EXPANDING HEAT RESILIENCE ACROSS INDIA

INTRODUCTION

With temperatures breaking records around the globe, cities and regions across India are taking concrete actions to better prepare and protect local communities from deadly heat. Climate change drives global average temperatures upwards and increases the frequency, intensity, and duration of heat waves.1,2

Building on the ground-breaking Ahmedabad Heat Action Plan (HAP) released in 2013, momentum is building toward developing and implementing early warning systems and preparedness plans for extreme heat at the city, state, and national levels. In 2018, based on guidance provided by the central government, 13 states and over 30 cities have adopted or are developing heat action plans.

At the national level, the National Disaster Management Authority (NDMA) has expanded efforts to support state-level heat action plans and launched a nationwide Beat the Heat India communication campaign aimed at raising public awareness. The Indian Meteorological Department (IMD) continues to provide season and daily forecasts to over 350 cities.3 The IMD forecasts are a critical trigger for prompting early warning for extreme heat by city officials.

The Natural Resources Defense Council (NRDC) and Public Health Foundation of India - Indian Institute of Public Health-Gandhinagar (PHFI-IIPH-G) work with government leaders and key experts across India and internationally to develop, launch, and implement heat action plans. This issue brief highlights the progress at the city, state and national level in 2018 to improve climate resilience to extreme heat and captures key elements of heat action plans.

NATIONAL LEADERSHIP

NDMA identified 17 heat-prone states and developed the first national Guidelines on Heat Waves in 2016 with the aim to strengthen heat preparedness.4 NDMA convenes annual national level workshops on preparedness, monitoring and management strategies with state and city officials as well as key experts to ramp up activities and share information. NDMA also coordinates with state disaster management departments to support local activities. In 2018, NDMA’s

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IMD forecasts are vital since they give communities lead-time to prepare for extreme heat by issuing heat warnings, which sets in motion inter-agency coordination that helps to ensure water availability, stocking of ice-packs and Oral Rehydration Solutions (ORS) in clinics and more. IMD and the regional meteorological offices provide 5-day forecasts of daily maximum temperatures to over 350 cities, expanded from 100 in 2016. In 2018, IMD started issuing daily heat bulletins at 7:30 am to enhance interagency coordination and alert-notifications, allowing residents to plan their days to reduce heat exposure. Continuing from 2016 and 2017, IMD issued a “Seasonal Outlook for Temperature for the Hot Weather Season (April-June)”. IMD's seasonal outlook aims to warn residents and key groups about extreme temperatures expected during the heat season. IMD also collaborates with Indian Meteorological Society (IMS) to convene city leaders, health officials, civil society groups to expand HAPs.

The Ministry of Health and Family Welfare is engaged in strengthening heat preparedness at the national level. The Ministry provides resources to stock oral rehydration solutions (ORS), create medical check-up posts at places of mass gathering, enhance hospital preparedness, and train medical staff. The Ministry also monitors the ground situation to understand health impacts, deploys rapid medical response teams and collects heat-related health data from states to maintain a national-level data base.

**STATE LEADERSHIP**

The states of Andhra Pradesh, Bihar, Delhi, Gujarat, Haryana, Jharkhand, Karnataka, Maharashtra, Odisha, Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh continue to demonstrate leadership with locally-developed heat action plans. Actions taken by some key states, which are highly affected by heat waves and also took innovative steps to protect residents are highlighted on following page.

**Highlighted State Activities**

**Andhra Pradesh**

The Andhra Pradesh State Disaster Management Authority (APSDMA) is working to ensure that districts are well-prepared to combat extreme heat conditions. Working with voluntary organizations, APSDMA set up 66,453 drinking water kiosks, organized 70,134 summer shelters and distributed over 2.2 lakhs (220,000) heat awareness pamphlets with information on precautions to prevent heat stroke and other heat related illnesses. The state government has also distributed 12,44,000 (~1.24 million) packets of ORS throughout the state.

To amplify temperature monitoring, Andhra Pradesh set up 1168 automatic weather stations (AWS) – approximately one for every hundred square kilometers. These AWS provide daily forecasts for heat for all 670 mandals (administrative zones within districts) in the state. Through a bi-lingual (Telugu and English) mobile phone application Andhra Pradesh Varuna, these forecasts reach thousands of people. The APSDMA has also released a Heat Wave Atlas that analyses heat wave conditions across the state since 2010 and identifies local heat wave hot spots.

**Maharashtra**

With a number of city-level HAPs and a regional approach developed in Nagpur in 2016, Maharashtra has put in place a state-wide strategy to combat extreme heat.

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A state steering committee, chaired by the State Ministry of Public Health, engages key agencies including IMD, Maharashtra Disaster Management Authority, National Health Mission, Urban Development, Rural Development, Education, Labour, Medical Education, Police and the Publicity departments.

The Maharashtra state level plan instructs that the responsible officers to conduct regional workshops, design and publish state-wide IEC plans (Information, Education, and Communication), and train Accredited Social Health Activists (ASHAs) and *anganwadi* workers. This year, the state health department issued a list of “Do’s and Don’ts” to all 34 district hospitals, 1,811 primary health centres and 365 rural hospital across the state. Some of the actions taken this year by the State Disaster Management Authority includes, changing school timings, putting in place drinking water spots, providing shelter for traffic police, altering duty hours of police personnel above the age of 45, preparing cold wards at hospitals with icepacks and necessary medication.10

**Odisha**

The Odisha State Disaster Management Authority (OSDMA), the designated nodal authority – which is the key department that coordinate across other relevant departments – works closely with the leadership of the special relief commissioner, local meteorological centre, key state departments, cities and civil society groups to effectively implement the HAP focused on community awareness, an early warning system, and mitigation.

The Odisha HAP emphasizes the importance of determining region specific early heat warning thresholds combining temperature and humidity. Some options the HAP suggests for addressing the long-term health risks posed by extreme heat include: increase access to cooling spaces (e.g., parks, lakes, swimming pools, public libraries, shopping malls); implement green urban planning programs (e.g., cool roofs and green roofs initiatives, tree plantings); and promote clean energy technology and building energy conservation programs.11

In addition, the HAP highlights a study conducted by The Energy and Resources Institute (TERI) in the highly vulnerable district of Jharsuguda that assessed the impact of urban heat island effects, and recommended steps to bolster local adaptive capacity in specific sectors, including coal mining, agriculture, urban planning, and industries. It also highlights planning for longer-term adaptive measures to reduce the urban


heat island (UHI) effect. UHIs are urban, built up areas that are hotter than nearby rural areas. UHIs are formed as built up surfaces absorb, and then emit heat. Urban heat islands can exacerbate the impact of heat waves, increasing the vulnerability of sensitive groups, such as children, older adults, and those with existing health conditions.12

Telangana

The Telangana HAP enables state government departments, media, civil society and the wider public to take steps to reduce heat-related fatalities and illness among people, as well as livestock due to extreme heat. The HAP emphasizes the process of implementation and the distinct roles and responsibilities of government departments. The document provides government officers with templates, strategies, and background information, with an emphasis on identifying and protecting vulnerable population groups, particularly the elderly, infants, and people those who are economically disadvantaged.

In 2018, Telangana made a special effort to ensure sufficient drinking water supplies at public junctions, distribution of ORS packets, improvement of medical facilities at government hospitals and organisation of awareness camps in all districts during the summer.13

Measures were taken to provide water and food for livestock, and also for wildlife too. For heat stroke victims, monetary relief to the surviving family was provided under the Apath Bandhu Scheme. In every district, a three-member team was tasked with investigating and verifying any reported heat-related death. The Revenue and Disaster Management department in consultation with NDMA, IMD, Telangana State Development Planning Society and UNICEF revised the Telangana HAP 2016 to develop the Telangana HAP 2018.

CITY LEADERSHIP

Some of the leading cities implementing heat action plans include Ahmedabad and Surat in Gujarat, Nagpur and Chandrapur in Maharashtra, and Hazaribagh in Jharkhand. In 2018, supported by the Department of Science and Technology, Government of India, two new cities, Jhansi in Uttar Pradesh and Sagar in Madhya Pradesh, have launched HAPs. Rajkot in Gujarat and Bhopal in Madhya Pradesh have also started developing HAPs in 2018.

**Highlighted City Activities**

**Ahmedabad, Gujarat** – In 2018, working with partners NRDC and IIPH-G, Ahmedabad Municipal Corporation launched the sixth version of its pioneering HAP, first established in 2013.14 The 2018 HAP focused on expanding existing initiatives and deploying new initiatives to protect city residents. The 2018 HAP included the following new efforts:

- Expanding the use of “cool roofs” - reflective paint on buildings citywide, which helps keep inside temperatures lower.
- Increasing access to cool drinking water through a mobile city cold water distribution network.
- Enhancing the participation of religious groups to spread awareness of heat alerts through places of religious importance.
- Strengthening digital and media advertising to raise awareness of taking precautions during heat spikes.
- Enhanced training of medical professionals to help protect patients in times of extreme heat.

**Rajasthan HAP: A Climate Resilience Heat Action Plan Focused on Rural Communities**

**Key activities**

Supported by IIPH-G and UNICEF, the State of Rajasthan developed the first rural community focused HAP with the following activities to build resilience to climate change and extreme heat:

- Communication needs assessed to frame a comprehensive communication strategy for climate risk reduction, adaptation and mitigation
- Community vulnerability assessment to understand heat-related challenges for rural communities
- IEC materials developed in local languages for sections of the society- schools, ASHA/ Auxiliary Nurse Midwife (ANM), medical officers
- More than 180 ASHA/ ANM/ Anganwadi workers and medical officers and more than 60 school teachers trained for prevention and management of climate sensitive disease including heat related illnesses
- Capacity building/sensitization workshops conducted for line department officials at block and district level (education, public works, administration, health, disaster, and others)

**Chandrapur, Maharashtra** – Building on earlier efforts, in 2018, Chandrapur amplified community outreach programs that range from awareness marches to “WhatsApp” alerts.

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to reach people. Demonstrating strong interagency coordination, HAP awareness pamphlets were distributed to around 80,000 households during house-to-house visits for the Intensive Pulse Polio Immunization program. In addition to this large-scale awareness campaign, the city kept gardens and parks open longer, established open water kiosks (at 10 locations around the city), ensured active participation of 108 ambulance, changed working hours of workers doing strenuous physical labor. The city medical department also trained civic medical officers to better prepare them for detecting and treating heat stroke symptoms.

Special arrangements were made for thousands of devotees participating in rituals and marches during the festival of “Mahakali Devi Yatra”. Some of these included:

- Cool shade for devotees lining-up for temple entrances
- Over-head water sprinklers for devotees inside the temple premises
- Drinking water kiosks to ensure people can have access to water to keep hydrated
- HAP awareness hoardings/billboards in and around the temple premises

Opportunities are ripe for additional cities to develop and implement heat preparedness plans. NRDC and IIPH-G developed useful resources, such as, the City Resilience Toolkit: Response to Deadly Heat Waves and Preparing for Rising Temperatures. The City Resilience Toolkit includes a user-friendly “How-to-Manual”, a powerful resource that states and cities in India used to scale up HAPs from the original Ahmedabad plan to the over 40 state and city HAPs across India.

An effective heat action plan requires a combination of strong local leadership, interagency coordination, scientific expertise, broad communication strategies, and community engagement. Locally-developed plans are the most effective; one size does not fit all. Yet, the heat action plans in the 12 states and 30 cities in India have common features that are important to protecting communities from extreme heat. The five core elements are:

1. **Community Outreach to Build Public Awareness**
   - Locally-developed and scientifically-supported IEC pamphlets, hoardings/billboards, and videos to inform people on how to protect themselves from extreme heat.
   - Social media channels, bulk text messages, emails, radio and mobile applications such as WhatsApp, aiming to reach the public.
   - Special efforts to reach vulnerable populations through focused sessions and direct communication by health care professionals in local clinics, ambulance service, and urban health centers.

2. **Early Warning Systems and Inter-Agency Coordination**
   - Early warning systems trigger joint response by relevant city and state authorities during extreme heat and alerts residents.
   - Create and institutionalize formal communication channels to alert state and city government agencies, including, health officials and hospitals, emergency responders, local community groups, media outlets and other key stakeholders.
   - Develop Standard Operating Procedures (SOPs) for activities before, during and after heat season for each department to successfully implement a HAP.
   - In SoPs, identify and define responsibilities of the officer accountable for implementation.

3. **Capacity Building Among Healthcare Professionals**
   - Develop special training modules for health staff in urban health centers.

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16 Information Shared by Dr. Anjali Ambatkar, Chief Medical Officer, Chandrapur Municipal Corporation, March 2018
4. **Addressing Vulnerability of the Population:**

- Typically, children, elderly people, people exposed to prolonged periods of extreme heat due to their profession (e.g., construction workers, farmers, traffic police) are more vulnerable.
- Ability to afford space cooling solutions (like air conditioners and fans) and health care can further determine vulnerability.

- Training programs for private general medical practitioners to equip first responders with knowledge of effective diagnosis and first-aid treatment for heat-related illnesses.
- Develop list of “Do’s and Don’ts” with help of local health professionals and disseminate to public through effective use of various media (print and social media, radio stations, TV ads).

- Identifying and analyzing underlying population vulnerability and considering them in decision making is critical.
- Effectiveness of implementing heat action plans and allocation of financial and human resources can improve if extent and nature of vulnerability is known.

For example, according to a Andhra Pradesh government analysis based on historic temperature profile of the state (2010-2017), out of 670 mandals, 148 were affected by severe heat waves, whereas, 410 are affected by moderate heat wave conditions and remaining 112 were affected by normal heat waves. This helped the state identify vulnerability hotspots and prioritize its actions in the especially vulnerable parts of the state.

5. **Implementing Adaptive Measures:**

- Undertake new efforts including outreach and communication on prevention methods, increasing access to potable drinking water and establishing cooling spaces during extreme heat days.
- Enhance preparedness to reduce heat-health threats far in advance of future heat seasons.
- Develop strategies to reduce the urban heat island effect by promoting green infrastructure.
- Consider social, environmental, and economic circumstances to decide which strategies are most appropriate and cost-effective to develop.
For example, strategies to mitigate the urban heat island effect and alleviate extreme heat include:

- Cool roofs
- City forestation (favoring native trees and vegetation)
- Cool pavements
- Land-use planning: to increase green spaces and urban air flow to reduce local temperatures
- Traffic and congestion reduction policies and strategies

### How to fund a cool roofs programme

Cool roofs are extremely cost competitive, and can be installed for as little as ₹0.50 (~$0.07) per square foot for a coating of lime wash on an existing roof. In commercial, office and high-end residential buildings in India, cool roofs can reduce air-conditioning costs, peak power demand and improve the performance of the Heating, Chilling Ventilation and Air Conditioning (HVAC) systems.

Examples of financing mechanisms:
- Allocating funds for cool roof programs in annual city budgets.
- Utilizing public funds for health, energy or urban administration departments for pilot programs.
- Leveraging Corporate Social Responsibility (CSR) funds for cool roof installations in low-income and vulnerable housing.
- Establishing property tax rebates for cool roof installation that key cities use as incentives.
Evaluation and updating plans for next heat season

Evaluation is a key element of improving heat action planning and preparedness for future heat seasons. Some key HAP evaluation steps are:

- Organize annual Heat Action Plan evaluation meeting with key agency leaders and relevant stakeholders.
- Evaluate the heat warning process based on system performance and revise accordingly.
- Evaluate the reach and impact of the plan and revise accordingly.
- Perform epidemiological study and case review of heat-related health effects during the summer to better understand heat risk factors, illness and death patterns, based on maximum daily temperatures.
- Compare mortality and heat-related morbidity rates based on data from before and after the HAP’s implementation.
- Incorporate data and findings related to HAP implementation and its impact in reducing mortality and extreme heat linked illnesses into future versions of the Heat Action Plan.

Heath Action Plan and Research Materials are available at:  

ONLINE RESOURCES

Ahmedabad’s Heat Action Plan

City Resilience Toolkit: Response to Deadly Heat Waves and Preparing for Rising Temperatures (includes How-to-Manual)

Inside Story: Addressing heat related health risks in urban India: Ahmedabad’s Heat Action Plan

Cool Roofs: Preventing Local Communities from Extreme Heat


CUTTING EDGE SCIENTIFIC RESEARCH AND JOURNAL ARTICLES

International Journal of Environmental Research and Public Health: A Cross-Sectional, Randomized Cluster Sample Survey of Household Vulnerability to Extreme Heat among Slum Dwellers in Ahmedabad, India (June 2013)


Journal of Environmental and Public Health: Neonates in Ahmedabad, India, during the 2010 Heat Wave: A Climate Change Adaptation Study (January 2014)


Rising Temperatures, Deadly Threat: Series of Four Issue Briefs of Recommendations for Heat Adaptation in Ahmedabad

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