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Department of Medical Health & Family Welfare
Government of Uttar Pradesh

वाराणसी नगर निगम
VARANASI NAGAR NIGAM

IIPH INDIAN INSTITUTE of PUBLIC HEALTH GANDHINAGAR
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MHT MAHILA HOUSING TRUST
Towards Responsible Urban Development

Varanasi

HEAT ACTION PLAN

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Abbreviation

ASHA	Accredited Social Health Activists
CMIP6	Coupled Model Intercomparison Project Phase 6
ECMWF	European Centre for Medium-Range Weather Forecast
GDP	Gross Domestic Product
GIS	Geographical Information System
HAC	Heat Action Committee
HAP	Heat Action Plan
HVRA	Heat Vulnerability Risk Assessment
IIPH-G	Indian Institute of Public Health - Gandhinagar
IMD	India Meteorological Department
IPCC	Intergovernmental Panel on Climate Change
LST	Land Surface Temperature
LULC	Land Use Land Cover
MHT	Mahila Housing Trust
NCDC	National Centre for Disease Control
NDBI	Normalized Difference Built-up Index
NDMA	National Disaster Management Authority
NDRF	National Disaster Response Fund
NDVI	Normalized Difference Vegetation Index
NOAA	National Oceanic and Atmospheric Administration
NRDC	Natural Resources Defense Council
ORS	Oral Rehydration Solution
PuVVNL	Purvanchal Vidyut Vitran Nigam Limited
RCP	Representative Concentration Pathways
SDRF	State Disaster Response Fund
ULB	Urban Local Body
UPSDMA	Uttar Pradesh State Disaster Management Authority
USGS	United States Geological Survey
VDA	Varanasi Development Authority
VNN	Varanasi Nagar Nigam
WHO	World Health Organization
WMO	World Meteorological Organization

Image: Pexel.com

1. Introduction

1.1 Climate Change and Rising Heat

The Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report highlights that, human-induced climate change has led to a rise in both the frequency and intensity of heatwaves since the 1950s, with further warming expected to exacerbate these extreme heat events.[1] As one of the fastest-growing economies, India faces the dual challenge of sustaining economic growth while ensuring energy security, job creation, and building climate resilience. Climate Resilience involves strengthening the country's ability to adapt to and recover from climate-related impacts, such as extreme weather events and shifting environmental conditions, while continuing to foster long-term sustainability and development. With 270 million people living below the poverty line, the impacts of climate change—including extreme heat, tropical cyclones, and flooding—disproportionately affect marginalized communities.[2] Rising temperatures pose a direct threat to public health, infrastructure, and economic productivity, exacerbating existing social and economic inequalities.

India could be experiencing the highest labor productivity losses globally amounting to over 100 billion hours annually. Heat-related productivity losses could put up to 4.5% of the country's GDP at risk.

The urgency of heat adaptation is underscored by record-breaking global temperatures. The year 2024 was the hottest ever recorded, surpassing 2023 and marking the first time annual average global temperatures exceeded 1.5°C above pre-industrial levels—an important threshold in international climate agreements.[3] India, too, has experienced unprecedented warming, with the past decade (2015–2024) being the hottest on record.[4]

Projections indicate that extreme heat events in India are expected to intensify not only in severity but also in duration, with a notable increase during monsoon months when high humidity exacerbates health risks.[5] India's workforce faces substantial risks, as extreme heat exposure is a growing concern for laborers across multiple sectors. Approximately three-fourths of the country's labor force is already exposed to extreme heat, putting livelihoods and productivity at risk. [6] The economic implications of heat stress are equally alarming—by 2030, India could be experiencing the highest labor productivity losses globally amounting to over 100 billion hours annually.[7] Heat-related productivity losses could put up to 4.5% of the country's GDP at risk.[8]

These projections underscore the urgent need for targeted heat adaptation strategies, including improved workplace safety regulations, early warning systems, and community-based interventions to protect vulnerable populations. As extreme heat events become more frequent and severe, there is an urgent need for a proactive, science-driven, and community-centered approach to heat resilience. This Heat Action Plan (HAP) is designed to mitigate the risks posed by rising temperatures, protect vulnerable populations, and integrate long-term heat adaptation strategies into urban planning, public health, and emergency response systems. Through coordinated action and early warning systems, India can strengthen its resilience to extreme heat and safeguard lives in a rapidly warming world.

1.2 Strengthening Heat Preparedness through Heat Action Plans in India

Over the past decade, governments at the city, district, and state levels in India have taken significant steps to address the growing risk of extreme heat by developing HAPs. The launch of India's first HAP in Ahmedabad in 2013, following the devastating 2010 heatwave, marked a critical shift toward proactive heat preparedness.[9] These plans serve as cross-sectoral frameworks, assigning responsibilities to various government agencies to take preemptive, responsive, and recovery measures to minimize heat-related health risks.

23 states prone to high temperatures and heatwave conditions.

Currently, HAPs have been implemented in 23 states prone to high temperatures and heatwave conditions.[10] HAPs have become a crucial policy tool in integrating heat resilience into broader development strategies, particularly for vulnerable populations, by ensuring that climate adaptation measures are embedded within national and regional planning efforts. Studies have shown that their implementation has led to a measurable reduction in heat-related mortality. The Ahmedabad HAP, a pioneering example, demonstrated a reduction of approximately 1,190 annual deaths (across all causes) in 2014–15 compared to the baseline period of 2007–10, highlighting the life-saving potential of structured heat preparedness and response.[9] These findings underscore the need for continuous refinement, expansion, and implementation of HAPs across India to enhance resilience against extreme heat, ensuring the protection of communities, particularly those most vulnerable to the escalating climate crisis.

While these plans have been developed at the state level, they often lack local, tailor-made assessments and targeted solutions to effectively address specific regional needs and vulnerabilities.

1.3 Understanding the Local Context: State and City Overview

Spanning 243,286 km^2, Uttar Pradesh is India's fourth-largest state, characterized by the fertile Gangetic Plain, which is vital for agriculture and sustains millions of livelihoods. However, the state's geographic and climatic conditions make it highly susceptible to extreme heat events. Over the years, average temperatures in Uttar Pradesh have risen, reflecting broader global climate trends and exacerbating the challenges of extreme heat.[11] Additionally, Uttar Pradesh holds the largest proportion of India's workforce, accounting for 19.3% of the total labor force as of 2022, underscoring its economic importance in the national context.[12]

One of the key cities in this state is Varanasi, also known as Benares, located in the eastern part of the state. As one of the oldest continuously inhabited cities in the world, Varanasi serves as a major cultural and spiritual hub, further highlighting the region's deep historical and social significance. The city is situated on the banks of the Ganges River and is known for its vibrant ghats and temples. Varanasi is a significant economic center due to its textile industry and attracts millions of tourists and pilgrims each year, contributing significantly to the local economy. The city is renowned worldwide for the Vishwanath Temple and Sarnath, attracting millions of visitors each year. Varanasi's high floating population, which refers to the transient group of people who temporarily reside in the city for tourism, pilgrimage, and business, makes it particularly vulnerable to heat risks. With the Kashi Vishwanath Temple alone witnessing over 2.86 crore (28.6 million) visitors in the first five months of 2024, according to Uttar Pradesh government data[13], the city's vulnerability is further amplified. The influx of visitors during peak seasons increases the strain on local infrastructure and health services, while the transient nature of this population makes it more challenging to implement effective heat resilience measures, putting both residents and visitors at greater risk during extreme heat events.

1.4 Climate Trends and Heat Vulnerabilities in Uttar Pradesh and Varanasi

The city of Varanasi experiences a humid subtropical climate and during the summer months temperatures often reach 45°C, leading to severe heat stress.[14] The summer season in Varanasi typically lasts from March to June, with the dry heat, known as "Loo," being particularly oppressive.[15] This period is marked by minimal rainfall, which exacerbates the heat conditions. Relative humidity in Varanasi varies significantly, peaking in August usually.[16] In 2024, Varanasi experienced an extreme heat event where the highest recorded temperature reached 47.2°C, which was the same as the highest temperature recorded in the past 140 years.[17] Rapid urbanization has led to increased temperatures due to the concentration of concrete structures and limited green spaces in the city.[18]

A well-designed HAP that integrates early warning systems, inter-agency coordination, and targeted community outreach, will provide a roadmap for reducing heat-related mortality and minimizing disruptions to economic activity. It will enable the city of Varanasi to move from reactive responses to long-term, climate-resilient strategies—building preparedness at every level, from households to health systems in the face of intensifying heat extremes.

1.5 Varanasi's Roadmap to Heat Resilience: Context, Goals, and Strategic Approach

The summer season in Varanasi typically lasts from March to June, with the dry heat, known as "Loo," being particularly oppressive.

Varanasi is an emerging economic hub with growing development potential. Its unique urban profile—marked by dense population clusters, informal settlements, and high footfall due to religious tourism—makes it particularly vulnerable to extreme heat. The following reasons outline why a tailored HAP is essential for building Varanasi's resilience to extreme heat.

- **High floating population & pilgrim footfall:** Varanasi, home to the Kashi Vishwanath temple and a major religious hub, sees a massive influx of pilgrims and tourists. This high floating population, often unacclimatized to extreme heat and coming from different climatic regions of India, increases the risk of heat-related illnesses and fatalities.
- **Rising temperature trends & extreme heat events:** Varanasi has been experiencing rising temperatures and prolonged heatwaves.[19] With climate change intensifying extreme heat events, the city's population—especially vulnerable groups such as the elderly, children, outdoor workers, and informal sector laborers—is at heightened risk.
- **Livelihood risks for informal & outdoor workers:** A large portion of Varanasi's workforce is engaged in outdoor occupations, including street vendors, construction workers, rickshaw pullers, and boatmen along the Ganges. Prolonged exposure to extreme heat impacts their health, productivity, and livelihoods, making targeted heat adaptation measures critical.
- **Cultural & economic significance:** As a spiritual and cultural hub, Varanasi's economy heavily relies on tourism, religious pilgrimages, and artisanal industries. Extreme heat can deter visitors, disrupt local businesses, and affect the city's economic stability. Implementing a robust HAP will help ensure the well-being of both residents and visitors while sustaining the city's economy.

1.5.1 Rationale for developing Urban Local Body (ULB) level heat action plan

In November 2024, NRDC India, Indian Institute of Public Health Gandhinagar (IIPHG) and Mahila Housing Trust (MHT) co-organized a consultation with Varanasi Nagar Nigam (VNN) and Varanasi Development Authority (VDA) to initiate a dialogue on the development of a local HAP (Photo). The consortium was organized with relevant stakeholders from Kashi Vishwanath Temple Trust, Office of Chief Medical Officer, VNN & VDA. The aim was to engage directly with the people of Varanasi, capture their lived experiences, and collaboratively shape solutions that could be integrated into the HAP to drive meaningful change.

Images: NRDC India

Photo : Multi-Stakeholder Consultation for the Varanasi HAP in November 2024 along with IIPHG & MHT

The key takeaways from the consultative discussion were:

- **Transient and urban poor populations are highly vulnerable:** Varanasi's large influx of daily pilgrims—mostly from outside the city—along with urban poor and informal workers face heightened heat stress due to poor access to cooling, water, and shelter. Vulnerability begins at transport hubs like train stations and extends to densely populated slum areas and occupational hotspots.

- **Community based cooling and health interventions are crucial:** Temple authorities and the Health Department have initiated context-specific interventions like cold water stations, Oral Rehydration Solution (ORS) booths, tensile structures, mist fans, and medical facilities. Accredited Social Health Activists (ASHA) workers play a vital role in health outreach and awareness among vulnerable groups.

- **Prevention and awareness are more effective than reactive responses:** The need to prioritize early warning systems, hydration awareness, and community engagement was emphasized over solely relying on treatment. The use of loudspeakers and communication in high-footfall areas was suggested to improve preparedness.

- **Urban planning and green infrastructure must be strengthened:** Heat mitigation requires long-term planning, including green belts and expansion of urban forestry. These contribute to reducing heat island effects and improving microclimates in congested city areas.

- **Scientific and equitable solutions are essential:** From vulnerability assessments at hotspots (like bus/train stations) to recognizing the economic infeasibility of providing universal air conditioning, there's a need for scalable, science-driven, and equitable cooling strategies. Tailored solutions for vulnerable groups—such as bunkers (poorly ventilated homes in dense slums) and weaving households (families operating looms in confined spaces)—must be integrated into Varanasi's HAP. These communities face heightened heat risks and require focused interventions to ensure effective protection.

ULBs play a crucial role in the successful implementation of HAPs as they coordinate with multiple departments, ensuring a localized and integrated approach. Heat resilience requires interventions across sectors, including health, disaster management, infrastructure, water supply, and urban planning, all of which fall within the purview of city governance. By leveraging their position as key coordinators, ULBs can develop hyperlocal, data-driven strategies that not only protect public health but also enhance the city's overall resilience.

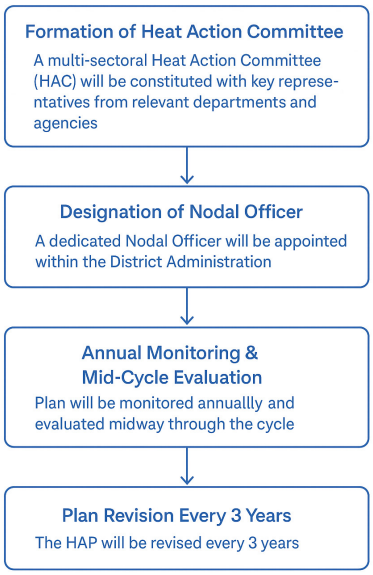


Figure 1: Framework for the Varanasi HAP

1.5.2 Approach for Varanasi Heat Action Plan

In Uttar Pradesh, heatwaves are officially recognized as a state-specific disaster. Building on this, the Varanasi Heat Action Plan (HAP) will follow a multi-stakeholder, institutionalized approach, rooted in scientific evidence and participatory planning. The plan will be locally owned, implemented, and continuously strengthened through the following framework. (Fig 1):

- **Formation of a heat action committee**: A multi-sectoral Heat Action Committee (HAC) will be constituted with key representatives from relevant departments and agencies (Table 1).

Commissioner, Varanasi Division	Chairman
Varanasi Municipal Commissioner	Member
Varanasi MPs	Member
Varanasi MLAs	Member
Mayor, VNN	Member
District Magistrate, Varanasi	Member
Additional District Magistrate (Finance and Revenue)	Member
Vice Chairman, Varanasi Development Authority	Member
Chairman, Kashi Vishwanath Temple Trust	Member
Nodal Officer, Heat Action Plan, VNN	Member
Chief Municipal Health Officer, VNN	Member
Scientist F & Head, India Meteorological Department, Lucknow	Member
Chief Medical Officer, Varanasi	Member
General Manager, Jal Kal Vibhag, VNN	Member
Chief Engineer, VNN	Member
Member of Legislative Council, Varanasi	Member
Ward Councilor (High Risk Ward)	Member
Conservator of Forests (Forest Department)	Member
Vice Chancellor, BHU	Member
Fire Department	Member
Chairman, PuVVNL	Member
Department of Women and Child Development, UP	Member
Labor Department	Member
District Inspector of School, Varanasi	Member
Chief Veterinary Officer, Animal Husbandry	Member
Agriculture Department	Member
Transport Department	Member
Varanasi Traffic Police	Member
National Disaster Response Force, Varanasi	Member
Department of Ayush, Varanasi	Member
NRDC	Member
MHT	Member
IIPHG	Member

Table 1: Heat Action Committee Task force table for Varanasi

- **Designation of a nodal officer**: A dedicated Nodal Officer will be appointed within the District Administration to: coordinate implementation of the HAP, ensure department-level integration and monitor and report progress
- **Annual monitoring & mid-cycle evaluation**: The Heat Action Committee shall convene before the onset of each heat season in February/March, meet fortnightly during the heat season to monitor and coordinate implementation, hold emergency meetings upon the issuance of heatwave alerts to assess on-ground actions, and reconvene post-summer in July/ August for a comprehensive evaluation of the response.
- **Plan revision every three years**: The HAP will be revised every 3 years based on new climate data, vulnerability assessments, and feedback from stakeholders. Revisions will align with evolving national/state climate and health frameworks.

Image: Pexel.com

2. Temperature Trends & Heat Vulnerability Risk Assessment (HVRA)

2.1 Localized Climate Insights for HAPs

Most HAPs in India currently lack detailed, sub-city-level analyses of vulnerable populations, which significantly limits their effectiveness in directing interventions. A 2023 study by the Centre for Policy Research (CPR), which reviewed 37 HAPs across various administrative levels, found that only two had conducted explicit vulnerability assessments.[20] This gap leaves implementers without the necessary data to allocate resources effectively to those most at risk. To strengthen Varanasi HAP, a comprehensive data-driven approach has been adopted. This includes an analysis of historical temperature trends using a reanalysis dataset (ERA5) spanning 1980 to 2024, focusing on the months of March through July (MAMJJ), the hottest period in Varanasi. The inclusion of June and July also accounts for elevated humidity levels that significantly compound heat stress.

2.1.1 Mapping Climatology of Varanasi

To evaluate trends in both daytime and nighttime heat extremes in Varanasi, air temperature (ERA5) reanalysis data is utilized to understand the historical trends. The analysis of temperature alongside humidity is essential for Varanasi, due to its humid subtropical climate characterized by hot summers.

To understand better the humid heat months, we used the NOAA (National Oceanic and Atmospheric Administration) Heat Index (HI) formula, which incorporates air temperature and relative humidity to estimate perceived temperature.[21] This formula is widely used for assessing heat stress in climatological and public health research.[22]

Between 1980 and 2024, Varanasi experienced an approximate increase in the mean temperature of 0.75°C during MAMJJ (Fig 2). Studies have reported similar temperature rises in other parts of the Indo-Gangetic Plan, with anthropogenic climate change playing a significant role.[23] In Figure 2 we see the heat index trend significantly steeper than the mean temperature trend, suggesting the rising temperature and humidity levels which exacerbate heat stress, leading to amplified thermal discomfort.

Analysis of historical minimum temperature (Tmin) for similar time-period and season reveals a significant upward trend as well (Fig 3). The overall increase has been ~ 0.52°C since 1980. This rise in minimum temperature is particularly concerning since it suggests a reduction in nocturnal cooling (night-time cooling), leading to minimal relief in turn exacerbating heat risks.[24] Research has linked prolonged exposure to high Tmin levels with an increased incidence of heat- related illness, because the body cannot recuperate from daytime heat stress at night as well.[25]

Between 1980 and 2024, Varanasi experienced an approximate increase in the mean temperature of 0.75°C during MAMJJ.

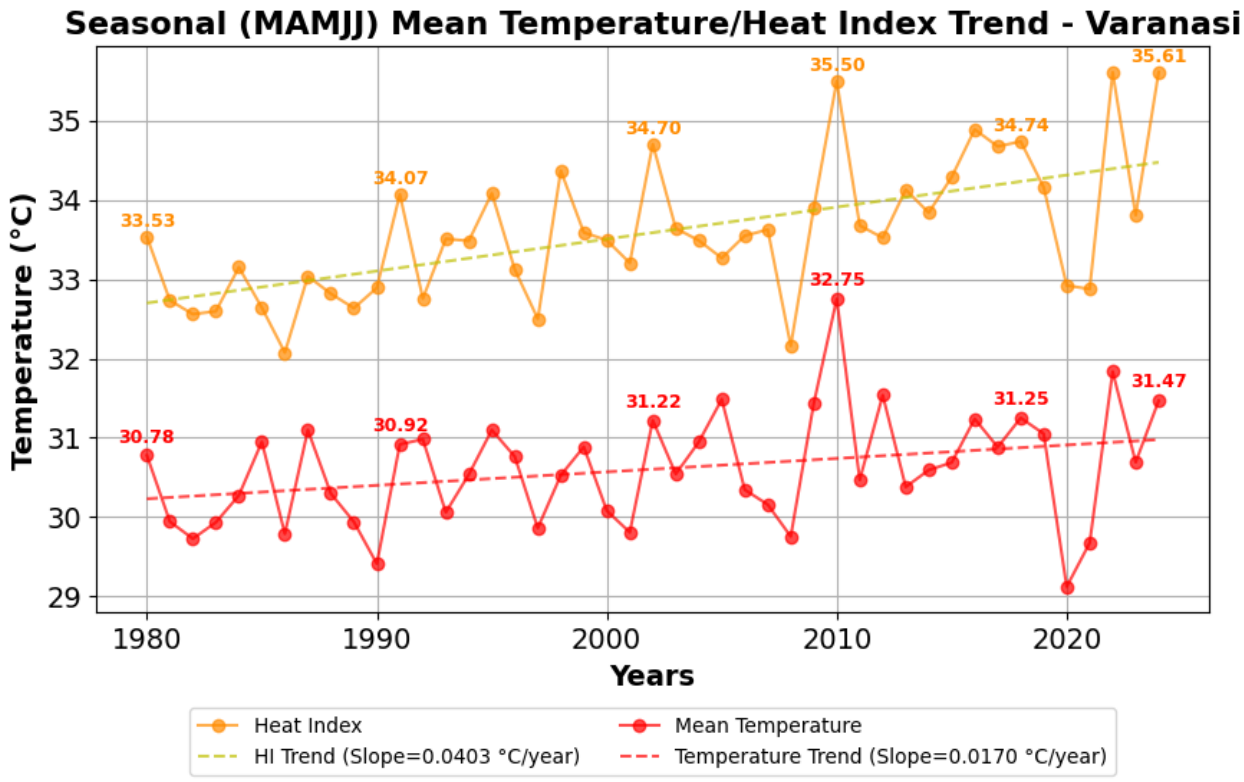


Figure 2: Seasonal – March to July (MAMJJ) Heat Index & Mean Temperature for Varanasi (1980-2024)

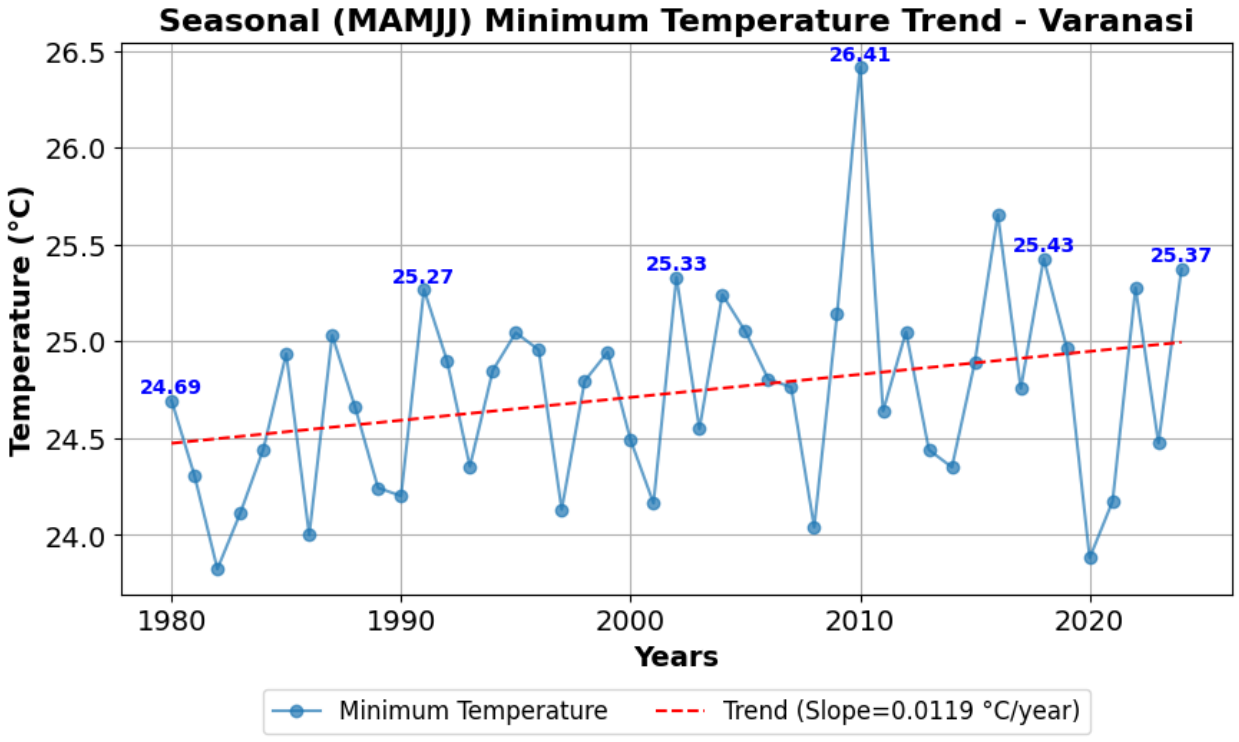


Figure 3: Seasonal – March to July (MAMJJ) Minimum Temperatures in Varanasi from 1980-2024

2.2. Climate Change Projections: Analysis of RCP 8.5 Scenarios

In addition to historical analysis, future climate projections for the period 2025–2050 are examined to anticipate and prepare for evolving heat risks. Adopted by the IPCC, Representative Concentration Pathways (RCPs) are trajectories of greenhouse gas concentrations meant to characterize potential climate pathways. Originally described as a "business-as-usual" scenario, RCP 8.5 now seems to be at the higher end of emissions paths characterized by continued increase resulting in more warning outcomes, according to recent studies.[26]

Adopted by the Intergovernmental Panel on Climate Change (IPCC), Representative Concentration Pathways (RCPs) are trajectories of greenhouse gas concentrations meant to characterize potential climate pathways

2.2.1 Climate Models and Projection Methodology

The temperature projections shown in Figure 4 uses three global climate models from the Coupled Model Intercomparison Project Phase 6 (CMIP6).[27] The projections' data came from the Copernicus Climate Data store, specifically from the cohort of CMIP6 dataset. The baseline period of 1980–2000 was used to compute temperature anomalies. This baseline is the reference period against which future temperature changes are measured. The anomaly method allows for a clearer picture of the warming trend independent of seasonal variations.[28]

2.2.2 Analysis of the Temperature Trends

The figure below illustrates historical temperature anomalies from 1980 to 2014, along with projected anomalies for the period 2015 to 2049 under the RCP 8.5 climate scenario (Fig 4). The historical record shows variable temperature anomalies typically ranging from 0.1°C to 1.8°C above the baseline, with significant inter-annual variability. From 2015, the projections then exhibit a noticeable warming trend. Temperature anomalies are predicted to rise steadily, reaching nearly 2.5–3.5°C above the baseline by the 2040s. By 2049, the projections suggest Varanasi could experience temperature anomalies of up to 4.0°C above the baseline. The shaded area indicates inter-model spread (10th–90th percentiles), a measure of uncertainty in projected anomalies arising from differences among climate models under the RCP 8.5 scenario.

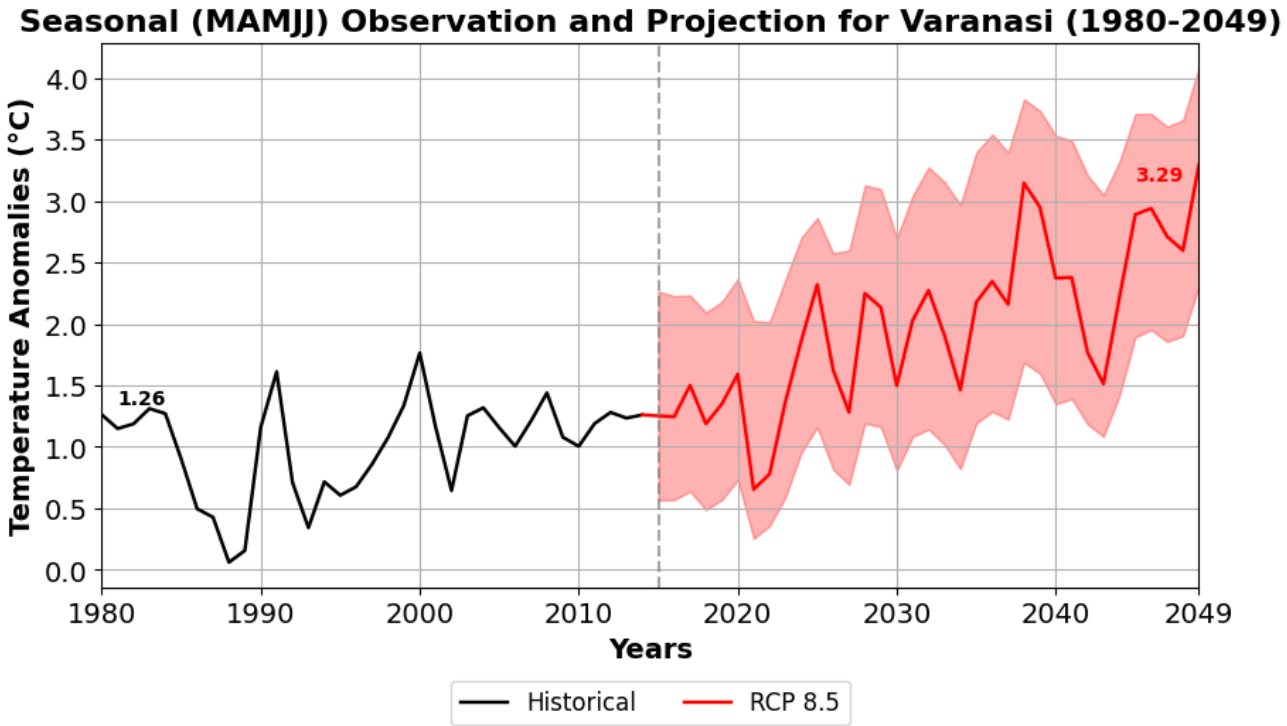


Figure 4: CMIP6 Mean Temperature projections for Varanasi (1980–2050). The black line shows the historical simulation, and the red line indicates future projections for RCP 8.5 scenario.

These projected temperature increases under RCP 8.5 have profound implications for heat-related health risks, energy demand, water resources, and agricultural productivity in Varanasi which is why it is important to address these risks through multi- sectoral coordinated preparedness, response and mitigation plan.

2.3 Heat Vulnerability Risk Assessment (HVRA)

For assessing the heat vulnerability of Varanasi, three critical factors are considered: exposure, sensitivity, and adaptive capacity (Fig 5). These factors are assessed based on their theoretical relevance to heat vulnerability, literature studies, and available data. The IPCC Sixth Assessment Report defines vulnerability as "the propensity or predisposition to be adversely affected," encompassing both sensitivity to harm and the inability to cope or adapt.[29] To effectively analyze vulnerability, a commonly used approach is the development of vulnerability indices that integrate socio-economic, environmental, and infrastructural elements. This spatial analysis allows for the identification of regions with varying vulnerability levels, from most to least affected. Such indices enable policymakers to implement targeted strategies in climate risk management and adaptation, ensuring that interventions are tailored to the specific needs of the most vulnerable areas.

Exposure refers to the extent to which communities experience elevated temperatures and heat stress. It has been assessed through specific parameters namely land surface temperature (LST), population density.

Sensitivity represents the degree to which the community is susceptible to the adverse effects of heat. The parameters adopted for assessing sensitivity are number of slum households, illiteracy rate, land use land cover, built-up area.

Adaptive capacity reflects the community's ability to respond, cope and acclimatize to adverse heat stress. The parameters adopted for assessing adaptive capacity are access to parks, access to urban health centers, access to water bodies, water index, vegetative index, access to road.

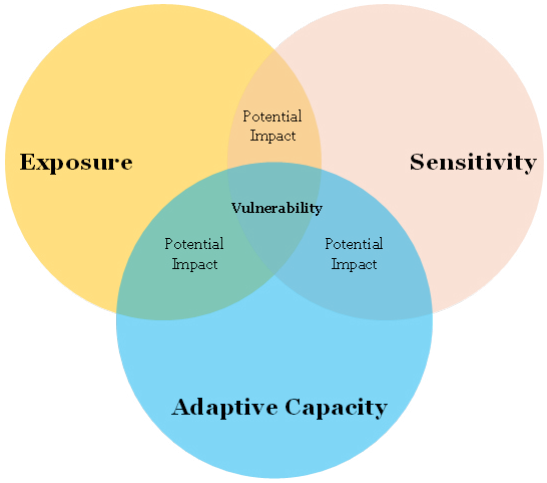


Figure 5: Heatwave Vulnerability Assessment Framework

2.3.1 Selection of Parameters for Exposure, Sensitivity, and Adaptive Capacity

A detailed overview of the selected factors and their corresponding parameters for heat vulnerability risk assessment in Varanasi is provided in the table below:

Factors	Sr No.	Parameters	Units	Resolution	Data Period	Source
Exposure	1	Land Surface Temperature	°C (Celsius)	Ward-level	2015-2024	USGS
	2	Population Density	No. of persons per square km	Ward-level	2011	Census
Sensitivity	3	No of Informal Settlements	No. of slums per square km	Ward-level	2011	VNN
	4	Illiteracy Rate	No. of illiterate persons per square km	Ward-level	2011	Census
	5	Built-Up Index (NDBI)	Built –up area/total ward area	Ward-level	2024	USGS
	6	Land Use	Major Land Use Classification in the ward	Ward-level	2024	USGS
Adaptive Capacity	7	Access to Urban Health Centers	Percentage area within 300m of a Health Center	Ward-level	2024	GIS + VNN

Factors	Sr No.	Parameters	Units	Resolution	Data Period	Source
	8	Access to Parks	Percentage area within 300m of a Park	Ward-level	2024	GIS + VNN
	9	Normalized Difference Vegetation Index (NDVI)	Vegetated area/total ward area	Ward-level	2024	USGS
	10	Access to Water Bodies	Percentage area within 300m of a Water Body	Ward-level	2024	USGS
	11	Access to Roads	Km length of the roads/ Area of the ward	Ward-level	2024	GIS + VNN

Table 2: Selected Parameters for Heat Vulnerability Risk Assessment in Varanasi

2.3.2 Results of the Heat Vulnerability Risk Assessment

Varanasi is divided into 90 wards. To determine the Heat Vulnerability Risk Assessment score for each ward, composite indices for exposure (Fig 7), sensitivity (Fig 8), and adaptive capacity (Fig 9) were first developed. These were then combined using the equation below to assess the overall vulnerability of each ward using the following equation (Fig 6):

Figure 6: Schematic Representation of Heat Vulnerability Function

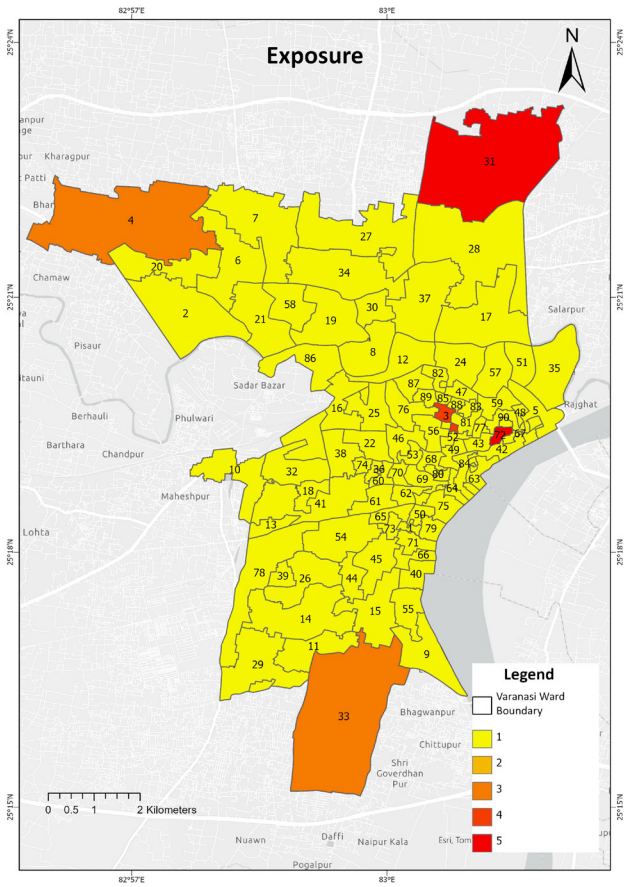


Figure 7: Exposure Composite {Color Scale: yellow – 1 (lowest) to dark red –5 (highest)}

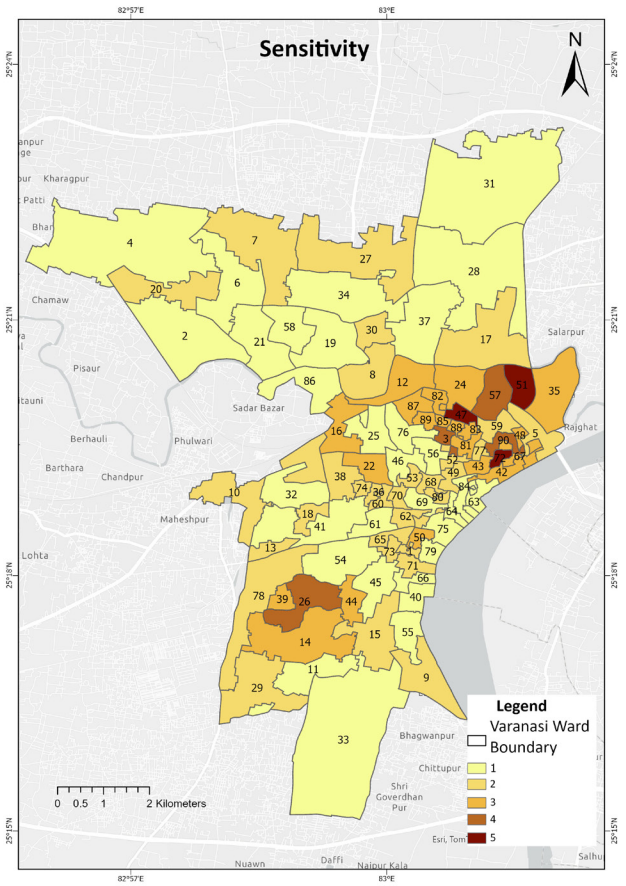


Figure 8: Sensitivity Composite {Color Scale: pale yellow – 1 (lowest) to dark brown –5 (highest)}

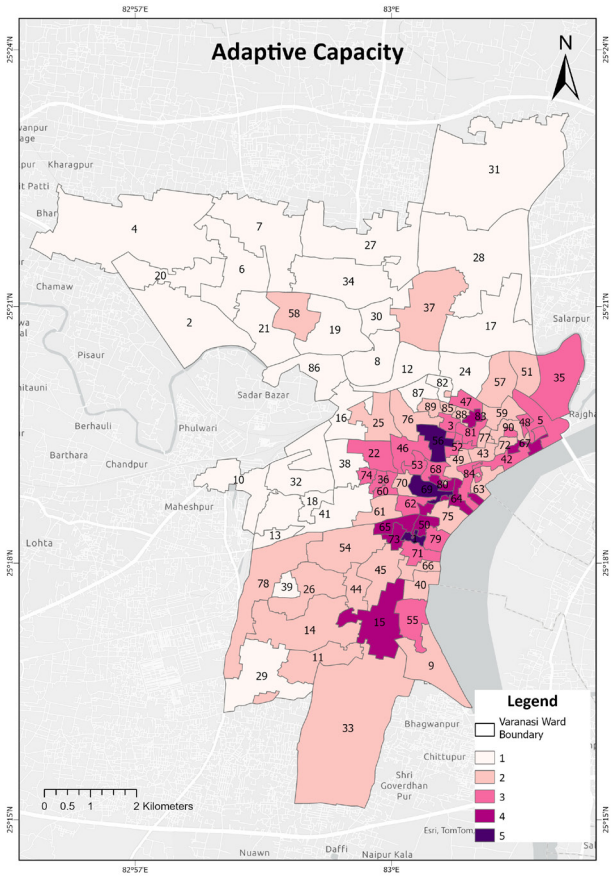


Figure 9: Adaptive Capacity composite {Color Scale: white– 1 (lowest) to violet –5 (highest)}

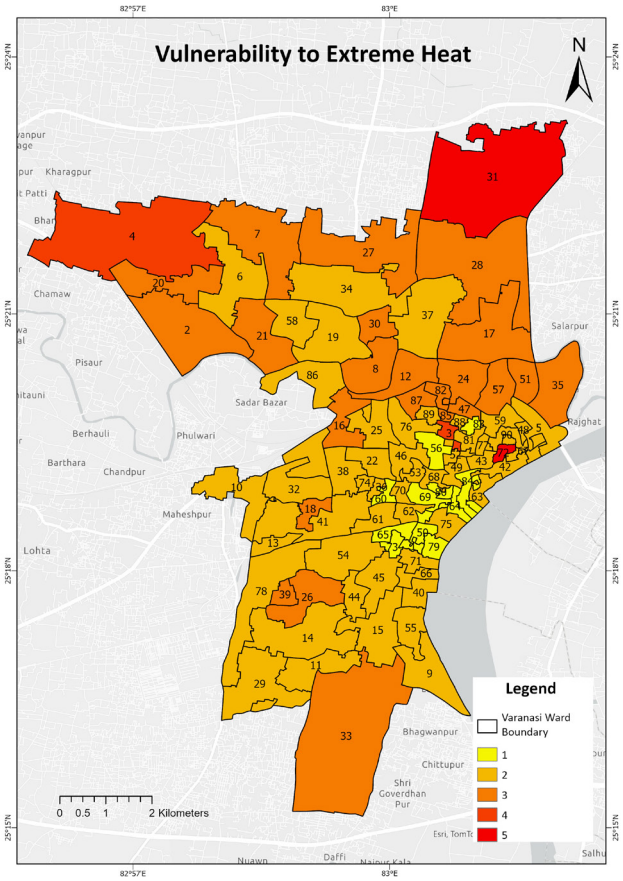


Figure 10: Heat Vulnerability Index Map {Color Scale: yellow – 1 (lowest) to dark red –5 (highest)}

Category	Score	Ward Nos.
High	5	3- Laharta 4- Shivpurwa 31- Nariya 72- Pan Dariwa
Moderate	3-4	2, 5, 6, 8, 10, 12, 13, 14, 16, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 30, 32, 33, 34, 35, 37, 39, 40, 42, 43, 44, 45, 46, 48, 49, 51, 52, 53, 54, 57, 58, 59, 60, 62, 63, 68, 69, 73, 74, 76, 77, 81, 82, 87, 89, 90
Low	1-2	56, 60, 65, 79, 80, 83, 84, 91

Table 3: Risk-Based Categorization of wards in Varanasi based on Heat Vulnerability Assessment

Ghats in Varanasi are a series of riverfront steps leading down to the banks of the Ganga River, serving as vital sites for religious rituals, cultural activities, and tourism.

The ward-level analysis reveals varied levels of heat-related vulnerability (Fig 11). Ward 3 and Ward 72 are characterized by high exposure, high sensitivity and lower adaptive capacity, indicating that residents in these areas face significant risks without sufficient resources or infrastructure to cope. Similarly, Ward 4 & 31 show high levels of exposure and low adaptive capacity, making it particularly susceptible to the adverse effects of extreme heat and thus, suggesting a pressing need for targeted interventions.

Notably, ward areas situated near the ghats (Fig 10)—such as those along the riverfront—warrant special attention due to the large and transient tourist population. Ghats in Varanasi are a series of riverfront steps leading down to the banks of the Ganga River, serving as vital sites for religious rituals, cultural activities, and tourism. These locations experience a continuous influx of pilgrims and visitors, which not only increases the overall exposure but also complicates mitigation and response efforts. Tailored strategies in these wards are essential to address the unique challenges posed by both the resident and floating populations.

2.3.3 Heat Stress Preparedness for Crowded Zones of the city

Varanasi attracts over 3 million tourists annually, significantly boosting its floating population.[30] Key sites such as Kashi Vishwanath, Sarnath, Kaal Bhairav, and several ghats like Dashashwamedh and Manikarnika witness high footfall, especially during pilgrimage seasons. The city's 84 historic ghats along the Ganga, integral to its identity and tourism economy, include Manikarnika Ghat, which remains active with cremation rituals day and night. Despite its religious importance, overcrowding and poor maintenance accelerate its deterioration, exacerbating heat vulnerability for visitors, particularly those unacclimatized to the extreme heat. Therefore, it is crucial to implement effective crowd safety and heat stress preparedness measures in these areas.

Key sites such as Kashi Vishwanath, Sarnath, Kaal Bhairav, and several ghats like Dashashwamedh and Manikarnika witness high footfall, especially during pilgrimage seasons.

- **Improving awareness**: Temperature details, early warnings and heatwave advisories indicating do's and don'ts should be displayed on all the crowded places and major ghats such as Dashashwamedh, Harish Chandra, Manikarnika, Panchganga, and Assi Ghat. These can be communicated through distribution of leaflets, posters, digital messages, display boards at ghat entry points, announcements. Boat operators, ghat workers, shopkeepers along with the local community should be engaged to conduct awareness drives. Awareness campaigns should also be organized at the locations concentrated with hotels, guest houses and key entry/exit and transit points such as bus stops, railway stations, toll booths, airports etc. This will help in reaching the floating population effectively.

- **Improving physical infrastructure:** Provide adequate shade, access to drinking water, misting, mats, german hangers, reflective paints, cool roofing, white pavements and constructing/converting existing structures into cooling stations in crowded places and ghat premise areas. Encourage and facilitate boat operators to install shaded covers at times of extreme heat.

- **Operation hours:** To prevent heat stress, encourage people to engage in outdoor activities during early morning (before 10:30 AM) and late evening hours (after 4:30 PM).

- **Setting up of emergency medical units:** Temporary booths should be established at ghats in coordination with local health department equipped with heat relief kits, ORS, and staffed by trained medical attendants. Deploy volunteers and first responders trained in heat stress response.

- **Crowd management plan:** Deploy crowd control measures particularly during peak heat hours to handle overcrowding and improve the safety of people. A crowd management plan to be prepared and implemented which shall include venue assessment, risk analysis, infrastructure planning, clearly defined stakeholder responsibilities, and emergency response protocols.

- **Monitoring and evaluation:** Undertake post-heat review meetings to evaluate the effectiveness of implemented heat preparedness and response strategies. Involve the community, devotees, tourists, and volunteers to assess their experiences and identify gaps. Document findings and update the HAP based on the feedback received.

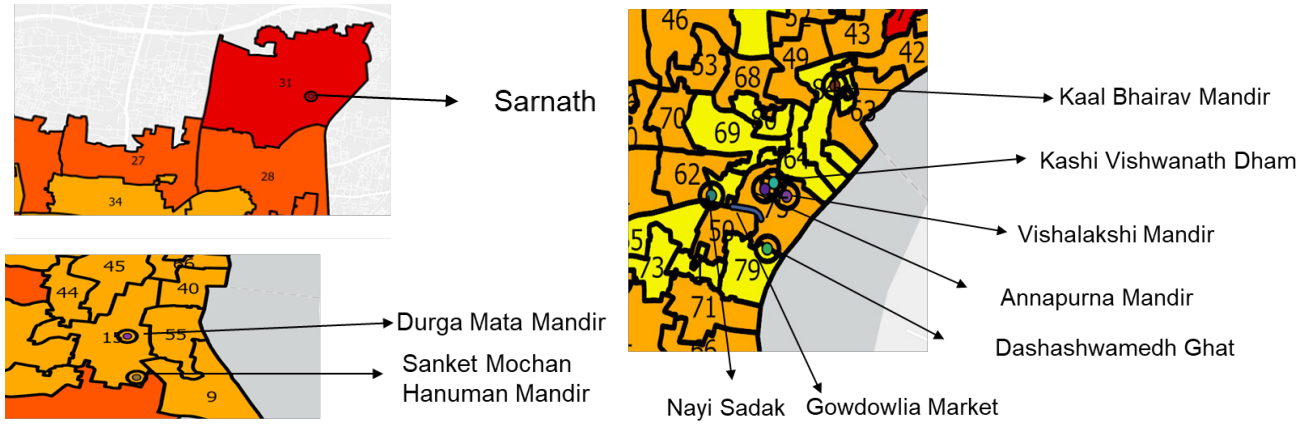


Figure 11: Ward-level Identification of Crowded Places in Varanasi


पंचगंगा घाट
PANCHGANGA GHAT
FRONTLINE

3. Preparedness and Response Plan

The Uttar Pradesh State Disaster Management Authority (UPSDMA) has adopted a percentile-based approach to set heat-health warning thresholds across districts in the state

Based on the analysis and findings in the previous chapters, it is clear that there has been a significant temperature rise in Varanasi since the 1980s. Further, based on heat vulnerability analysis, it is observed that certain wards of the city are more prone to heat stress than others. Therefore, it is imperative to execute a targeted approach for heatwave mitigation at the municipal/ward/local level. This chapter of the HAP outlines the early warning system and alert mechanism, inter-agency coordination, and information-education-communication measures.

3.1 Early warning system and alert mechanism

The Uttar Pradesh State Disaster Management Authority (UPSDMA) has adopted a percentile-based approach to set heat-health warning thresholds across districts in the state, using the 75th, 85th, and 95th percentile values of maximum temperatures over the summer season (March to June) as the basis for yellow, orange, and red alert levels, respectively.[31] However, for the purposes of this Heat Action Plan, we will adopt the localized thresholds provided by IMD, as they account for a broader range of factors—including the duration of the heat event, humidity levels, wind speed, and prevailing climatological trends—making them more responsive to local conditions and public health risk.

IMD issues following colour code impact-based heat warning (Table 4).

Colour Code	Alert	Warning	Impact	Suggested Actions
Green (No action)	Normal Day	Maximum temperatures are near normal	Comfortable temperature. No cautionary action required	Normal day-to-day activities can continue without special precautions.
Yellow Alert (Be Updated)	Heat Alert (Maximum temperature between 40-43°C or departure from normal is 4.5-6.4°C)	Heat wave conditions at isolated pockets which persists on for 2 days	Moderate temperature. Heat is tolerable for general public but moderate health concern for vulnerable people e.g., infants, elderly, people with chronic diseases	a) Avoid heat exposure; b) Wear light-coloured, loose, cotton clothes; c) Cover your head; d) Use a cloth, hat, or umbrella
Orange Alert (Be prepared)	Severe Heat Alert for the day (Maximum temperature between 44-46°C or departure from normal is ≥6.5°C)	a) Severe Heat wave conditions persist for 2 days b) Though not severe, but Heat wave persists for 4 days or more	High temperature. Increased likelihood of heat illnesses symptoms in people who are either exposed to sun for a prolonged period or doing heavy work. High health concern for vulnerable people e.g., infants, elderly, people with chronic diseases	a) Avoid heat exposure – keep cool, avoid dehydration b) Drink sufficient water – even if not thirsty c) Use ORS, homemade drinks like lassi, torani (rice water), lemon water, butter milk, etc., to keep yourself hydrated
Red Alert (Action Req.)	Extreme Heat Alert for the day (Maximum temperature ≥47°C)	a) Severe Heat Wave persists for more than 2 days b) Total number of heat/severe Heat wave days exceeding 6 days	Very high likelihood of developing heat illnesses and heat stroke in all ages	Extreme care needed for vulnerable people

Table 4: IMD Color Code Heat Warning Framework

3.2 Inter-agency coordination chart (for dissemination of alerts and warnings)

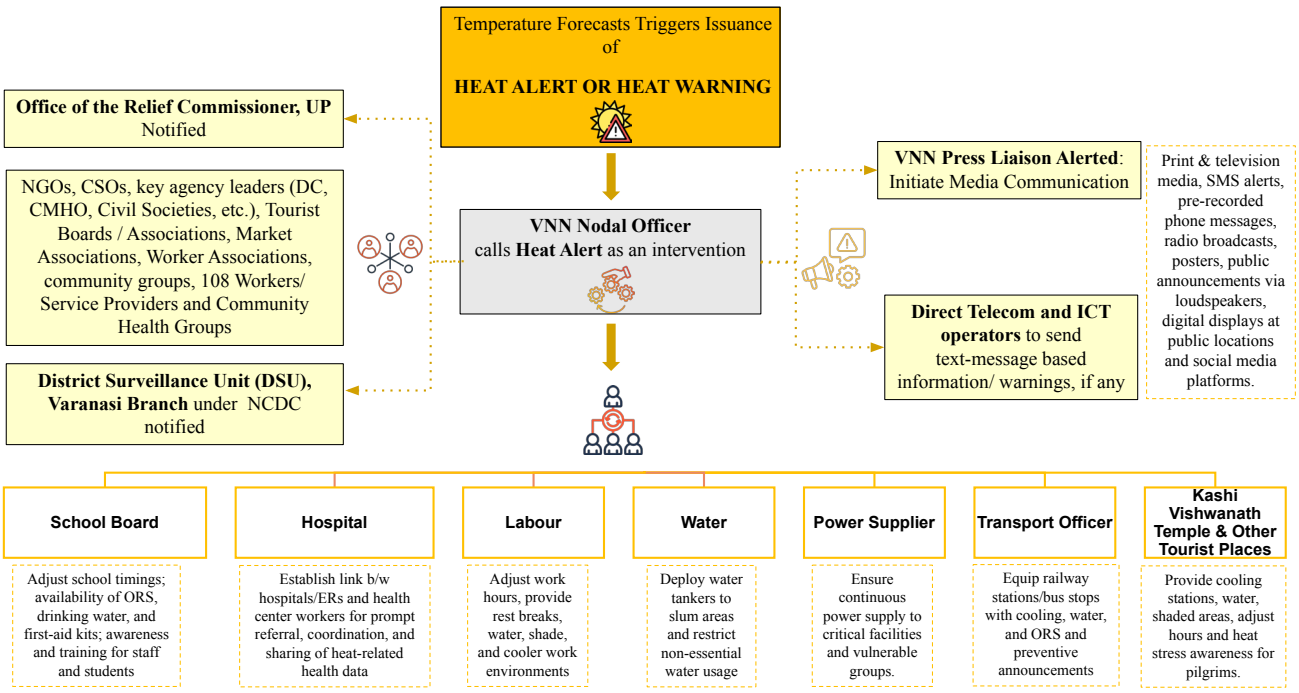


Figure 12: Interagency Coordination Plan when Varanasi Nagar Nodal Officer Activates Alerts

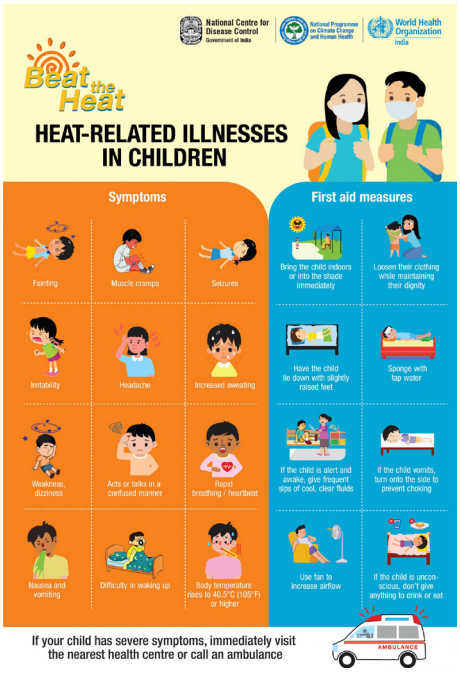
VNN shall designate a Nodal Officer to lead the overall coordination and effective implementation of the HAP (Fig 12). The Nodal Officer shall facilitate communication and coordinate actions before, during, and after heat events, and will ensure the provision of support staff for HAP-related activities through the Nodal Office as needed.

3.3 Information, education and communication strategies [32]

In this section, we provide essential Information, Education, and Communication (IEC) materials designed to prepare alerts for vulnerable populations and support outreach efforts. These materials have been integrated from the National Centre for Disease Control (NCDC), UPSDMA and the Government of Uttar Pradesh ensuring that the resources are tailored to address heat impacts effectively.

IEC Material in English

a) IEC-Heat related illnesses in Children

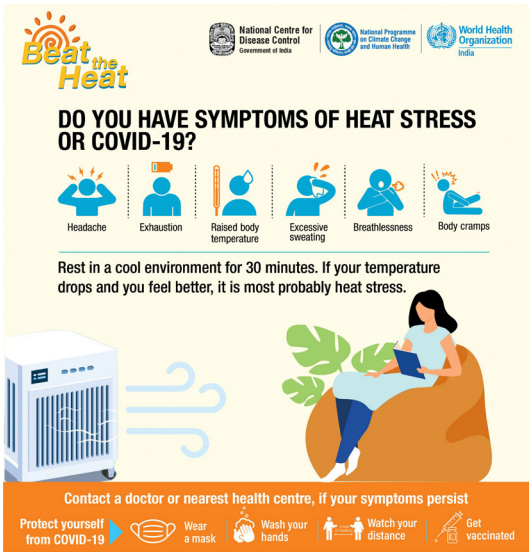


Source: NCDC

b) Beat the Heat – Do's & Don'ts

Source: NCDC

c) Clarifying symptoms of COVID-19 and Heat Stress

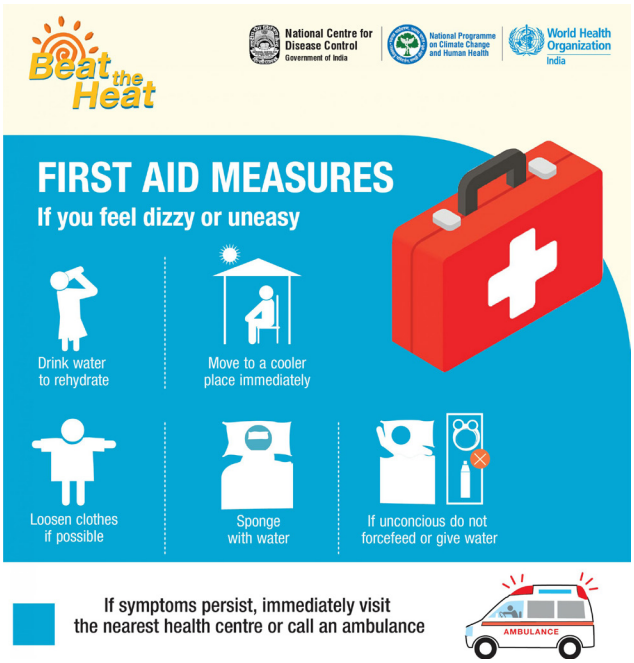


Source: NCDC

d) Safeguard Workers from the Heat

Source: NCDC

e) First Aid Measures



Source: NCDC

f) Safeguard yourself from the Heat

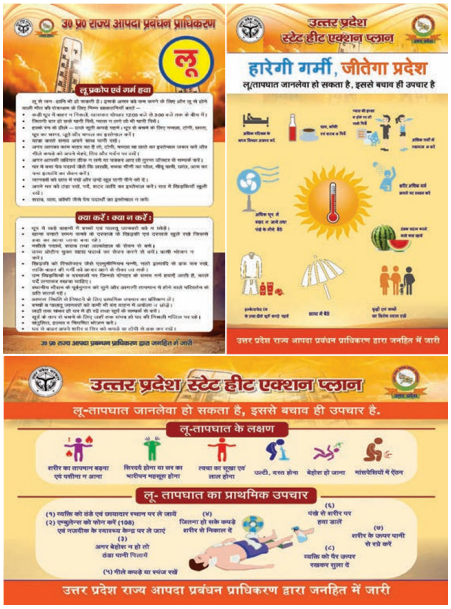
Source: NCDC

IEC Material in Hindi

a) Do's and Don'ts

Source: UPSDMA

b) Do's and Don'ts



Source: UPSDMA

c) Symptoms of Heat Related Illness

Source: UPSDMA

4. Heat Risk Mitigation Measures

Solutions include promoting sustainable urban planning, expanding green spaces, advancing climate-friendly cooling technologies, and integrating heat risk considerations into infrastructure development.

In Uttar Pradesh, heatwaves are officially recognized as a state-specific disaster. As a result, the State Disaster Mitigation Fund (SDMF), established under Section 48(1)(c) of the Disaster Management Act, 2005, can be allocated for mitigation projects targeting heat-related risks. The SDMF supports initiatives under the State Disaster Response Fund (SDRF), the National Disaster Response Fund (NDRF), and state-notified local disasters, enabling focused investments to strengthen resilience against extreme heat.[33]

To address the escalating impacts of heat, there is a growing need for long-term mitigation measures that tackle root causes such as urban heat islands, inadequate housing, and unequal access to cooling. Solutions include promoting sustainable urban planning, expanding green spaces, advancing climate-friendly cooling technologies, and integrating heat risk considerations into infrastructure development. These actions are crucial for reducing vulnerability, particularly among high-risk communities. Regular post-season evaluations and updates to the HAP will further enhance its effectiveness.

While long-term strategies are critical, immediate threats from extreme heatwaves can severely disrupt essential services. Therefore, coordinated action between government agencies, civil society organizations (CSOs), and local institutions is vital for effective preparedness and response. Strong intra- and inter-departmental coordination, timely early warning systems, and grassroots capacity building are key to protecting vulnerable populations and maintaining service continuity during heat events.

The following table presents the stakeholder responsibility matrix, outlining roles and strategies for heat preparedness, response, and mitigation across municipal, district, and state levels, along with implementation timelines and funding sources.

PREPAREDNESS, RESPONSE AND MITIGATION STRATEGIES										
Sl. No	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
PREPAREDNESS & RESPONSE										
1	Cooling Stations	Convert/Construct/Access existing structures into cooling stations by ensuring adequate shade, access to drinking water, and cooling facilities. Large public spaces such as malls, bus terminals, and railway stations can be temporarily repurposed as cooling centres in preparation for forecasted heatwaves.	Short-term, Long-term	Varanasi Nagar Nigam, Kashi Vishwanath Temple Trust	Pre Heat & Heat Season		Municipal funds, Kashi Vishwanath Temple Funds	-	-	MP/MLA funds
2	Special focus on crowded places - Kashi Vishwanath, Ghat, Sarnath, Kaalbhairav, Sankatmochan, Durgakund, Annapurna, Gowdowlia, and Nayi Sadak.	Provide with drinking water, ice packs, cooling centers, reflective paints, shaded pathways, german hangers, mats, green net, high pressure mist fans, emergency medical units in crowded places. Deploy trained volunteers and first responders. Crowd Management Plan to be devised for such areas. Promotion of VR-based darshan services for old age and vulnerable populations	Short-term	Varanasi Nagar Nigam, Kashi Vishwanath Temple Trust	Pre Heat & Heat Season		Municipal funds, Kashi Vishwanath Temple Funds	-	-	PRASHAD Scheme
3	IEC campaigns/ Capacity Building/ Workshops	Planned campaigns for dissemination of information via phones, posters, banners, signage, public speakers, LED TV displays at public places, pre-record messages, telephone heat hotline, social media posts with extreme heat warnings in vernacular languages. Set up public display of temperatures in wards at higher risk. Workshops at ward level for citizens, community leaders on heat stress management and prevention. Special campaigns for police personnel, traffic police, fire department workers, logistics workers, construction workers, school staff & children, Anganwadi workers, ASHA workers, volunteers etc.	Short-term, Long-term	Varanasi Nagar Nigam, Kashi Vishwanath Temple Trust, Uttar Pradesh State Disaster Management Authority, Health and Family Welfare Department, Police Department, Fire Department, Labor Department, Education Department	Pre Heat & Heat Season		Municipal funds, Kashi Vishwanath Temple Funds	-	-	-
4	Public drinking water	Construct permanent or temporary drinking water kiosks at public locations to help prevent dehydration during the heat season.	Short-term	Varanasi Nagar Nigam, Kashi Vishwanath Temple Trust	Pre Heat Season		Municipal funds, Kashi Vishwanath Temple Funds	-	-	MP/MLA funds

PREPAREDNESS, RESPONSE AND MITIGATION STRATEGIES										
Sl. No	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
5	Cool Roof	Buildings of government, KV Temple premises, educational, healthcare facilities, residential buildings, commercial spaces to have cool roof coatings to regulate indoor temperatures.	Short-term	Varanasi Nagar Nigam	Pre-Heat Season		Municipal funds	-	-	-
6	Healthcare facilities	Dedicated wards for heat related illnesses. Develop school health program. Primary health centres, emergency centres, ambulances, and hospitals to be well-equipped for the treatment of heat-related illnesses, ensuring comprehensive healthcare support. Veterinary hospitals should be stocked with adequate medical supplies. Communicate information on tertiary care and 108 service. Prepare handouts for paramedics on heat illness management with focus on vulnerable group - Elderly, Infants and young children, Pregnant and lactating women, People with pre-existing medical conditions. Establish a Dynamic Strategic Deployment Plan for ambulances to ensure timely response. Ensure an adequate supply of intravenous fluids at health facilities. Share relevant data with key agency leaders for informed decision-making.	Short-term, Long-term	Varanasi Nagar Nigam	Pre-Heat Season, Heat Season		Municipal funds	-	-	-
7	Heat-proofing and Strengthening Anganwadi Centres	Upgrade Anganwadi Centres as localized heat-resilient shelters for children, women, and caregivers. Measures include: - Provision of drinking water, oral rehydration solution, and ice packs to manage heat stress, Installation of fans, coolers, Use of reflective paint, green shade nets, set up temporary cooling zones, schedule activities during cooler hours, avoiding peak heat. Train anganwadi workers for heat wave preparedness and response.	Short-term	Varanasi Nagar Nigam, Women and Child Development Department Uttar Pradesh	Pre Heat Season		Municipal funds	SDMF		MP/MLA funds
8	Change working hours	To prevent heat stress among workers, incorporating measures such as adjusted working hours (including reduced afternoon shifts), mandatory rest breaks, and ensured access to drinking water and shaded areas.	Short-term	Varanasi Nagar Nigam, UP Labor Department	Heat Season		-	-	-	-

PREPAREDNESS, RESPONSE AND MITIGATION STRATEGIES									
Sl. No	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
9	Cool clothing for outdoor personnel	Ensure the provision of cooling jackets for police, traffic personnel, and other outdoor workers as a protective measure against heat stress during extreme summer conditions	Short-term	Varanasi Nagar Nigam, Kashi Vishwanath Temple Trust, Police Department, Labor Department	Heat Season		-	-	-	-
10	Cool Transit	Enhancing passenger comfort and safety at railway stations/ bus stops/ toll booth: Should be converted/equipped with cooling facilities, drinking water, and ORS. Intense IEC activities with regular announcements to build awareness of floating population.	Short-term	Varanasi Nagar Nigam, Varanasi city transport service Ltd.	Pre Heat Season		Municipal funds,Respective Government dept fund	-	-	MP/MLA funds
11	Modify school timings	School timings should be adjusted to earlier hours to prevent heat stress during the summer months.	Short-term	Varanasi Nagar Nigam	Heat Season		-	-	-	-
12	Preparedness of schools	Schools should ensure an adequate supply of ORS, first-aid kits, and drinking water.	Short-term	Varanasi Nagar Nigam	Pre-Heat Season		Municipal funds	-	-	-
13	Shelter for livestock and holistic preparedness	Build shelters for livestock with adequate shade and drinking water to reduce heat stress on livestock. Ensure additional mobile hospitals are ready in vulnerable villages and identify heat-vulnerable areas for animals. Conduct clinical education programs for communities, especially livestock-owning families. Prepare handouts for animal paramedics on heat illness and adopt relevant prevention protocols. Ensure availability of medicines and fluids and conduct capacity-building programs at veterinary hospitals. Share data with key agency leaders for coordinated action.	Short-term	Varanasi Nagar Nigam, UP Animal Husbandry Department	Pre-Heat Season		Municipal funds	-	-	MP/MLA funds
14	Supply and Maintenance of electrical grid	Communicate the local utility protocol to prioritize maintain of power to critical facilities. Undertake maintenance of distribution networks, transformers in high-load industries and households	Short-term	Varanasi Nagar Nigam, Purvanchal Vidyut Vitran Nigam Limited, UP Power Transmission Power Corporation Limited	Pre-Heat Season		Respective govt dept fund	-	-	Revamped Distribution Sector Scheme

PREPAREDNESS, RESPONSE AND MITIGATION STRATEGIES										
Sl. No	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
15	Maintenance of water supply systems	Undertake maintenance of faults in water supply infrastructure to ensure uninterrupted water supply during heatwaves.	Short-term	Varanasi Nagar Nigam	Pre-Heat Season		Municipal funds	-	-	-
16	Monitoring, Evaluation, and Research	Conduct epidemiological investigations of heat-related illnesses and deaths, analyzing data on risk factors and health outcomes from various sources. Compare morbidity and mortality trends before and after Heat Action Plan implementation to guide future updates. Organize annual review meetings and gather feedbacks from key stakeholders to assess performance, revise the plan accordingly, and ensure updated versions are publicly available. Establish heat illness and mortality tracking system and update datasets.	Short-term, Long-term	Varanasi Nagar Nigam, Kashi Vishwanath Temple Trust, Uttar Pradesh State Disaster Management Authority, stakeholder govt. depts., academic institutions	Post-Heat Season		-	-	-	-
17	Coordinated Response	Engage NGOs, CSOs, key agency leaders (DC, CMHO, Civil Societies, etc.), Tourist Boards / Associations, Market Associations, Worker Associations and community groups, local agencies working on environmental health, district officials, HAP nodal officer, relevant government departments and the urban local body for coordinated efforts. Establish public/private partnerships for mobilization of community members and better outreach/ implementation. Capacity building in terms of dos and don'ts based on existing cultural and traditional practices. Notify the committee when the heat alert is over. Conduct frequent calls to discuss reports and breaking developments during heat alerts	Short-term	Varanasi Nagar Nigam, Kashi Vishwanath Temple Trust, Uttar Pradesh State Disaster Management Authority, Civil Society Organisations, Non-Governmental Organisations, Tourist Boards / Associations, Market Associations, Worker Associations and community groups, local agencies	Pre Heat Season		-	-	-	-

PREPAREDNESS, RESPONSE AND MITIGATION STRATEGIES										
Sl. No	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
18	Preparedness by HAP Nodal Officer	Identify vulnerable areas and check medical supply inventories at health centres. Ensure availability and accessibility of cooling centres. Engage the community through education of workers and trainers. Prepare a rapid response team and distribute "Dos and Don'ts" to the public. Communicate a clear "Don't Panic!" message. Ensure deployment of Medical Mobile Vans and arrange for additional vans if needed. Participate in the annual evaluation and review of the revised Heat Action Plan.	Short-term, Long-term	Varanasi Nagar Nigam	Pre Heat, Heat and Post Heat					
MITIGATION										
19	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
20	Green Roof	Promote a green roofs program to reduce indoor ambient temperatures through the installation of vegetation-covered roofs, walls, and green corridors	Long-term	Varanasi Nagar Nigam, Varanasi Developemnt Authority	3-4 years		Municipal funds	-	-	AMRUT 2.0
21	Rainwater harvesting	Promote rainwater harvesting systems in both public and private buildings to help mitigate water scarcity during heatwaves.	Long-term	Jal Kal Vibhag	3-4 years		-	-	-	Jal Jeevan Mission, Jal Shakti Abhiyan
22	Community cooling action plan	Develop a localized community cooling action plan that encourages passive cooling methods and the use of energy-efficient refrigeration and cooling systems.	Long-term	Varanasi Nagar Nigam, RWAs	3-4 years		-	-	-	National Health Mission (NHM)
23	Drinking water supply Program	Strengthen drinking water access by investing in programs to enhance piped water supply infrastructure	Long-term	Jal Kal Vibhag, Varanasi Nagar Nigam	3-4 years		Municipal funds	-	-	Jal Jeevan Mission, AMRUT 2.0

PREPAREDNESS, RESPONSE AND MITIGATION STRATEGIES										
Sl. No	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
24	City level greening plan	Support urban greening initiatives to reduce urban heat island effects through retrofit of streets, avenue plantations and the development of open green spaces like parks.	Long-term	Varanasi Development Authority, Varanasi Nagar Nigam, forest dept.	3-4 years		Municipal funds	-	-	AMRUT 2.0, Green India Mission, Nagar Van Yojana
25	Localised early warning dissemination program	Establish a localized early warning system and enhance inter-agency coordination by notifying the key agency leaders, Collector, Municipal Commissioner, Ward Councillors and DDMA. Leveraging mobile alerts, community networks, and local media to deliver timely and accessible information through bulk warnings to public via centralized email databases during heat alert.	Long-term	Varanasi Nagar Nigam, Meteorological Department	3-4 years		-	-	-	Respective Govt Dept funds
26	Planning for resilient city	Planning documents guiding urban development, building bye-laws and other control measures should be appropriately revised to include environmental well being at centre of the urban development and adoption of passive low cost innovative cooling design strategies for all types of buildings.	Long-term	Town Country Planning Department, Public Works Department, St Uttar Pradesh State Disaster Management Authority, Varanasi Nagar Nigam, Varanasi Development Authority	3-4 years		-	-	-	Respective Govt Dept funds
27	Community Preparedness	Strengthening health emergency and disaster management systems at the state, city, and district levels with a focus on capacity building, training, workshops. Improving data collection and response monitoring.	Long-term	Varanasi Nagar Nigam	3-4 years		Municipal funds	-	-	Respective Govt Dept funds

Annexures

This chapter presents the formats and guidelines for recording heat-related data, based on national templates from the Ministry of Health and Family Welfare (MoHFW) and the National Disaster Management Authority (NDMA). Building on MoHFW's 2015 *Guidelines on the Prevention and Management of Heat-Related Illnesses* and the 2021 *National Action Plan on Heat-Related Illness*, this section integrates updated formats—covering surveillance, hospital preparedness, and investigations of suspected heat-related deaths—into the Varanasi HAP.

Format 1 (A): Health Facility Format

Daily Line List of Suspected Heatstroke CASES# at Health Facility

Name of health facility: **Block:** **District:**							**Date of reporting: _._/_._/_._**				
Type of health facility (Circle the applicable): 1. PHC 2. CHC 3. Taluka/Rural Hospital/Block Hospital 4. Sub-district 5. District Hospital/Civil Hospital 6. Medical College & Hospital 7. Private hospitals with emergency facility 8. Other.....											
(A). Total no. of patients in department (Casualty/Emergency of Medicine + Paediatrics):											
Daily Line List of Suspected Heatstroke CASES# at Health Facility											
S. No	**Hospital Registration No.**	**Name**	**Age***	**Sex (M/F)**	**Address**		**Outcome within date of reporting (tick the box)**				**Remarks**
					Block	**District**	**Admitted**	**Died**	**Referred**	**Recovered**	
Total											

*Age in completed years

Name of person filling the form:

Designation:

Signature:

Name of Facility In-Charge:

Signature of Facility In-Charge:

Date:

#Suspected Heatstroke: Altered mental status (including disorientation, delirium, seizure, obtundation) with elevated core body temperature ≥ 40°C/ ≥104°F, without signs of stroke, history of infection, or signs of medication overdose OR Altered mental status (including disorientation, delirium, seizure, obtundation) with hot and dry skin and deranged vitals, i.e., tachycardia, tachypnoea and wide pulse pressure without signs of stroke, history of infection, or signs of medication overdose. (*definition is applicable during heatwave season, i.e., March to July*)

Standard Operating Procedures: Format 1(A)

- Format 1 (A) is a daily line list format of suspected heatstroke cases to be filled at health facility.
- It will be kept at health facility for record purpose.
- It will be used to compile line list Format 1(B) and daily reporting Format 2.
- **Suspected heatstroke (Case definition):** Altered mental status (including disorientation, delirium, seizure, obtundation) with elevated core body temperature ≥ 40°C/ ≥ 104°F, without signs of stroke, history of infection, or signs of medication overdose OR Altered mental status (including disorientation, delirium, seizure, obtundation) with hot and dry skin and deranged vitals i.e., tachycardia, tachypnoea and wide pulse pressure without signs of stroke, history of infection, or signs of medication overdose. (*definition is applicable during Heatwave season i.e., March to July*)
- Institute and department who will compile suspected heatstroke cases:
  - » All public hospitals with casualty/emergency.
  - » All private hospitals with casualty/emergency.
  - » Reporting Departments will be casualty/emergency of medicine and paediatrics.

- Data collection period: In standard it will be from 01st March to 31st July, every year. Further direction will be communicated at the start of the year if required.
- Case identification:
  - » Person who will diagnose: A qualified medical doctor will diagnose HRI case as per case definition.
- **Where will the data be recorded:** A qualified medical practitioner will write the provisional diagnosis in the casualty/ emergency register as suspected heatstroke.
- **Data collecting person:** Pharmacist, multipurpose health worker-male (MPHW-M), staff nurse -either of the employee will collect the data of suspected heatstroke cases that were diagnosed on previous day from emergency/casualty of medicine and paediatrics departments every day.
- **Day of diagnosis and recording:** The date of diagnosis will be considered as day zero. Cases diagnosed on day Zero should be recorded on the following day, i.e., day One in FORMAT 1 (A). Example: Cases diagnosed on Sunday (Day Zero) will be recorded on Monday (Day One).
- **Data compilation:** A hard copy of each completed and signed Format 1(A) should be stored in a file daily in a proper order. A soft copy of the line list should be maintained as a single excel sheet which should be updated weekly to include all Heatstroke cases. It should be ready to be submitted to DSU or SSU as per request.
- **Reporting after a holiday:** A report which should have been prepared on holiday (e.g. Sunday or gazetted holiday) must be compiled and filed on the next working day. For example, cases diagnosed on Saturday (Day Zero) must be recorded on Format 1 (A) on Monday (Day Two) along with a separate daily Format 1 (A) report of cases diagnosed on Sunday (Day One).
- Nil reporting is mandatory in the prescribed format. No columns will be left blank; in case of nil reporting, "0" should be written.

Format 1 (B): Health Facility Format

Daily Line List of Suspected Heatstroke DEATHS# and Confirmed CVD DEATHS*
(From Medicine, Paediatrics and Casualty/Emergency department)
(To be kept at health facility for record)

Name of health facility:	Block:	District:	Date of reporting: _._/_._/_._
Type of health facility (Circle the applicable): 1. PHC 2. CHC 3. Taluka/Rural Hospital/Block Hospital 4. Sub-district 5. District Hospital/Civil Hospital 6. Medical College & Hospital 7. Private hospitals with emergency facility 8. Other.....			
(A). Total no. of all-cause deaths in health facility (Casualty/emergency of Medicine and Paediatrics):			

Daily Line List of Suspected Heatstroke DEATHS and Confirmed CVD DEATHS

S.No	Registration number	Name	Age	Sex (M/F)	Address		Deaths (tick the box)	
					Block	District	Suspected Heatstroke death##	Confirmed CVD death
Total								

Name of person filling the form:

Designation:

Signature:

Name of Facility In-Charge:

Signature of Facility In-Charge:

Date:

#Suspected Heatstroke: Altered mental status (including disorientation, delirium, seizure, obtundation) with elevated core body temperature ≥ 40°C/ ≥ 104°F, without signs of stroke, history of infection, or signs of medication overdose OR Altered mental status (including disorientation, delirium, seizure, obtundation) with hot and dry skin and deranged vitals, i.e., tachycardia, tachypnoea and wide pulse pressure without signs of stroke, history of infection, or signs of medication overdose. *(definition is applicable during Heatwave season, i.e., March to July)*

##Suspected Heatstroke Death: This is a death on account of suspected heatstroke patient.

*Cardiovascular death includes death resulting from an acute myocardial infarction (MI) or sudden cardiac arrest or heart failure (HF) or cardiovascular (CV) procedures or CV hemorrhage or death due to other CV causes.

Standard Operating Procedures: Format 1 (B)

- Format 1 (B)is a daily line list of suspected heatstroke deaths and confirmed cardiovascular disease (CVD) deaths.
- The total number of all-cause deaths in a health facility (casualty/emergency of medicine and paediatrics) should also be recorded.
- Institute and department who will report suspected heatstroke cases:
  - All public hospitals with OPDs & casualty/emergency.
  - All private hospitals are having casualty/emergency.
  - Reporting departments will be casualty/emergency of medicine and paediatrics.
- **Date of death and recording:** Date of death will be considered as day zero. Cases that died on day Zero should be recorded on the following day, i.e., day One in FORMAT 1 (B). Example: Cases diagnosed on Sunday (Day Zero) will be recorded on Monday (Day One).
- **Data compilation:** A hard copy of each completed and signed Format 1 (B) should be stored in a file daily in a proper order. A soft copy of the line list should be maintained as a single excel sheet which should be updated weekly to include all suspected heatstroke deaths and confirmed CVD deaths. It should be ready to be submitted to the district or state nodal unit as per request.
- Nil reporting is mandatory in the prescribed format. No columns will be left blank; in case of nil reporting, "0" should be written.

Format 2: Health Facility Format for Sending to District

Daily numbers of Suspected Heatstroke CASES# and All cause DEATHS*

(Compilation of Format 1, A & B)

(To be sent to District Nodal Unit daily)

Name of health facility: Block: District:							Date of reporting: _._/_._/_._
Type of health facility (Circle the applicable): 1. PHC 2. CHC 3. Taluka/Rural Hospital/Block Hospital 4. Sub-district 5. District Hospital/Civil Hospital 6. Medical College & Hospital 7. Private hospitals with emergency facility 8. Other.....							
Department (Circle the applicable):			**1. Emergency Medicine**		**2. Emergency Paediatrics**		**3. Casualty**
Date	**Total patients in the department**	**New Suspected Heatstroke Cases (A)**	**Total Suspected Heatstroke cases since 1st March 2020 (B)**	**All-cause deaths****			
				Suspected Heatstroke deaths## (a)	**Confirmed CVD deaths (b)**	**Others including unknown (c)**	**Total deaths (a+b +c)**

Form filled by (Name):

Designation:

Signature:

Name of Facility In-Charge:

Signature of Facility In-Charge:

Date:

****All-cause death:** All the deaths in casualty/emergency medicine plus paediatrics, regardless of cause.

#Suspected Heatstroke: Altered mental status (including disorientation, delirium, seizure, obtundation) with elevated core body temperature ≥ 40°C/ ≥ 104°F, without signs of stroke, history of infection, or signs of medication overdose OR Altered mental status (including disorientation, delirium, seizure, obtundation) with hot and dry skin and deranged vitals, i.e., tachycardia, tachypnoea and wide pulse pressure without signs of stroke, history of infection, or signs of medication overdose. (*definition is applicable during Heatwave season i.e., March to July*)

##Suspected Heatstroke Death: This is a death on account of suspected heatstroke patient.

***Cardiovascular death** includes death resulting from an acute myocardial infarction (MI) or sudden cardiac arrest or heart failure (HF) or cardiovascular (CV) procedures or CV hemorrhage or death due to other CV causes.

Standard Operating Procedures: Format 2
(Health facility format for sending to DISTRICT)

- Format 2 will be compiled from data of Format 1 (A) and Format 1 (B) by the nodal person at the health facility daily.
- Institute and department who will report HRI:
  - » All public hospitals with casualty/emergency.
  - » All private hospitals are having casualty/emergency.
  - » Reporting Departments will be medicine, paediatrics and casualty/emergency.
- Time of reporting to district nodal unit: Format 2 compiled from Format 1 (A) should be reported to District nodal unit on the following day (day one) by 12.00 hr (i.e. noon).
- Reporting person: A nodal person identified for the health facility will prepare the report.
- Data compilation: A soft copy in the form of an excel sheet shall be e-mailed daily to the district nodal unit through a proper channel. In places where the internet facility is not available, the report can be communicated by any possible means. A hard copy of each Format 2 should be kept in a designated file daily at the institutions/health facility.

- Data collection period: In standard, it will be from 01st March to 31st July every year. Further direction will be communicated during the start of the year if required.
- Nil reporting is mandatory in the prescribed format. No columns will be left blank; in case of nil reporting, "0" should be written.
- If not submitted on time: Late report must be submitted within 48 hrs.

Format 3 (A): District Format for Daily Compilation

Daily numbers of Suspected Heatstroke CASES# and All cause DEATHS*

(Compiled from Format 2)

(To be kept at District for record)

Cases and deaths due to HRI- District name					**Date of reporting: _._/_._/_._**				
S. No.	**Name & type of Health Facility**	**Total patients of the day (Emergency Medicine + Emergency Paediatrics + Casualty)**	**New Suspected Heatstroke cases (A)**	**Total Suspected Heatstroke cases since 1st March, 2020 (B)**	**All-cause deaths****				**Remarks**
					Suspected Heatstroke deaths## (a)	**Con-firmed CVD deaths (b)**	**Others including unknown (c)**	**Total deaths (a+b +c)**	
	PHC1								
	PHC2								
	CHC								
	CH/DH								
	PVT1								
	PVT2								
	PVT3								
Total for District 1									

Total number of New Confirmed Heatstroke Deaths* in the District on _._/_._/_._: Total number of Confirmed Heatstroke Deaths in the District since 1st March 2020:** *[confirmed by death committee (heat death committee/three men committee)]*

Name of person filling the form:

Designation:

Signature:

Name of nodal officer:

Signature of nodal officer:

Date:

****All-cause death:** All of the deaths in casualty/emergency medicine plus paediatrics, regardless of cause.

#Suspected Heatstroke: Altered mental status (including disorientation, delirium, seizure, obtundation) with elevated core body temperature ≥ 40°C/ ≥ 104°F, without signs of stroke, history of infection, or signs of medication overdose OR Altered mental status (including disorientation, delirium, seizure, obtundation) with hot and dry skin and deranged vitals, i.e., tachycardia, tachypnoea and wide pulse pressure without signs of stroke, history of infection, or signs of medication overdose. (*definition is applicable during heatwave season, i.e., March to July*)

##Suspected Heatstroke Death: This is a death on account of a suspected heatstroke patient.

***Cardiovascular death** includes death resulting from an acute myocardial infarction (MI) or sudden cardiac arrest or heart failure (HF) or cardiovascular (CV) procedures or CV haemorrhage or death due to other CV causes.

****Confirmed Heatstroke Death:** A suspected heatstroke death confirmed by the death committee (heat death investigation committee/three-person committee) at the district level.

Standard Operating Procedures: Format 3 (A)
(District format for compilation from health facility)

- Format 3(A) will be compiled by a nodal officer daily at District nodal unit.
- Format 3 (A)will be compiled from Format 2 from all health facility.
- Format 3 (A) adaptation: Modify relevant fields (in grey italic fonts) in given Format 3 (A) to add the name of your district, to list all the government facilities and private reporting units in a proper order- from the primary health centre (PHC), Community Health Centre (CHC), District Hospital (DH), Civil Hospital (CH) to Private. This will be the standard Format 3(A) for your district for daily data compilation during the whole reporting period of a year.
- Total patient of the day: Against each health facility, write the total patient of the day from emergency medicine, emergency paediatrics and casualty.
- Data compilation: District nodal unit should receive Format 2 from health facilities by 12.00 hr (i.e. 12.00 noon) daily. Format 3 (A) should be compiled daily from all submitted Format 2 reports. A date-wise soft copy of each daily Format 3 (A) report should be maintained digitally in a designated folder. A hard copy of the same should be printed and filed daily at the district level.
- Data collection period: In standard, it will be from 01st March to 31st July every year. Further direction will be communicated during the start of the year if required.
- No reporting by health facility:
  - If a health facility report (Format 2) is not received on time, write "delayed" in the row for that facility.
  - If the facility reports to the district after the deadline of 12:00 noon, Format 3 (A) should be updated to reflect the change. Format 3 (A) for the given reporting period can be updated till 48 hrs and should show the updated date of reporting, if applicable.
  - If the health facility does not submit Format 2 at all or submits it after 48 hrs of reporting deadline, Format 3 of that reporting period should be updated; "delayed" should be changed to "not available".
- Reporting after a holiday: Format 3 (A) which should have been prepared on holiday (e.g. Sunday) must be compiled and prepared on the next working day. For example, facility reports (Format 2) submitted to the district on Saturday must be compiled on Format 3(A) on Monday, along with a separate Format 3(A) for facility reports submitted to the district on Sunday.
- Nil reporting is mandatory in the prescribed format. No columns will be left blank; in case of nil reporting, "0" should be written.
- Confirmed heatstroke death: a suspected heatstroke death is to be reported as and when the death is confirmed by the death investigation committee (heat death committee/three men committee) at the district level.

Format 3 (B): District Format for Sending to State

Daily numbers of Suspected Heatstroke CASES# and All-cause DEATHS*

(Compiled from Format 3 A) (To be sent to State Nodal Unit daily while keeping a copy for record)

Cases and deaths due to heatstroke- District name									
Date	Total patients of the day (Emergency Medicine + Emergency Paediatrics + Casualty)	New Suspected Heatstroke Cases (A)	Total Suspected Heatstroke cases since 1st March, 20_ _ (B)	All-cause deaths**				New Confirmed Heatstroke Deaths***	Total Confirmed Heat Deaths since 1st March 20_ _
				Suspected Heatstroke deaths## (a)	Confirmed CVD deaths (b)	Others including unknown (c)	Total deaths (a+b +c)		

Name of person filling the form:

Designation:

Signature:

Name of nodal officer:

Signature of nodal officer:

Date:

**All-cause death: All of the deaths in casualty/emergency medicine plus paediatrics, regardless of cause.

#Suspected Heatstroke: Altered mental status (including disorientation, delirium, seizure, obtundation) with elevated core body temperature ≥ 40 oC/≥104 oF, without signs of stroke, history of infection, or signs of medication overdose OR Altered mental status (including disorientation, delirium, seizure, obtundation) with hot and dry skin and deranged vitals i.e., tachycardia, tachypnoea and wide pulse pressure without signs of stroke, history of infection, or signs of medication overdose. (*definition is applicable during heatwave season, i.e., March to July*)

##Suspected Heatstroke Death: This is a death on account of suspected heatstroke patient.

*Cardiovascular death includes death resulting from an acute myocardial infarction (MI) or sudden cardiac arrest or heart failure (HF) or cardiovascular (CV) procedures or CV hemorrhage or death due to other CV causes.

***Confirmed Heatstroke Death: A suspected heatstroke death confirmed by the death investigation committee (heat death committee/three men committee) at the district level.

Standard Operating Procedures: Format 3 (B)
(District format for sending to State)

- Format 3 (B) will be compiled by a nodal officer daily at District nodal unit.
- Format 3 (B) will be compiled from the end row of Format 3 (A).
- Time of reporting to state nodal unit: Format 3 (B) compiled from Format 3 (A) should be reported to the state nodal unit on the following day (day one) by 04.00 PM.
- Reporting after a holiday: Format 3 (B) which should have been prepared on holiday (e.g. Sunday) must be compiled and prepared on the next working day. For example, facility reports (Format 2) submitted to the district on Saturday must be compiled on Format 3(B) on Monday, along with a separate Format 3(B) for facility reports submitted to the district on Sunday.
- Nil reporting is mandatory in the prescribed format. No columns shall be left blank; in case of nil reporting, "0" should be written.
- Confirmed heatstroke death: a suspected heatstroke death is to be reported as and when the death is confirmed by the death committee (heat death committee/three-man committee) at the district level.

Partner Acknowledgements

Varanasi Nagar Nigam (Municipal Corporation)

Varanasi Nagar Nigam (VNN) is the governing body of the city of Varanasi in the Indian state of Uttar Pradesh. The municipal corporation consists of democratically-elected members, headed by a Mayor, and administers the city's infrastructure and public services. Varanasi Municipal Corporation was established on January 24, 1959, as a Nagar Mahapalika under the Municipal Corporation Act of 1959, and in 1994, it was upgraded to Nagar Nigam. The Varanasi Municipal Corporation is responsible for the planning, development, and upkeep of the city and the delivery of civic services to its citizens. VNN's mission is to make Varanasi a dynamic, vibrant, beautiful, self-reliant, and sustainable city with all basic amenities and to provide a better quality of life to its citizens.

NRDC

NRDC India aims to build a healthier and more prosperous future for all Indians. An independent organization, it seeks to advance national and global climate goals through community-based solutions that prioritize public health and equity, creating jobs and boosting resiliency. NRDC India is inspired by and associated with NRDC (Natural Resources Defense Council) – a global organization with more than three million members and 700 experts across the globe. NRDC works to safeguard the earth—its people, its plants and animals, and the natural systems on which all life depends.

Mahila Housing Trust

Mahila Housing Trust (MHT) is improving urban built environments in poor communities through collective action. Since its establishment in 1994, it has mobilized women to exercise their civic rights and empowered them to take charge of their habitat improvement process. By forging unique relationships with poor communities and local governments, it has advanced access to basic services, promoted climate resilience, and deepened participatory governance.

Indian Institute of Public Health Gandhinagar

IIPHG is India's first Public Health University. IIPHG is working towards building a healthier India and aims to strengthen the overall health system in the country through education, training, research, and advocacy/policy initiatives. The institute has a Governing Council with four secretaries of the government as ex-officio members and four representatives of PHFI as members. IIPHG is an example of visionary leadership of Honourable Shri Narendra Modi (then Honourable Chief Minister of Gujarat), who laid the foundation stone and provided support for establishing the institute in 2008. Government of Gujarat and Public Health Foundation of India (PHFI) entered an MoU in 2007 to establish IIPHG.

Department of Medical Health and Family Welfare, Government of Uttar Pradesh

Department of Medical Health and Family Welfare, Uttar Pradesh is playing a vital role in improving the health status & living quality of the people of Uttar Pradesh. This department is responsible for providing Medical Health and Family Welfare related services to the citizens of densely populated state of Uttar Pradesh spread over a vast area of 2,36,286 sq. km. With the objective of providing health services in urban and remote areas, the department provides three tier medical services in the state of Uttar Pradesh. Under this, at the first level, health services are provided in urban areas whereas at the second and third level health services are provided in rural areas.

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