeryprinting.tn.gov.in/extraordinary/2024/336_Ex_II_2_2024.pdf
36. Government of Tamil Nadu. 2025. Policy Note 2025-2026: Revenue and Disaster Management Department. https://cms.tn.gov.in/cms_migrated/document/docfiles/revenue_e_pn_2025_26.pdf
37. Tamil Nadu Green Climate Company (TNGCC) and ICLEI South Asia, Urban Heat Island Assessment and Strategic Guidelines for Urban Cooling in Tamil Nadu (2026). https://www.tngcc.tn.gov.in/wp-content/uploads/2026/02/TN-Urban-cooling-guidelines_ICLEISA-3_comp.pdf; Tamil Nadu State Planning Commission, Beating the Heat: Tamil Nadu Heat Mitigation Strategy (2024), https://spc.tn.gov.in/wp-content/uploads/Heat_Mitigation_Strategy.pdf.
38. Government of Tamil Nadu, Tamil Nadu Urban Greening Policy 2026, [https://www.forests.tn.gov.in/frontend/gos/Urban_Greening_Policy_\(English\)0.pdf](https://www.forests.tn.gov.in/frontend/gos/Urban_Greening_Policy_(English)0.pdf);
39. Government of Tamil Nadu, Press Release – Government of Tamil Nadu Scales Climate Education and Cool Roof Initiatives Across 300 Green Schools, 2026 https://cms.tn.gov.in/cms_migrated/document/press_release/pr190126_e_146.pdf
40. Government of Tamil Nadu, Government of Tamil Nadu and UK Government Jointly Launch a Heat Resilience Centre for the State (2025), https://cms.tn.gov.in/cms_migrated/document/press_release/pr211125_e_2793.pdf.
41. Maharashtra State Disaster Management Authority, "Heat Wave Action Plan," <https://sdma.maharashtra.gov.in/en/heat-wave-action-plan/>.
42. Amravati Municipal Corporation, Amravati Cool Roof Byelaws 2025, https://erp.amravaticorporation.in/MAMC_CoolRoof/Images/Cool%20Roof%20Policy%20Signed.pdf
43. Decision of Maharashtra State Executive Committee meeting dt 19.05.2025
44. Uttar Pradesh State Disaster Management Authority (UPSDMA), Action Taken Report: Heatwave Management 2024 (2024), <https://upsdma.up.nic.in/2024/HATR2024.pdf>.
45. Uttar Pradesh State Disaster Management Authority (UPSDMA), District-Wise Heat Threshold Determination for Uttar Pradesh and India (2024), https://upsdma.up.nic.in/2024/UPSDMA_HeatThreshold_19July2024.pdf.
46. Urban Development Department, Government of Uttar Pradesh, Urban Green Policy 2025-26, [https://urbandevlopment.up.nic.in/assets-new/pdf/Urban%20Green%20Policy/Urban%20Greening%20Policy%20\(2\)%20Hindi%20Version_09_6_2025.pdf](https://urbandevlopment.up.nic.in/assets-new/pdf/Urban%20Green%20Policy/Urban%20Greening%20Policy%20(2)%20Hindi%20Version_09_6_2025.pdf)
47. National Centre for Disease Control (NCDC), Telangana State Action Plan on Climate Change and Human Health 2022-27 (2022), https://ncdc.mohfw.gov.in/wp-content/uploads/2025/01/28_SAPCCHH_Telangana_21-10-24.pdf.
48. Delhi Disaster Management Authority (DDMA), Delhi Heat Action Plan (2025), https://ddma.delhi.gov.in/sites/default/files/ddma/generic_multiple_files/hap_delhi_21.4.25_3.pdf.
49. Government of Rajasthan, Notification: Heatwave as State-Specific Disaster (2024), <https://dmrelief.rajasthan.gov.in/content/dam/dmr/files/documents/Heat%20Wave%20Notification%200101.pdf>.
50. Government of Rajasthan. (2025). Heat Wave Action Plan. <https://dmrelief.rajasthan.gov.in/content/dam/dmr/files/heatwave2025/BIKANER.pdf>
51. Government of Tamil Nadu. "Declaration of Heat Wave, Sunstroke and Sunburn as State-Specific Disasters under SDRF (G.O. Ms. No. 9)." Disaster Management Department, 2024. https://cms.tn.gov.in/cms_migrated/document/docfiles/DM-SDRF-State-Specific-Disasters-Heat-wave-Sun-stroke-Sun-burn-Orders-issued.-G.O.Ms-No.-9-DMD.pdf
52. Kerala State Disaster Management Authority (KSDMA). 2020. Heat Action Plan – Kerala. <https://sdma.kerala.gov.in/wp-content/uploads/2020/07/Heat-Action-Plan-Kerala.pdf>

53. Kerala State Disaster Management Authority (KSDMA). 2025. Heat Action Plan 2025 (Malayalam Edition). https://sdma.kerala.gov.in/wp-content/uploads/2026/02/HAP_2025_ML_FINAL-1_11zon.pdf
54. The Hindu. 2025. "Local Bodies Told to Prepare Heat Action Plans." <https://www.thehindu.com/news/national/kerala/local-bodies-told-to-prepare-heat-action-plans/article70726941.ece>
55. Government of Kerala. 2022. Kerala State Action Plan on Climate Change 2.0 (2023–2030). Directorate of Environment and Climate Change, Department of Environment. <https://climatechange.envt.kerala.gov.in/wp-content/uploads/2024/05/Kerala-State-Action-Plan-on-Climate-Change-2.0.pdf>
56. Pillai et al., 2025. Is India Ready for a Warming World? How Heat Resilience Measures Are Being Implemented for 11% of India's Urban Population in Some of Its Most At-Risk Cities. Sustainable Futures Collaborative. <https://www.sustainablefutures.org/wp-content/uploads/2025/03/Is-India-Ready-for-a-Warming-World-How-Heat-Resilience-Measures-Are-Being-Implemented-for-11-Percent-of-Indias-Urban-Population-in-Some-of-Its-Most-At-Risk-Cities.pdf>



Copyright © 2025 Natural Resources
Defense Council

All rights reserved. No part of this publication
may be reproduced, stored in a retrieval
system or transmitted, in any form or by any
means, electronic, mechanical, photocopying,
recording or otherwise, without prior
permission