



Fighting Climate Effects: Protecting People from Extreme Heat in One of India's Fastest-Growing Cities

Ahmedabad, one of the top 10 fastest-growing cities in India, experiences dangerously high daily temperatures for several months out of the year.¹ Recently, the city experienced its most harsh heat wave season, with four months of extreme temperatures reaching 122° Fahrenheit (50° Celsius) in 2010. Although national programs exist to address many effects of climate change in India, the country has yet to implement strategies to adapt to the extreme effects of increasing heat. In response, NRDC and our on-the-ground partners, the Public Health Foundation of India (PHFI) and the Indian Institute of Public Health Gandhinagar (IIPH), are working with city officials and leaders in Ahmedabad to protect people from the city's extreme heat exacerbated by climate change. The project's priority is to promote improved health by implementing interventions that can help reduce heat-related health vulnerabilities, designing an early warning system for dangerous heat events, and developing targeted climate change adaptation strategies.

VULNERABILITIES TO HEAT IN AHMEDABAD

With a population of 7.2 million people, including a large number of migrants living in slums, Ahmedabad District is the largest region in the state of Gujarat.² In 2010, Forbes magazine reported that Ahmedabad will be one of the world's nineteen fastest growing urban centers over the next decade.³ Ahmedabad is also experiencing robust industrial growth. But, with real estate development, automotive manufacturing, and pharmaceutical production expanding

in the region, the city is now burdened with the related air, water, and soil pollution often associated with such burgeoning industrial development.

Daily maximum temperatures in the city can reach a scorching 113° Fahrenheit (45° Celsius) between March and June. In May 2010, Gujarat's temperatures climbed to 122° Fahrenheit (50° Celsius) in a four-month heat wave, resulting in more than 100 heat-related deaths.⁴ By the 2080s, it is projected that daytime temperatures will increase by up to



INDIAN INSTITUTE OF PUBLIC HEALTH GANDHINAGAR

For more information, please contact:

Dr. Dileep Malvalankar
dmavalankar@iiphg.org
Tel: +91-79-40240444

Dr. Gulrez Azhar
gsazhar@iiphg.org
Tel: +91-79-40240444

Anjali Jaiswal
ajaiswal@nrdc.org
Tel: (415) 875-6100
Tel: +91- 97-178 12808

7.2° Fahrenheit (4° Celsius), with nighttime temperatures rising by 9° Fahrenheit (5° Celsius) due to climate change.⁵

Compounding the difficulties of treating heat-related illnesses, Ahmedabad's population lacks reliable access to healthcare, potable water, proper sanitation, and shelter. The elderly and young children are particularly vulnerable to extreme heat. Poorer communities and workers in certain high-risk occupations, namely outdoor laborers policemen, rickshaw drivers, and those working in indoor kitchens, are also more vulnerable to heat stress.⁶

ADDRESSING THE VULNERABILITIES OF CLIMATE CHANGE, HEAT, AND HEALTH IN AHMEDABAD

In 2011, PHFI, IIPH, and NRDC brought together leading experts from India and the United States to kick-off a discussion to develop heat-adaptation strategies in Ahmedabad. More than 40 expert scientists, municipal and state administrators, and health officials collaborated to develop recommendations addressing heat-health vulnerability, including:

1. Researching impacts of heat stress, community resources, and existing heat-coping measures through in-depth discussions with four groups: vulnerable people living in slums, workers in high-risk occupations, city department staff, and health care providers; and then analyzing data on local temperatures and corresponding deaths.
2. Identifying the most vulnerable populations in Ahmedabad through surveys assessing current heat awareness and susceptibility, and distributing an informational pamphlet on reducing extreme heat's health risks to families with young children and the elderly.
3. Developing an actionable early warning system in Ahmedabad and integrating it into a local climate change preparedness plan to warn the population of impending extreme heat events.
4. Targeting heat-risk-reduction outreach to the most heat-vulnerable groups, including young children, elders, people with heart or lung illnesses, families living in poverty, and workers in high-risk occupations.
5. Conducting best-practices workshops with Ahmedabad city departments, medical providers, workers in high-risk occupations, and community leaders to implement extreme heat strategies, build local capacity, and improve internal information sharing and communication.

Extreme Heat Exacerbated by Climate Change Can Harm Health

Climate change will exacerbate extreme heat frequency and intensity.⁷ Health effects of heat stress include:

- dehydration
- heat stroke
- heat cramps
- heat-related death
- heat exhaustion

Additionally, heat worsens air quality, causing respiratory health problems. Hotter temperatures also affect insect vector distribution and increase transmission of diseases such as Dengue fever, Chikungunya—a viral disease that causes muscular pain and can result in death—and other climate-sensitive waterborne and diarrheal illnesses.

Following those discussions, NRDC and our partners collaborated with Emory University's School of Public Health in the summer of 2011 to conduct Ahmedabad's first heat vulnerability assessment survey. The in-depth survey assessed 12 slums on household member health history, heat-exposure adaptation, heat-stress knowledge, and access to resources.

As a result of PHFI, IIPH, and NRDC's communication with the Ahmedabad Municipal Corporation (AMC), Ahmedabad officials are now developing a climate change state action plan, and specifically, accelerating efforts to protect communities from extreme heat. Also, local officials announced plans to install 10 weather gauges.⁸ The new temperature gauges will enable local government to examine historical weather trends, determine high-risk areas, and warn local communities about impending heat waves, which is critical to protecting the most vulnerable residents from heat exhaustion, heat stroke, and heat-related deaths.

In 2012, we—along with partners, local government, and civil society—will continue development of an early warning system and a climate change preparedness plan for Ahmedabad. This ongoing research and intensive outreach regarding the importance of heat adaptation has the potential to save lives from the increasingly severe effects of climate change.

The Public Health Foundation of India (PHFI), an independent foundation, engages training, research, and policy development in the area of public health. Through the network of Indian Institute of Public Health (IIPH) institutes, PHFI delivers training and research courses. www.phfi.org.

NRDC is a leading U.S.-based environmental organization working with partners in India on efforts to solve our shared challenges of climate change and clean energy. www.nrdc.org/international/india.

1 Government of India, Census of India 2011: *Provisional Population Totals, Population and Decadal Growth Rate by Residence – Persons*. Census of India Website: Office of the Registrar General & Census Commissioner. http://www.censusindia.gov.in/2011-prov-results/paper2/data_files/Gujrat/6-pop10-28.pdf. Last accessed January 18, 2012.

2 *Ibid*; Government of India, Census of India 2001: *Provisional Slum Population in Million Plus Cities (Municipal Corporations): Part A*. Census of India Website: Office of the Registrar General & Census Commissioner, India. http://censusindia.gov.in/Tables_Published/Admin_Units/Admin_links/slum1_m_plus.html. Last accessed January 18, 2012.

3 Kotkin, Joel. *The World's Fastest Growing Cities*. October 7, 2010. <http://www.forbes.com/2010/10/07/cities-china-chicago-opinions-columnists-joel-kotkin.html>. Last accessed January 11, 2012.

4 The Guardian. *Hundreds Die In India Heat Wave*. November 9, 2011. <http://www.guardian.co.uk/world/2010/may/30/india-heatwave-deaths>. Last accessed January 11, 2012.

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7 Meehi, G.A., Tebalidi, C., *More Intense, More Frequent, and Longer Lasting Heat Waves in the 21st Century*. Science, 2004. 305: 994-997.

8 Daily News and Analysis Correspondent. *Colour Bands to Warn You about Heat Wave*. November 9, 2011. http://www.dnaindia.com/india/report_colour-bands-to-warn-you-about-heat-wave_1609864. Last accessed January 11, 2012.