

Climate change: addressing heat-health vulnerability in rapidly urbanising regions of Western India

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4TH INTERNATIONAL CLIMATE CHANGE ADAPTATION CONFERENCE



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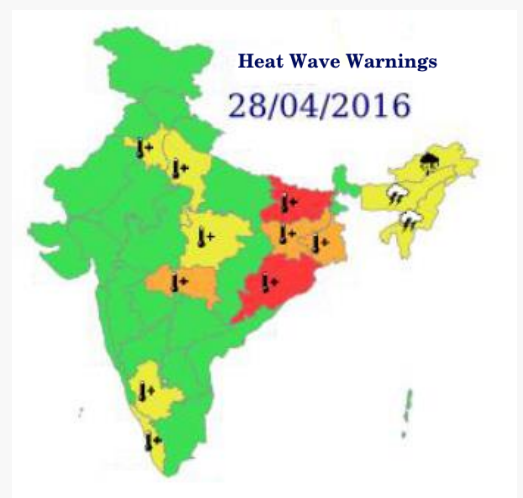


NRDC



India Current weather observation

- Heat wave condition in many parts of the country like Jharkhand, Telangana, Bihar, West Bengal, Vidarbha region Maharashtra, south coastal Andhra Pradesh and north and interior of Tamil Nadu.
- Several states of India are facing severe water crisis.
- Concern for worsening exposures with climate change in India and elsewhere



Origin of the Ahmedabad Heat and Climate Study Group

Heat wave in city: Over 50 people dead already

TNN | May 28, 2010, 04:56AM IST

AHMEDABAD: Four more people died of heat stroke in the city on Thursday. All of them were elderly people. With this the total death toll has risen to 51 in the city. At least three patients were brought to VS hospital.



The Indian EXPRESS
JOURNALISM OF COURAGE

Weather: Researchers fear 'May 2010 heat wave' may return to city

Mandar Chitre Posted online: Thu May 03 2012, 05:08 hrs

Colour bands to warn you about heat wave

Wednesday, 9 November 2011 - 1:07pm IST | Place: Ahmedabad | Agency: DNA

Ahmedabad: 44 degree Celsius on Monday, expect worse in coming days

DNA | May 21, 2013, 04:20AM IST

Heat wave conditions to continue across Gujarat

Press Trust of India - Express news service : Tue May 21 2013, 05:03 hrs

Heatwave heats up, cop dies on duty

12:36 IST | Place: Ahmedabad | Agency: DNA

Traffic head constable may have died of sunstroke.



Saturday was hotter than other days, so much so that an on-duty traffic police head constable fell victim to the heat. He fell on the footpath at Rajendra Park crossroads in Amraiwadi area of the city due to the heat, police sources said.

"The incident occurred on Friday evening when the deceased - Dalpatsinh Chavda, 52, was on duty. He fainted on the divider of the road near Rajendra Park. He was rushed to the hospital but died during treatment," said police sub-inspector MD Panchal.

The incident occurred around 8 pm. Chavda's colleague called for the ambulance and he was rushed to Shardaben Hospital in

MOU - Vibrant Gujarat Summit 2011

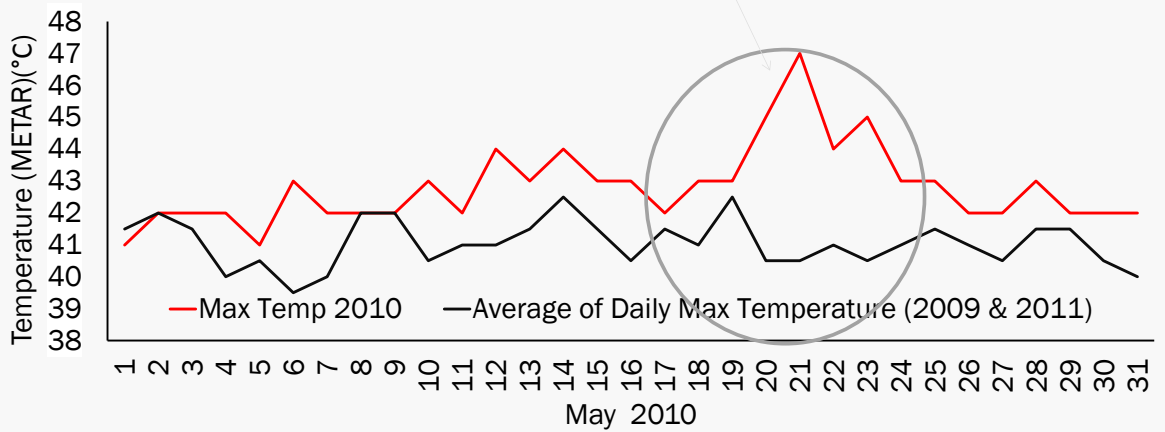


PHFI-IIPH and NRDC hosted a **first scientific Workshop on climate change and Heat-health** in Ahmedabad to convene and mobilize relevant scientists, stakeholders, and partners in March 2011

PHFI-IIPH and NRDC entered into MOUs with the state of Gujarat and the city of Ahmedabad (AMC) for joint work on heat

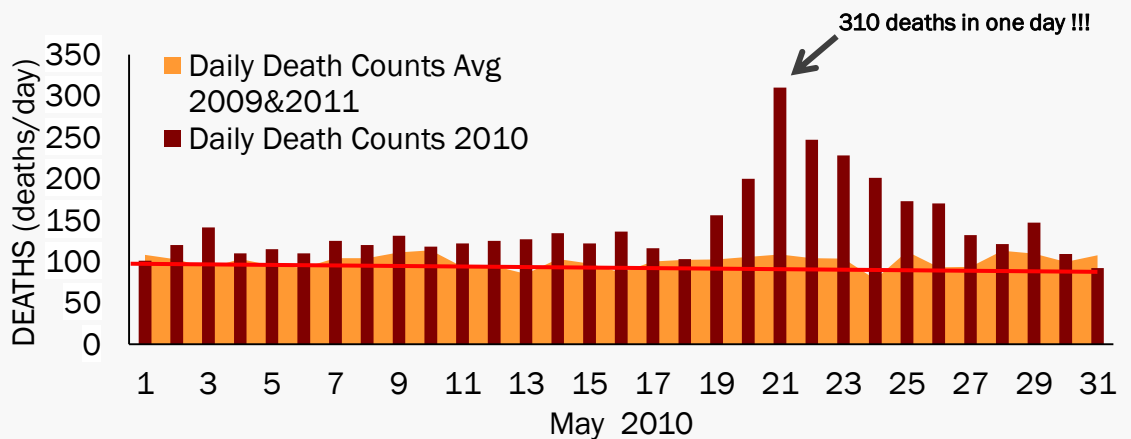
A number of **preliminary studies** were commissioned to assess the situation on the ground in Ahmedabad

2010 Heat wave in Ahmedabad – Temp. 47deg C on 21st May



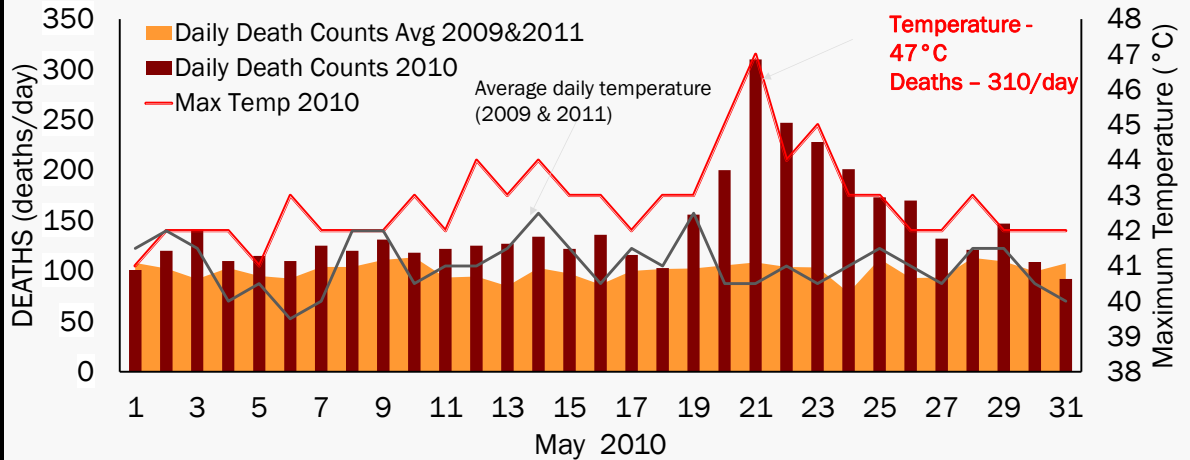
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Daily mortality in May 2010 compared to average of 2009 and 2011

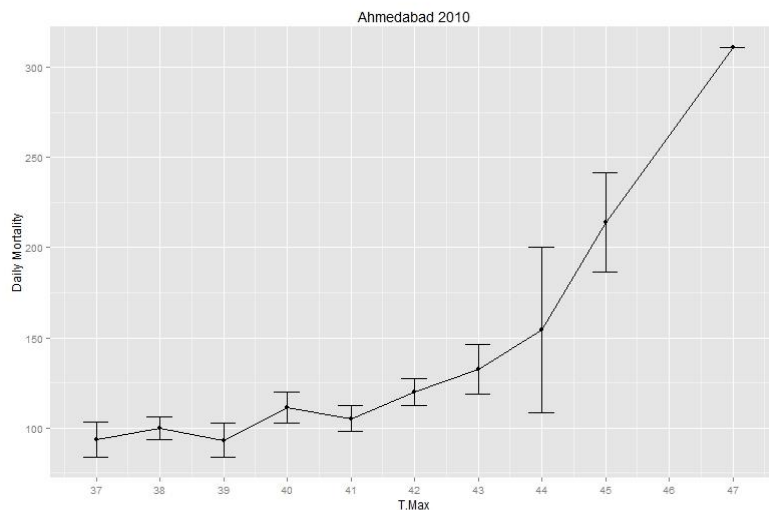


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2010 Ahmedabad heat wave : May 20-27th – excess deaths 800 in one week and 1344 excess deaths in May 2010.

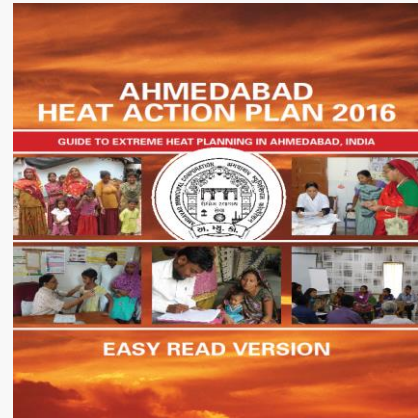


Error plot showing Ahmedabad daily max. temp. and mortality relation during summer 2010 (March – June)



Development of Ahmedabad Heat Action Plan 2013 - **an collaborative effort**

- Plan was developed collaboratively by IIPHG, NRDC and AMC and other partners
- Review of heat action plans of cities in the west
- Review of data and evidence from Ahmedabad.
- Series of meetings and workshops with key stakeholders,
- Identification of locally possible key actions
- Writing of draft plan and dissemination



http://www.egovamc.com/downloads/healthcare/healthpdf/heat_action_plan.pdf

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Key components of Heat Action Plan

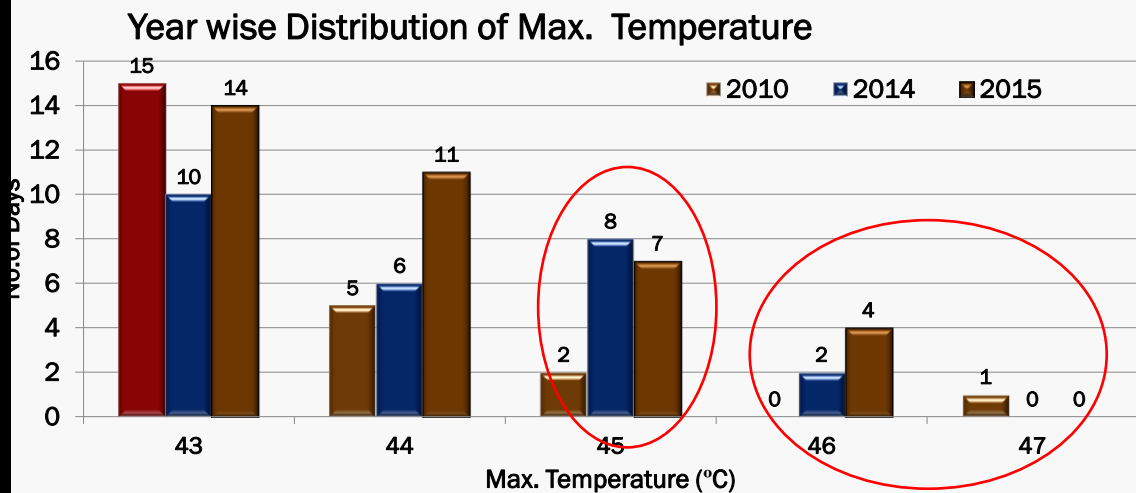
- The Plan consists of
 - **Develop a 7-day early warning system** for heat waves
 - **Nodal officer of AMC and communication and coordinating** an interagency emergency planning and response effort when heat waves hit.
 - **Increasing public awareness** of the risks of extreme heat through community outreach and communication activities.
 - **Increase capacity among Ahmedabad's medical staff** to respond to heat-related illnesses and to reduce mortality.
 - **Regular research & evaluation of the impact** of the plan and continual improvement each year

Method for calculating mortality decline in 2014 heat wave

- All cause mortality reported:
- Temperature-mortality relationship calculated using data from 2010.
- Data was then extrapolated to 2014 heat wave temperatures to predict mortalities using 2010 temperature mortality correlations.
- Compared against actual mortality data from for 2014
- Heat stroke cases reported:
- For heat stroke case reports – data was collected by the AMC from 5 of Ahmedabad’s municipal/government hospitals – VS Hospital, LG Hospital, Sola, Sardar Patel Hospital and Civil Hospital.

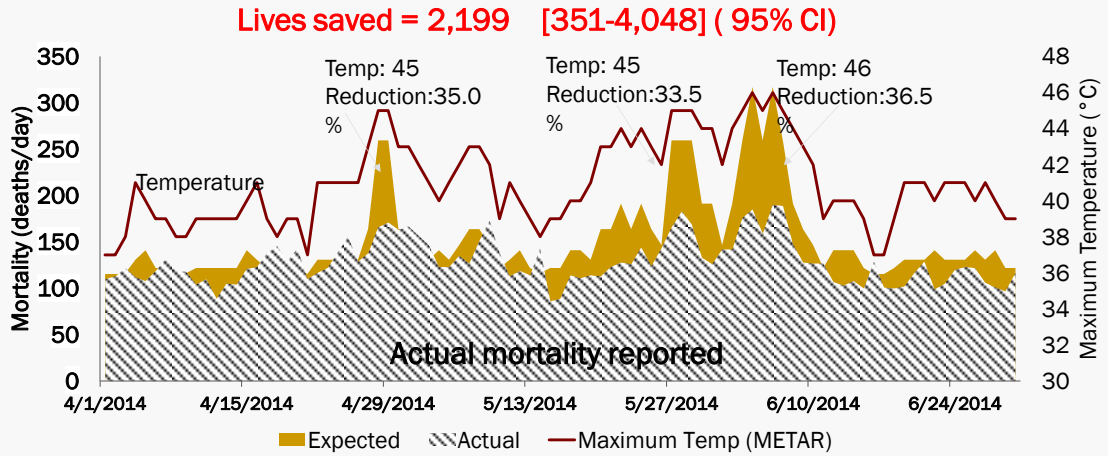
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Distribution of Max. Temperature (2010, 2014 & 2015) Ahmedabad city



Heat Wave 2014 (April-June) – temperature & mortality

Expected deaths (13,896) Vs. Actual deaths (11,697)

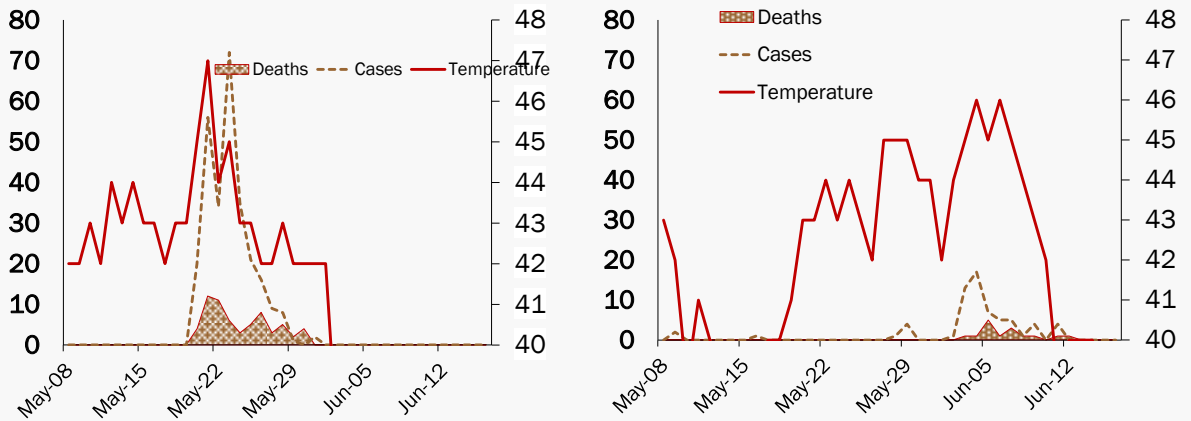


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Comparing temperature, heat stroke cases and death

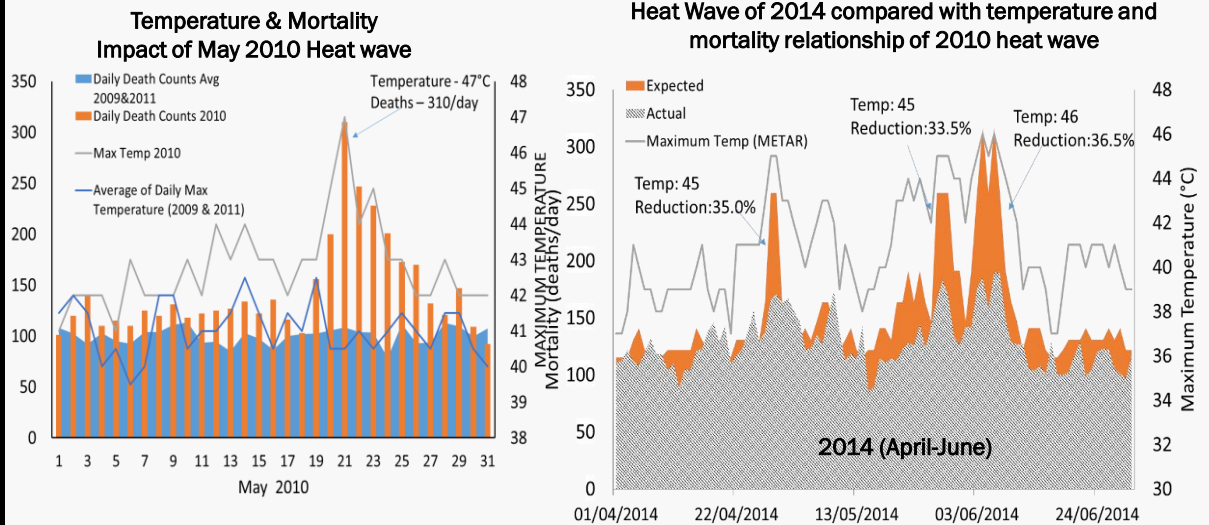
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2014

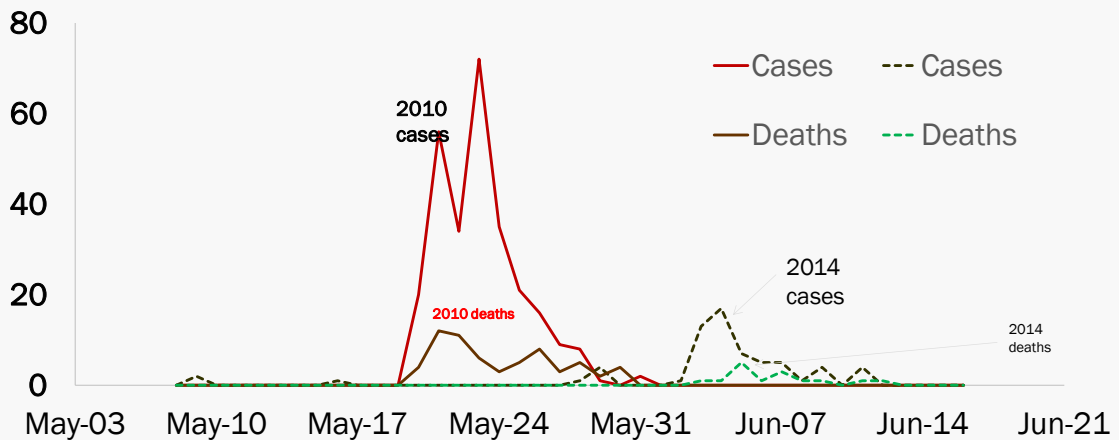


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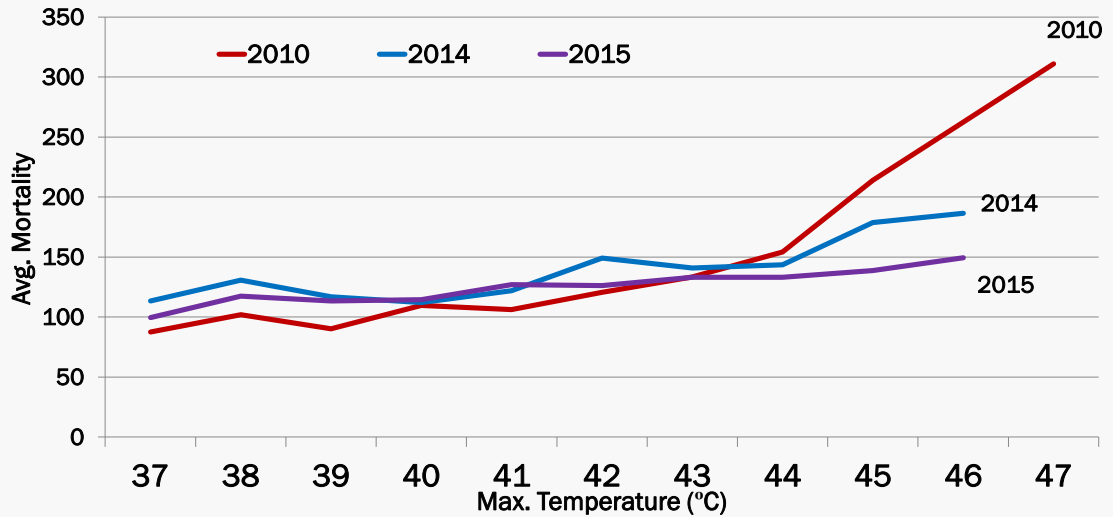
About 2000 lives saved in 2014 heat wave (post HAP) as compared to 2010 heat wave in Ahmedabad



Reported number of heat stroke Case and deaths: Timelines for 2010 and 2014



Temperature Mortality Relationship - Pre and Post HAP



Heat Wave 2014: Hospital Case reports

	2010 (temp 47)	2014 (temp 46)	Crude reduction (%)
Total heat stroke mortality *	65	15	76.19%
Total heat stroke cases*	274	63	76.28%

*Cases reported from 5 of Ahmedabad's municipal hospitals - VS Hospital, LG Hospital, Sola civil hospital, Sardar Patel Hospital and Civil Hospital Asarwa.

Key Public Health learning from Ahmedabad HAP

- Value of creating evidence
- Cost effective intervention
- Networking –Local (IIPHG), International (NRDC, CDKN)
- Advocacy at right level
- Stakeholder involvement and ownership to ensure sustainability
- Scaling up (supported by right advocacy)

Scaling Up Ahmedabad Experience & Release of “How To Manual” for other cities and states – April 2015

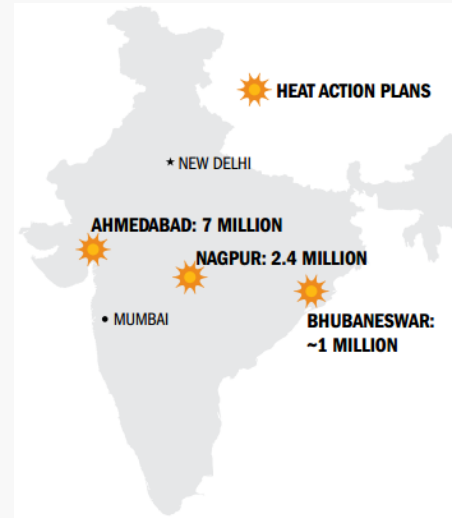


New York Knowledge Exchange Visit & Involvement of IMD – September 2015

COP21 PARIS
 NRDC Released “CITY RESILIENCE
 TOOLKIT: Response to Deadly Heat Waves
 and Preparing for Rising Temperatures”

States & Cities Piloting their First Heat Action Plan in 2016

- Maharashtra – 5 Cities including Nagpur
State Public Health Department Driven
- Odisha – 4 Cities including Bhubaneswar
State Disaster Management Authority Driven
- Gujarat – Surat
Municipal Corporation Driven

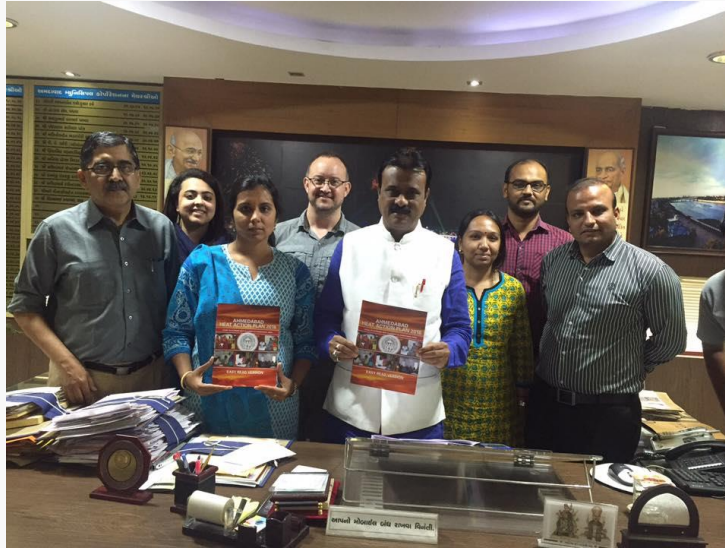


Scope: Institutionalising the plan nationally - as part of state action plans on climate change

Journal Publications

- Kim Knowlton, Anjali Jaiswal, Gulrez Shah Azhar, Dileep Mavalankar, Amruta Nori-Sarma, Ajit Rajiva, Priya Dutta et al. (2014) **Ahmedabad, Gujarat: Development and Implementation of South Asia's First Heat-Health Action Plan**. *Int. J. Environ. Res. Public Health*, 11: 3473-3492. (IF: 2.197) http://www.mdpi.com/journal/ijerph/special_issues/weather_risks
- Gulrez Shah Azhar, Dileep Mavalankar, Amruta Nori-Sarma, Ajit Rajiva, Priya Dutta et al. (2014) **Heat-related mortality in India: Excess all-cause mortality associated with the 2010 Ahmedabad heat wave**. *PLOS ONE* 9(3): 1-8. (IF: 3.73) <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0091831>
- Khyati Kakkad, Michelle L. Barzaga, Sylvan Wallenstein, Gulrez Shah Azhar, and Perry E. Sheffield (2014) **Neonates in Ahmedabad, India, during the 2010 Heat Wave: A Climate Change Adaptation Study**. *Journal of Environmental and Public Health*, Article ID 946875, 1:8. <http://www.hindawi.com/journals/jep/2014/946875/>
- Tran, Kathy V., Gulrez S. Azhar, Rajesh Nair, Kim Knowlton, Anjali Jaiswal, Perry Sheffield, Dileep Mavalankar, and Jeremy Hess (2013). **A cross-sectional, randomized cluster sample survey of household vulnerability to extreme heat among slum dwellers in Ahmedabad, India.** *International journal of environmental research and public health* 10, no. 6: 2515-2543. <http://www.mdpi.com/1660-4601/10/6/2515>

City leadership releasing the 2016 HAP



Thanks