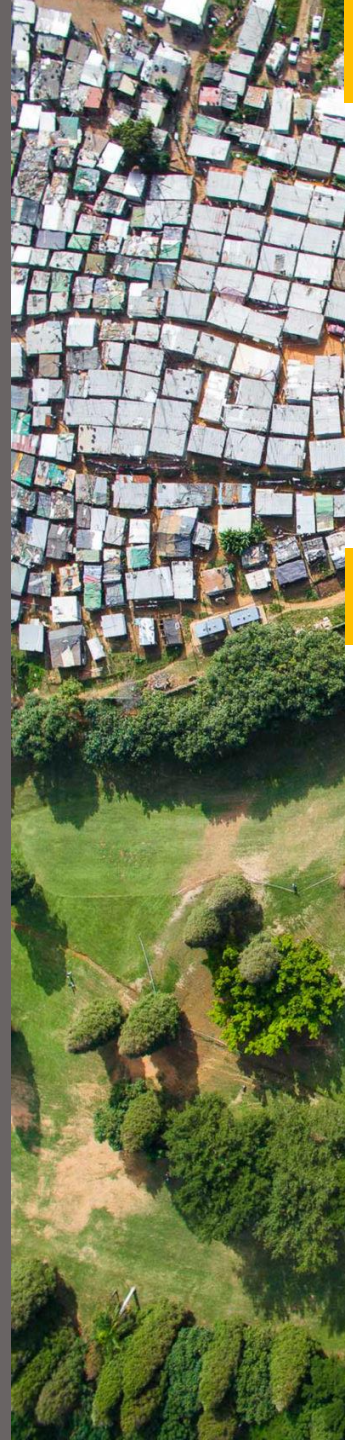

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MASTER CLASS

CLIMATE ADAPTIVE HEAT ACTION PLANS

25th August, 2021

Rohit Magotra

Deputy Director, IRADe

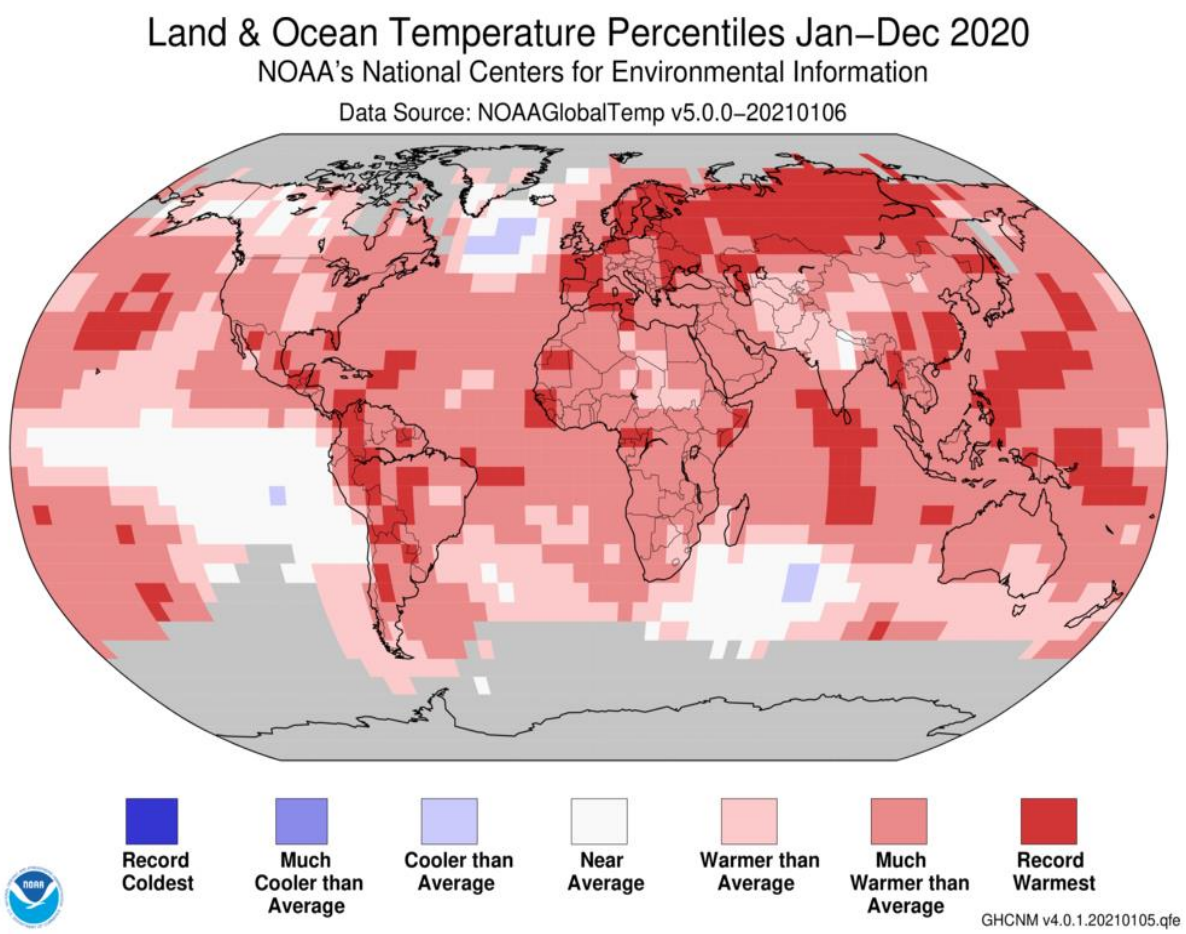
Integrated Research and Action for Development

The code Red - Increasing Evidence

- **IPCC, AR 5, 2014** - last 50 years have witnessed a hike in the frequency of hot days, nights, and heat waves globally.

- **IPCC AR6, 2021** - "Increase in intensity and frequency of hot extremes, such as warm days, warm nights, and heat waves.

RISING TEMPERATURES – GLOBAL SCENARIO



- **June and July, 2020** the **warmest months ever on record.**
- **2020 warmest year**, 1.2° C above the pre-industrial *(WMO)*
- **2010-20, Warmest Decade ever on the record**

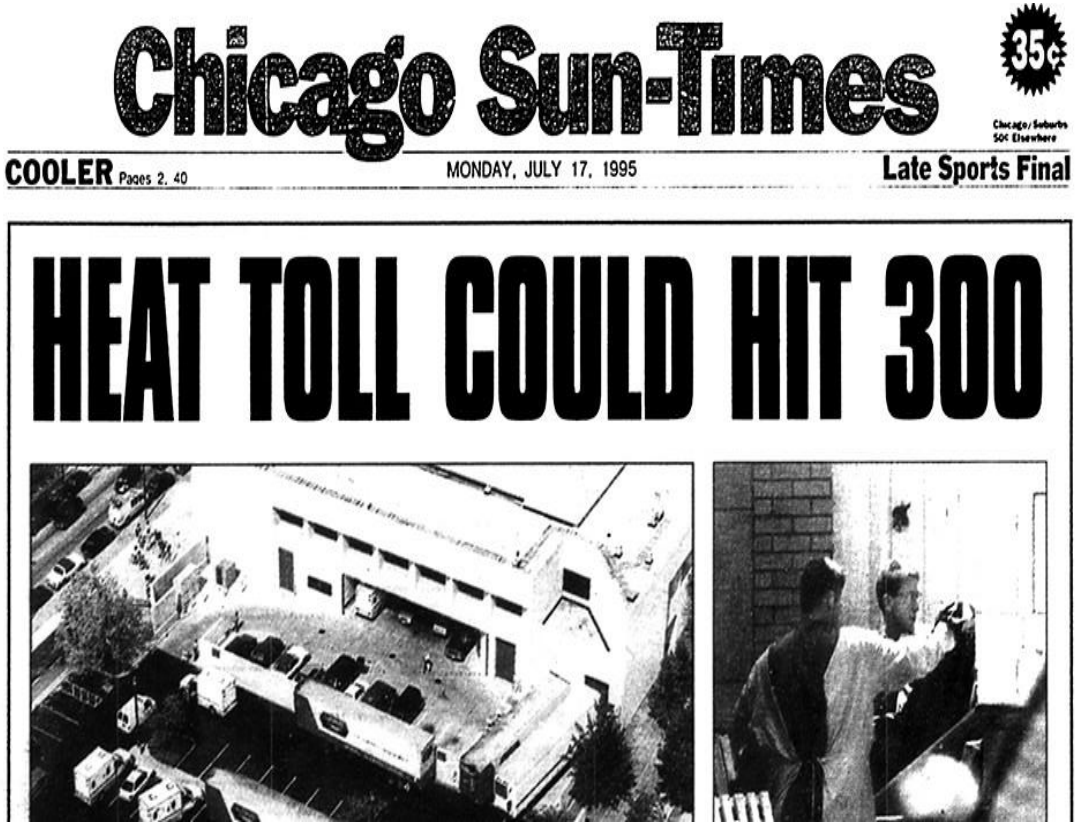
HEAT STRESS - Threat

- **In 2019, 475 million vulnerable populations exposed** to heatwave events globally (***Lancet Countdown Report, 2021***)

- **In 2100**, Heat stress induced deaths - **85 per 100,000 globally and above 100 per 100,000 in lower-income groups** (***Global Impact Lab, 2019***)

HEAT WAVE – EXTREME EVENTS

Chicago Heat Wave, 1995



Chicago Sun-Times

35¢

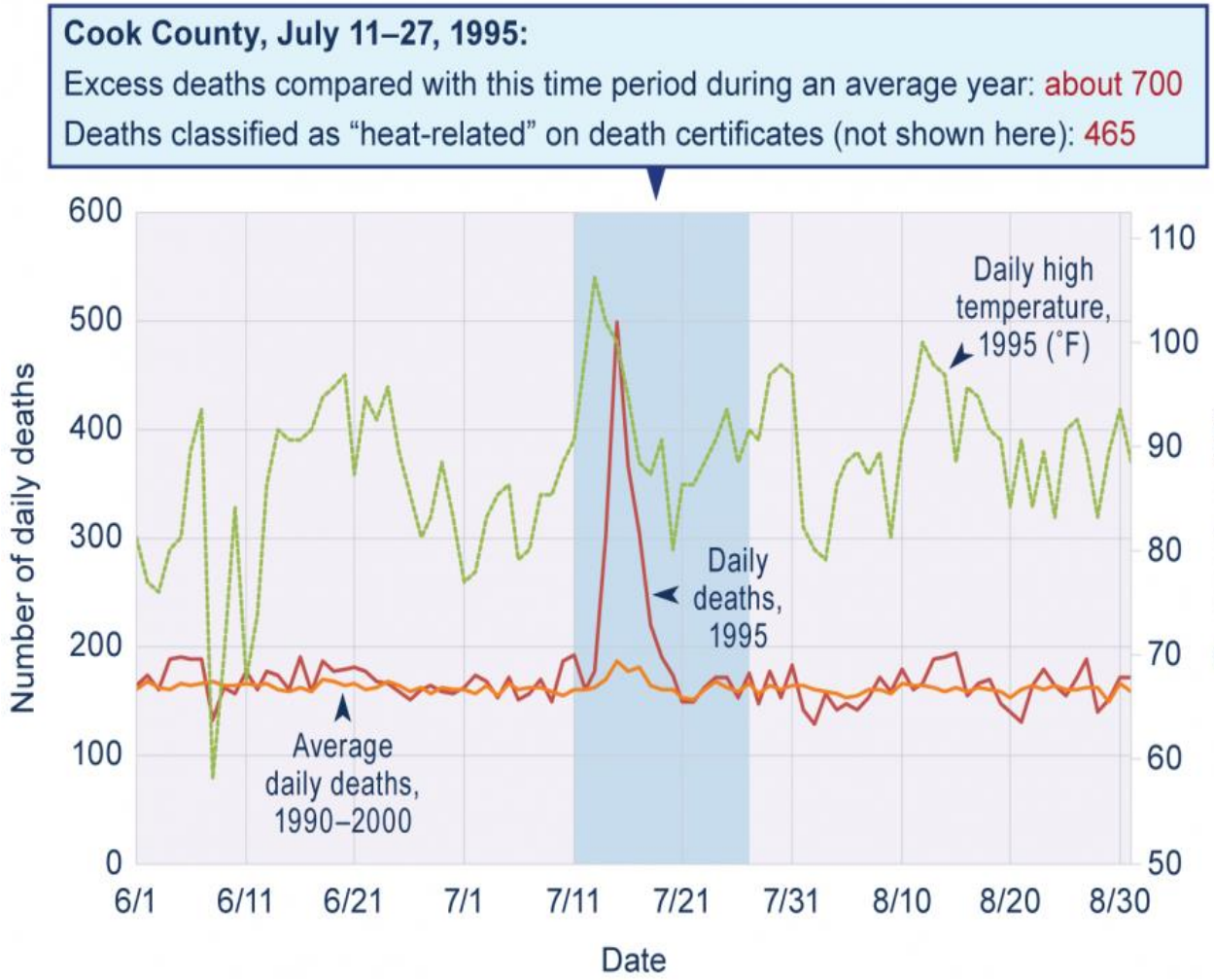
COOLER Pages 2, 40 MONDAY, JULY 17, 1995 Late Sports Final

HEAT TOLL COULD HIT 300

- **739 heat-related deaths** in Chicago over a period of **five days.**
- Most of the victims of the heat wave were elderly poor residents of the city

HEAT WAVE – EXTREME EVENTS

Chicago Heat Wave, 1995



Semenza JC, Rubin CH, Falter KH, Selanikio JD, Flanders WD, Howe HL, Wilhelm JL. Heat-related deaths during the July 1995 heat wave in Chicago. New England journal of medicine. 1996 Jul 11;335(2):84-90.

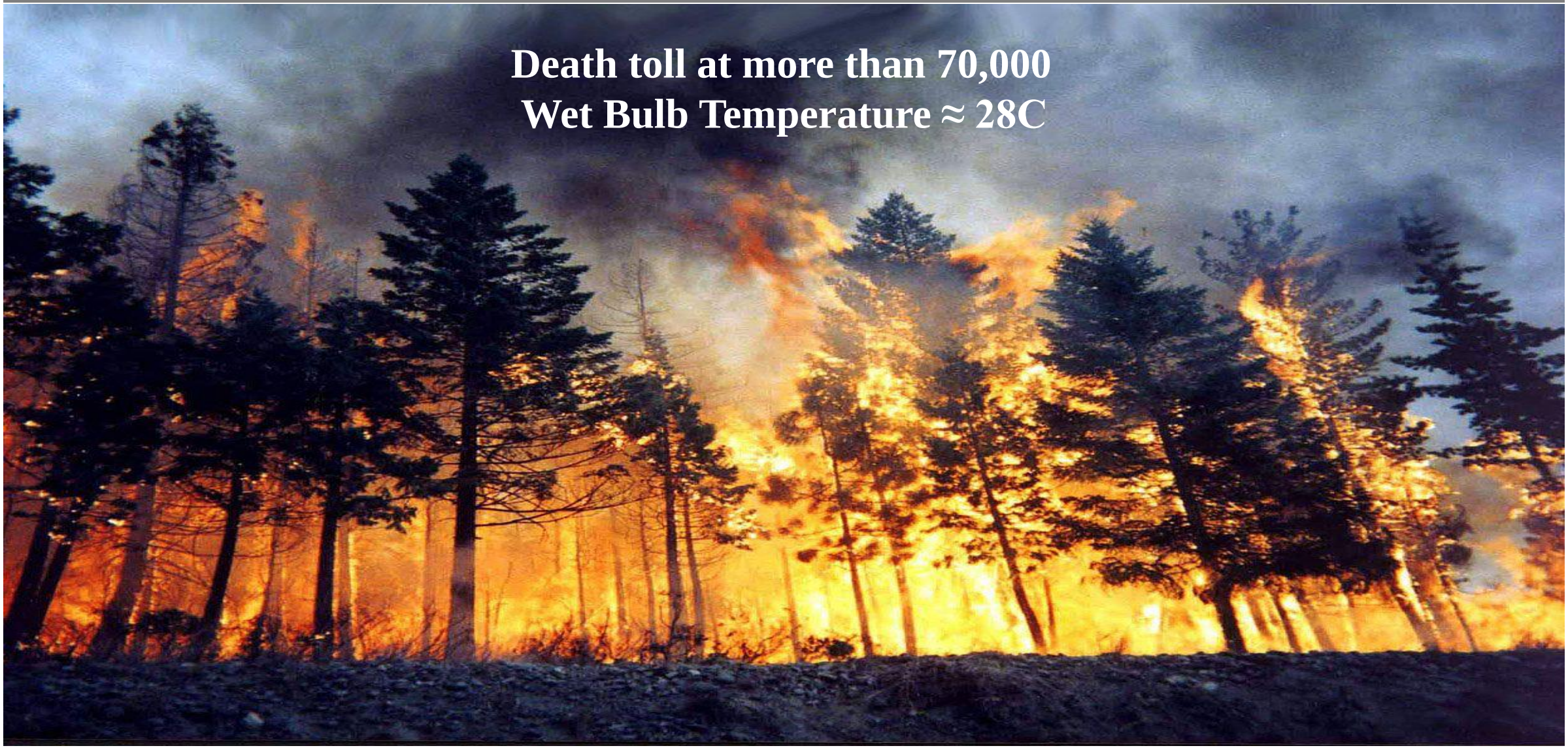
<u>Mass Grave</u> in Chicago after Heat Wave – 68 unclaimed bodies, with 41 who died due to Heat Wave

HEAT WAVE EXTREME EVENTS

Moscow Russia, 2010

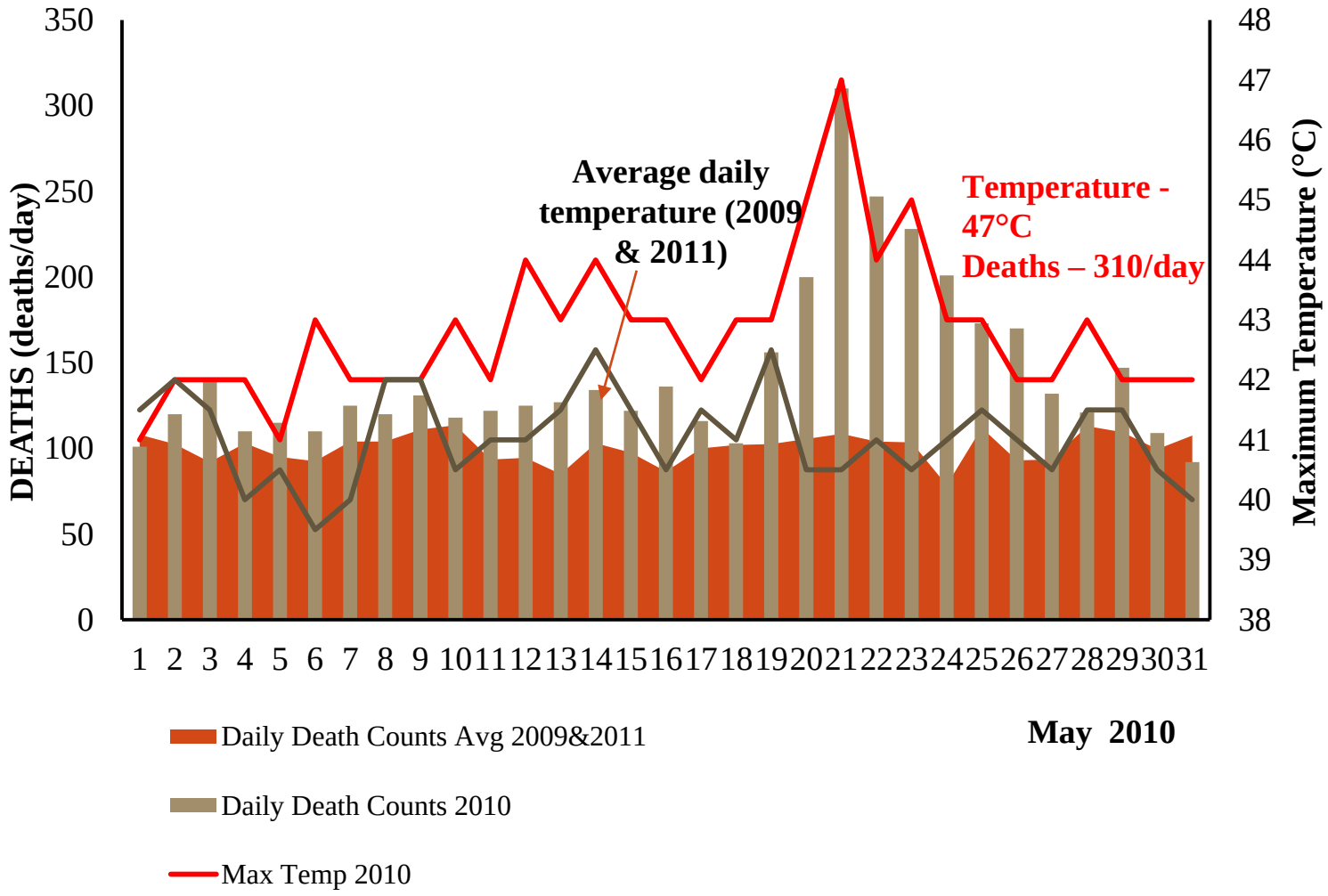
HEAT WAVE – EXTREME EVENTS

European Heat Wave, 2003



HEAT WAVE – EXTREME EVENTS

Ahmedabad, India, 2010



- **1,344 additional deaths registered** in the city during the month of May
- **May 20-27th – excess deaths 800 in one week**

HEAT WAVE – EXTREME EVENTS

Karachi, Pakistan, 2015

700 people died in three-day

HEAT WAVE – EXTREME EVENTS

Karachi, Pakistan, 2018

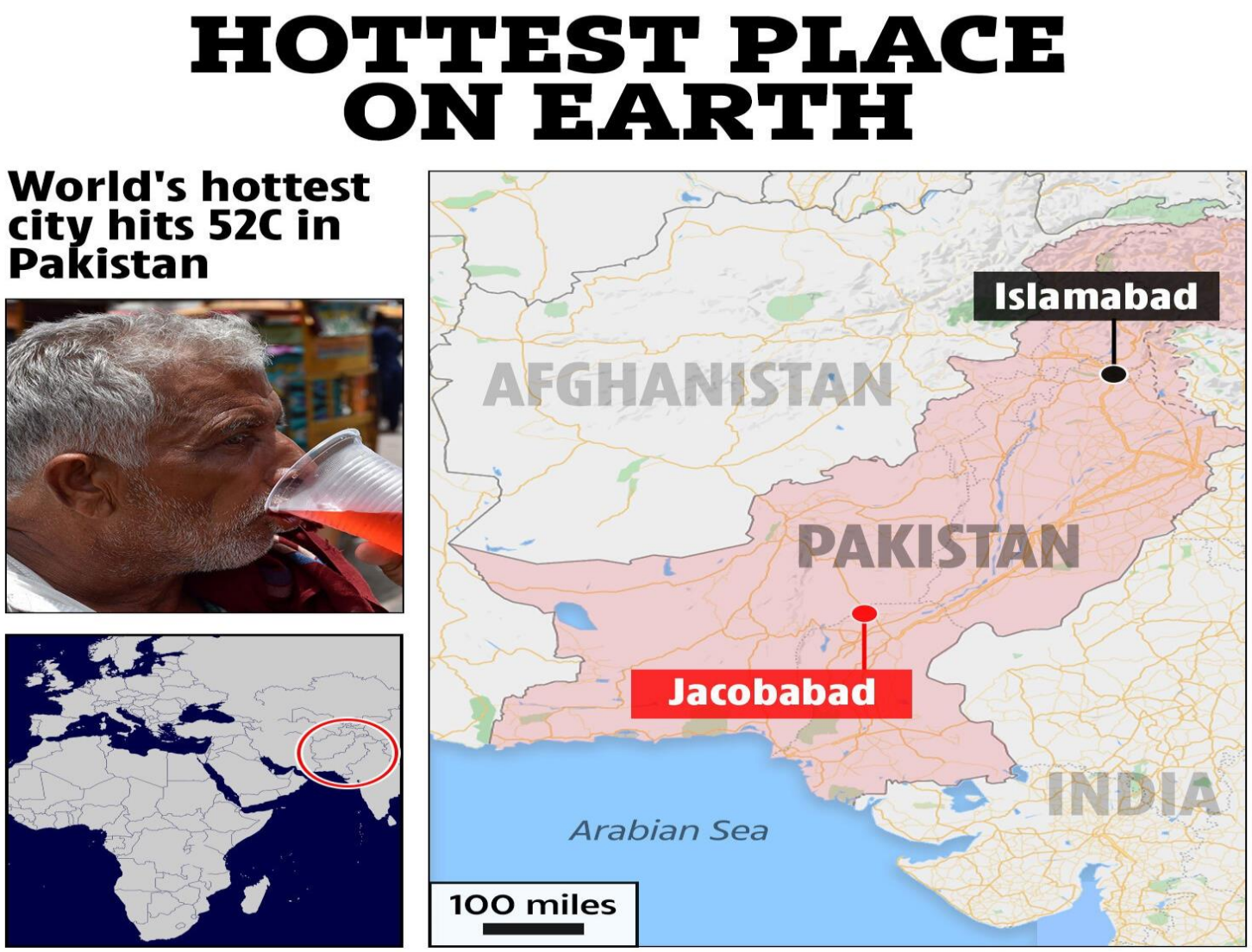
killed at least 65 people in just three days

HEAT WAVE – EXTREME EVENTS

Western North America Heatwave, 2021

HEAT WAVE – EXTREME EVENTS

Jacobabad, Pakistan, 2021



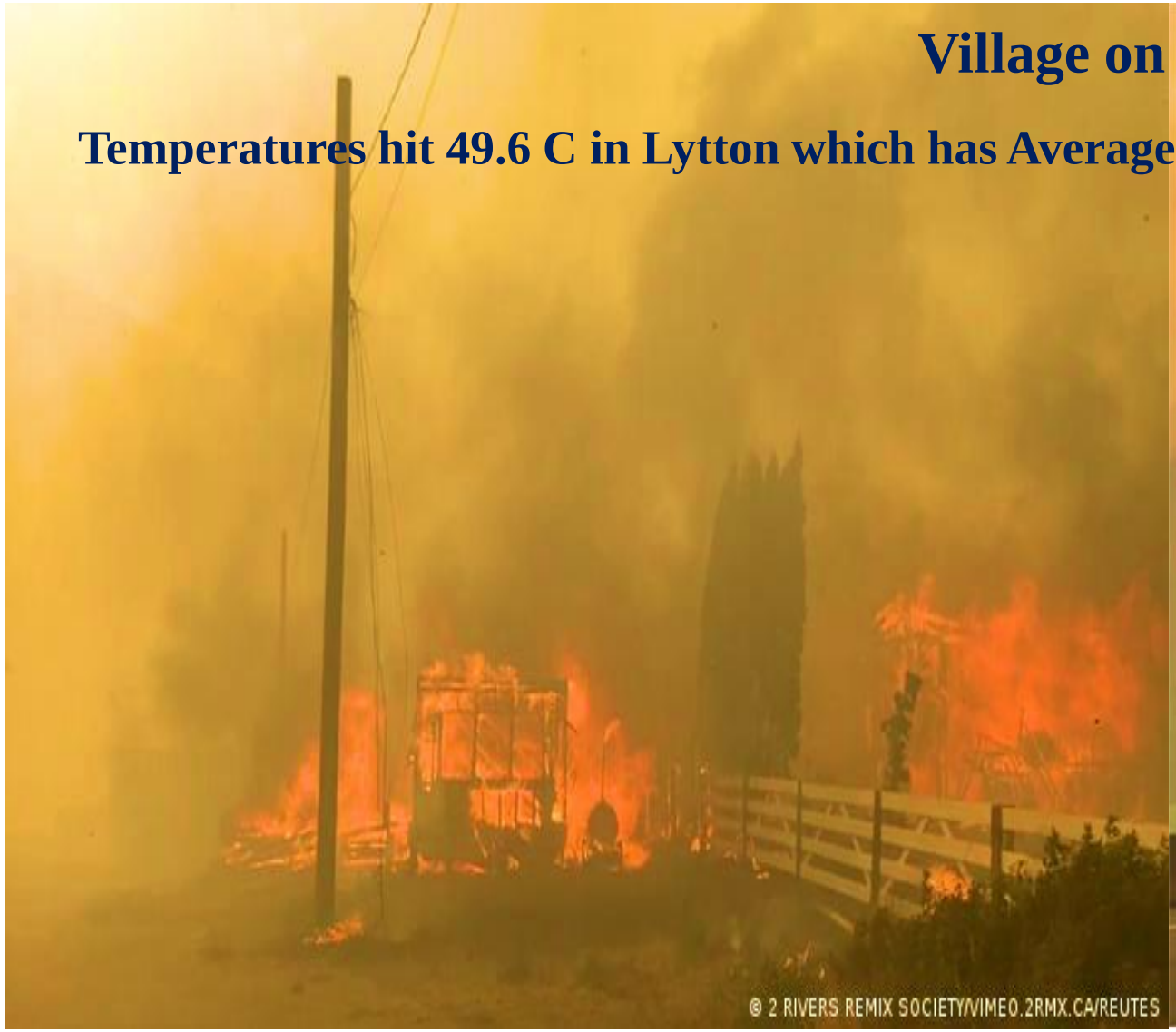
- **Wet Bulb Temperature has crossed 35^0C** in July 1987, in June 2005, June 2010 and July 2012.
- The dry bulb temperature is **over 50 ^{0}Cin the summers**.

HEAT WAVE – WILDFIRE

Lytton Canada, 2021

Village on Fire

Temperatures hit 49.6 C in Lytton which has Average Maximum Temperature of 24 ^{0}C during June



HEAT WAVE – WILDFIRE

California USA Heatwave, 2021

Nearly 350 homes have been destroyed and more than 17,000 structures are threatened

HEAT WAVE –BIODIVERSITY LOSS

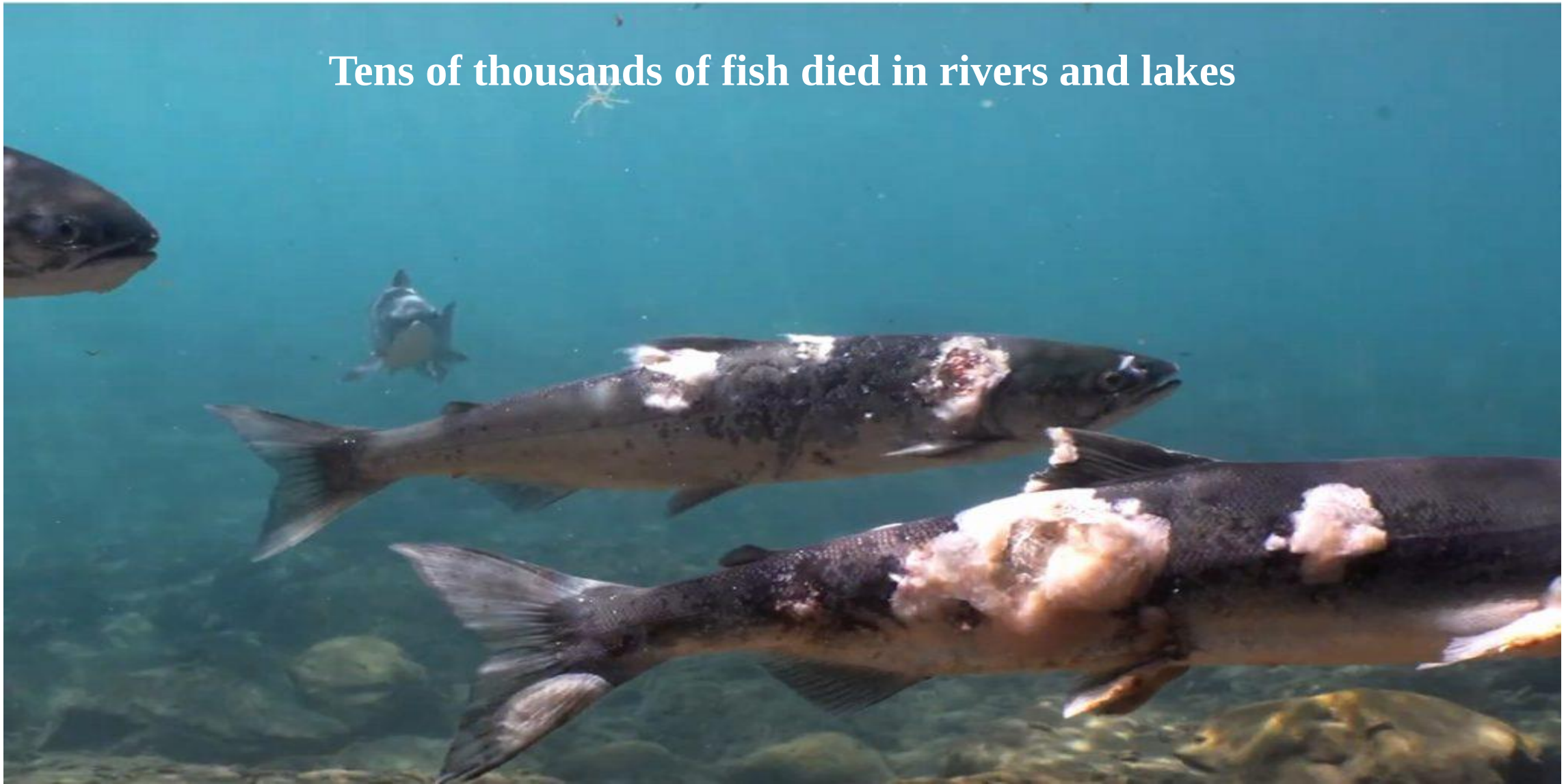
Canada Heatwave, 2021

HEAT WAVE –BIODIVERSITY LOSS

Spain Heat Waves, 2021

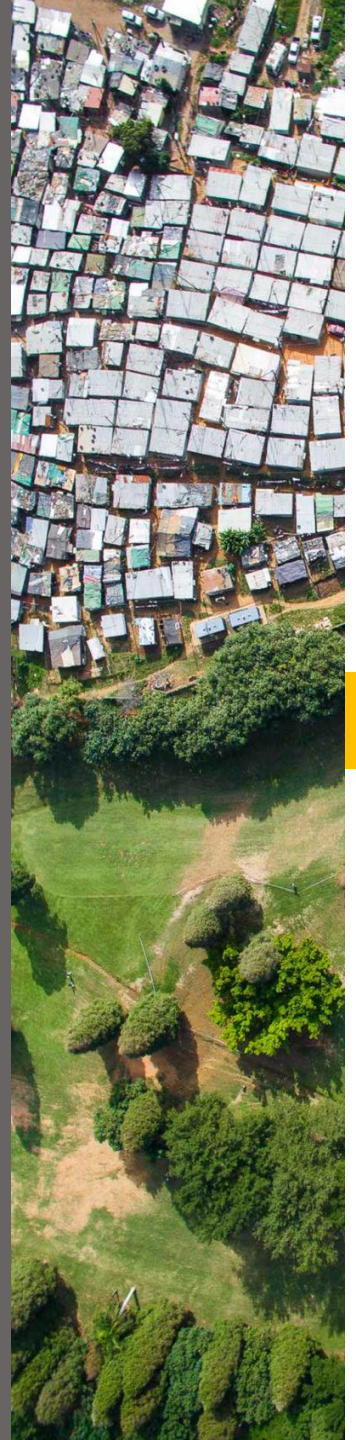
HEAT WAVE –BIODIVERSITY LOSS

Pacific Northwest Heatwave, 2021



HEAT WAVE – BIODIVERSITY LOSS

Egypt Heatwave, 2021



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HEAT WAVE & HEAT STRESS

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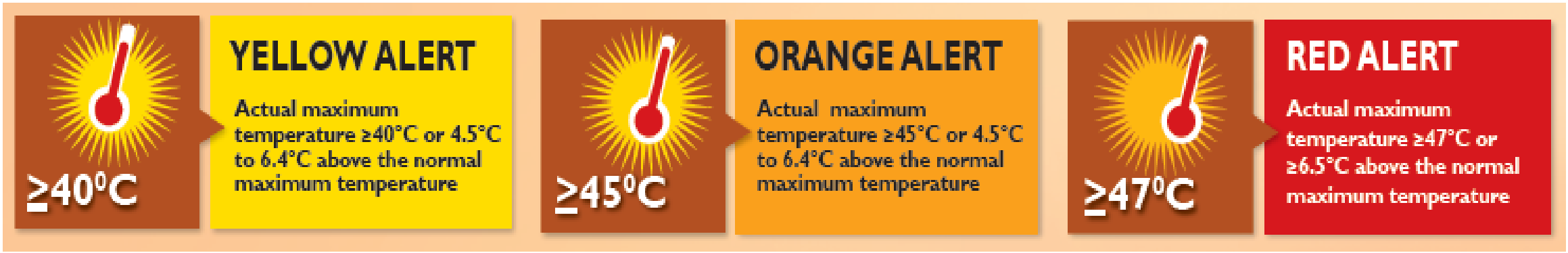
HEAT WAVES

•Heat wave is a **relative phenomenon** and it is deviation from the normal temperatures .

•Heat wave criteria vary for hilly, coastal and plains – varies geographically

•In India Heat Wave is not considered till maximum temperature of a station reaches at least 40 ºC for Plains and at least 30ºC for hilly areas and 37ºC for coastal areas

IMD criteria for Heat wave Alert



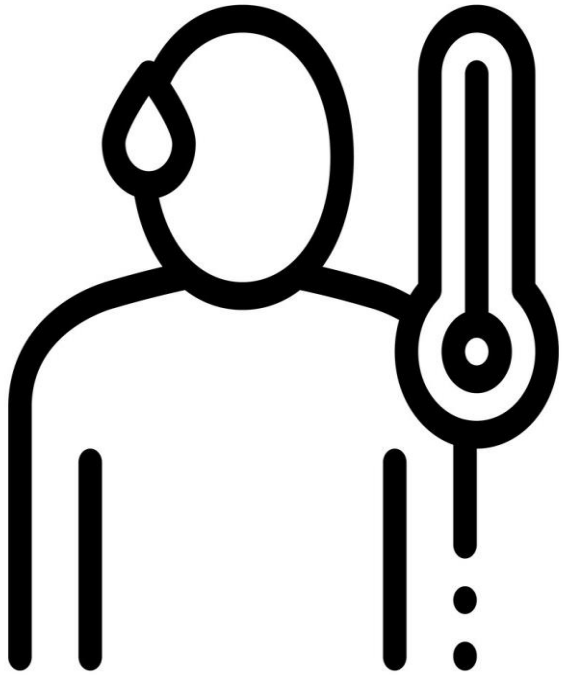
HEAT ALERTS

Karachi, Pakistan	Above 40 ^{0}C
Paris, France	0°C to 3°C differences for averaged maximum temperatures (23-25^{0}C)
Denmark, Europe	Three consecutive days exceeds 28°C (82.4°F)
Adelaide, Australia	Five straight days with temperatures at or above 35°C (95°F), or three consecutive days at or over 40°C (104°F)

Wet Bulb Temperature

- When the UK sweltered with a record drybulb temperature of 38.7°C in July 2019, the **wet-bulb temperature** in Cambridge was no more than 24°C.

- Even in Karachi's killer heatwave of 2015, the wet-bulb temperature stayed below 30°C.

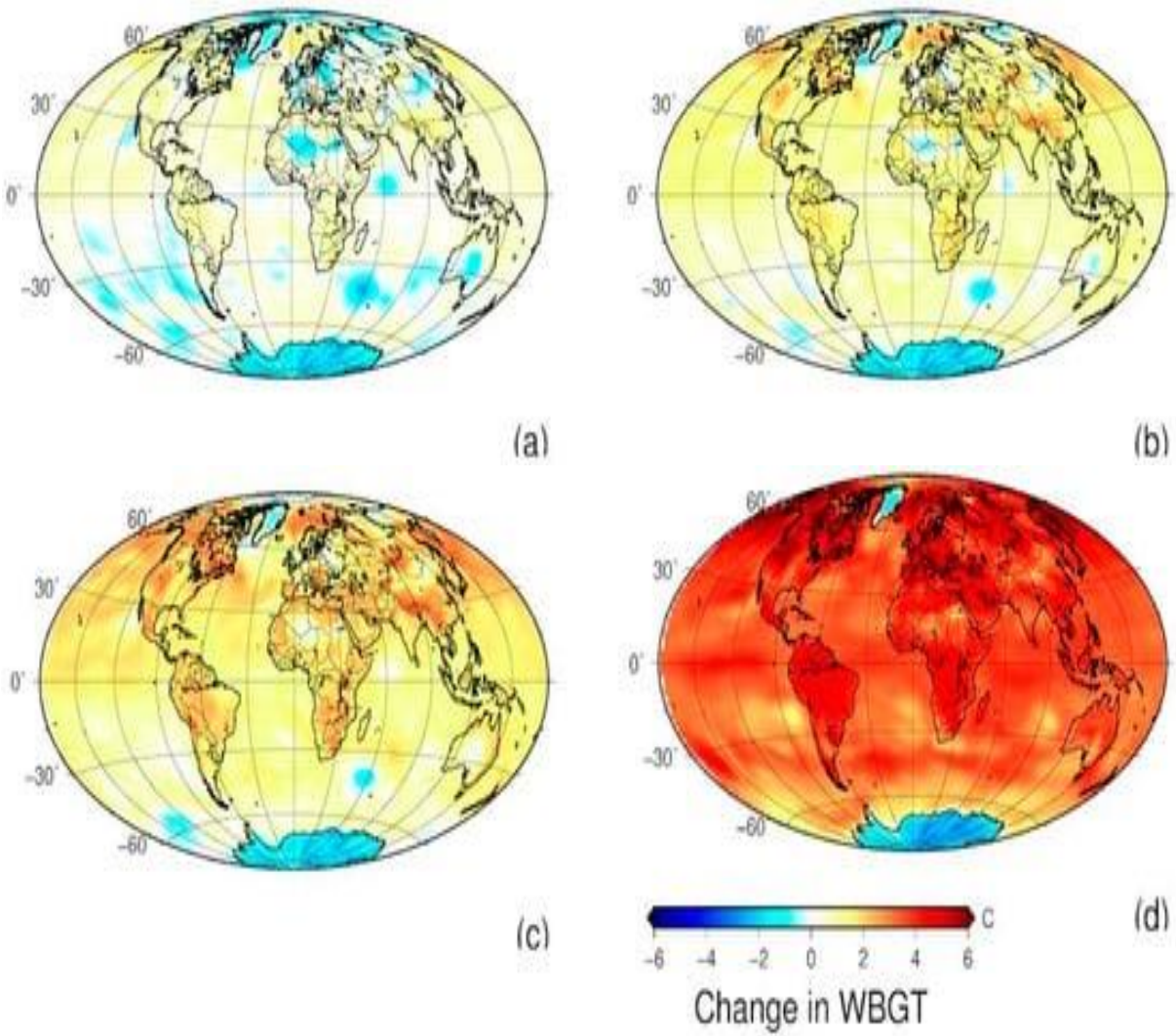


A wet-bulb temperature of 35 °C, or around 95 °F, is pretty much the absolute limit of human tolerance

Skin Temperature	Core Temperature
35^0C	37^0C

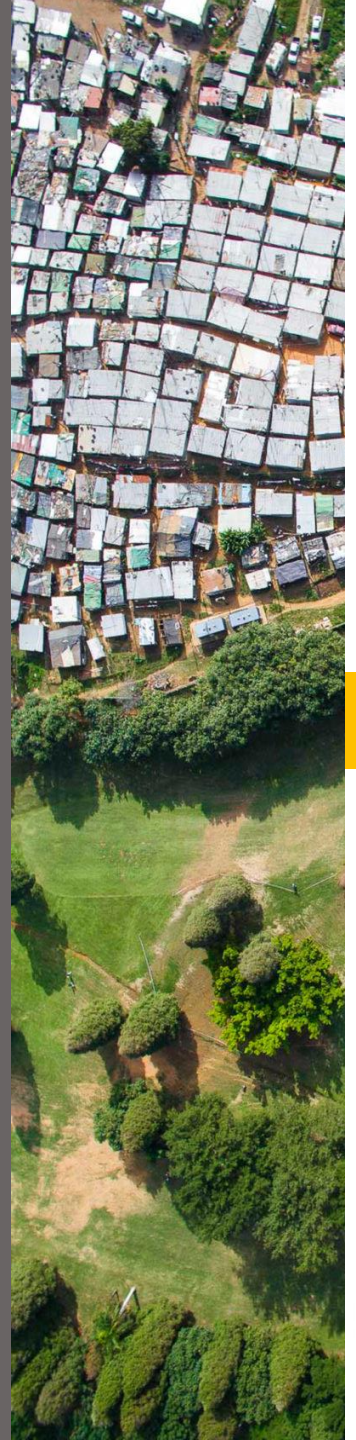
Above $35\ ^0C$ the body cannot cool itself through sweat

Wet Bulb Temperature – The Real Threat



Regional changes in ten-year maximum monthly mean Wet-Bulb Globe Temperature during the period of 2091–2100 compared to the long-term average (1948–2010) under the Representative Concentration Pathways.

- WBGT is projected to increase by **0.6-1.7 °C for RCP 2.6 and 2.37-4.4 °C for RCP 8.5.**
- Climate models project the first **35°C TW occurrences by the mid-21st century in South Asia , Coastal Middle East & Coastal South West North America.**
- Some **coastal subtropical locations have already reported a TW of 35°C** and that extreme humid heat overall has more than doubled in frequency since 1979.



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HEAT WAVE ACTION PLAN

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HEAT ACTION PLANS

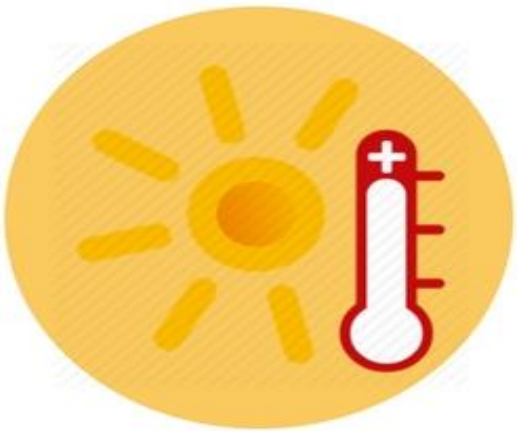
Terminology

Heat Action Plans are **critical adaptation measure to manage growing heat stress**. Heat Action Plans aim to provide a framework for implementation, coordination and evaluation of extreme heat response activities that reduces the negative impact of extreme heat

- **Early warning, co-ordination with the emergency response systems** and health authorities are key feature of heat action plan.

HEAT ACTION PLANS

Heat Stress Action Plan Components



EARLY WARNING SYSTEM & INTER AGENCY EMERGENCY RESPONSE PLAN

Alert residents of predicted high and extreme temperatures & formally communication channels to alert governmental agencies

PUBLIC AWARENESS & COMMUNITY OUTREACH

Communicate the risks of heat waves and implement practices to prevent heat-related deaths and illnesses

CAPACITY BUILDING OF MEDICAL PROFESSIONALS

Training focus on primary medical officers and other paramedical staff, and community health staff

REDUCING HEAT EXPOSURE AND PROMOTING ADAPTIVE MEASURES

Access to potable drinking water and cooling spaces during extreme heat days & promote adaptive measures.

WHY HEAT ACTION PLANS?

1. **Prevents deaths** associated with heat strokes.
2. Government commitment to **protect the poor and vulnerable citizens**.
3. **Reduces** chances of **illness** due to heat waves.
4. Making cities future ready, **Climate resilient Indian cities**.
5. Better **preparedness of hospitals/health centers.**
6. **Economic losses- labor productivity, loss of job days, reduced labor and opportunity loss.**

CLIMATE ADATIVE HEAT ACTION PLANS linkages with SDGs

Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters
Target 13.2: Integrate climate change measures into national policies, strategies and planning
Target 13.3: Improve education, awareness-raising and human and institutional capacity

Target 11.b: Substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the **Sendai Framework for Disaster Risk Reduction 2015-2030,** holistic disaster risk management at all levels

Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure
Target 9.a: Facilitate sustainable and resilient infrastructure development in developing countries

Target 3.9: Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

HEAT ACTION PLANS – TIMELINE (GLOBAL)

EUROPE	France, Germany, England, Austria & Portugal
USA & CANADA	Phoenix, Philadelphia & New York City
	Heat Alert and Response Systems to Protect Health: Best Practices Guidebook - Canada
	Hot Weather Response Framework – Toronto, 2019
	Excessive Heat Events Guidebook - USA
AUSTRALIA	Health Extreme Heat Strategy – South Australia
	Queensland Health Heatwave Management Sub-Plan – Queensland

HEAT ACTION PLANS – TIMELINE (SOUTH ASIA)

1999 — Odisha, India Implements First Heat Action Plan

2009 — Bangladesh Climate Change Strategy and Action Plan

2013 — Ahmedabad, Gujarat Launches Heat Action Plan

2016

- National Disaster Management Authority (NDMA) introduces a set of guidelines to enable states to prepare effective Heat Action Plans
- Telangana Heat Wave Action Plan
- Andhra Pradesh Heat Wave Action Plan
- Hazaribagh Heat Action Plan
- Sri Lanka Heat Action Plan
- Male Heat Action Plan

2017

- Rajasthan Heat Action Plan
- Haryana Heat Action Plan
- Nepal Heat Action Plan

2018

- Uttar Pradesh Heat Action Plan
- Karnataka Heat Action Plan
- Maharashtra Heat Action Plan
- Surat Heat Action Plan
- Karachi Heat Action Plan

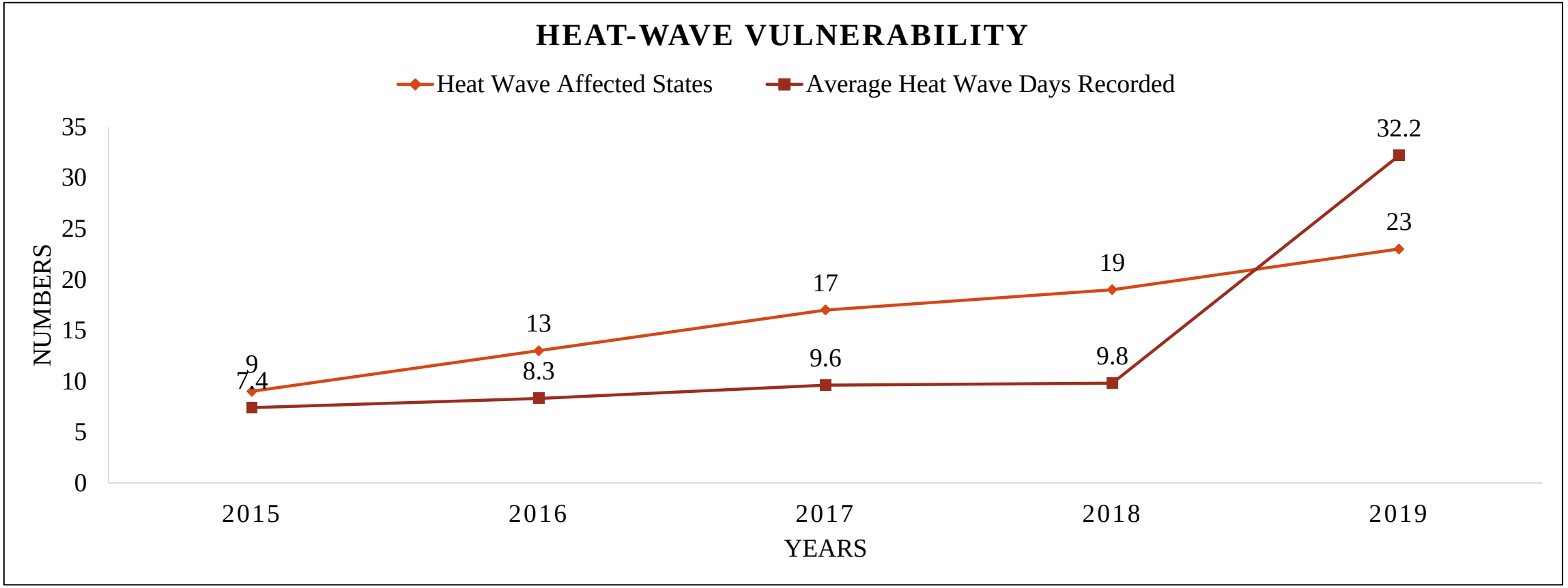
2019

- Gorakhpur Heat Action Plan
- Tamil Nadu Heat Action Plan
- Bihar Heat Action Plan

2020 — Odisha Heat Action Plan, Updated Kerala Heat Action Plan

IMPACT OF HEAT ACTION PLANS

India is projected to see 10% increase in death rates due to climate change (Climate Impact Lab, 2019).



Source: Forecast Demonstration Project(FDP) for Improving Heat Wave Warning over India, Implementation Report, 2019, IMD, New Delhi

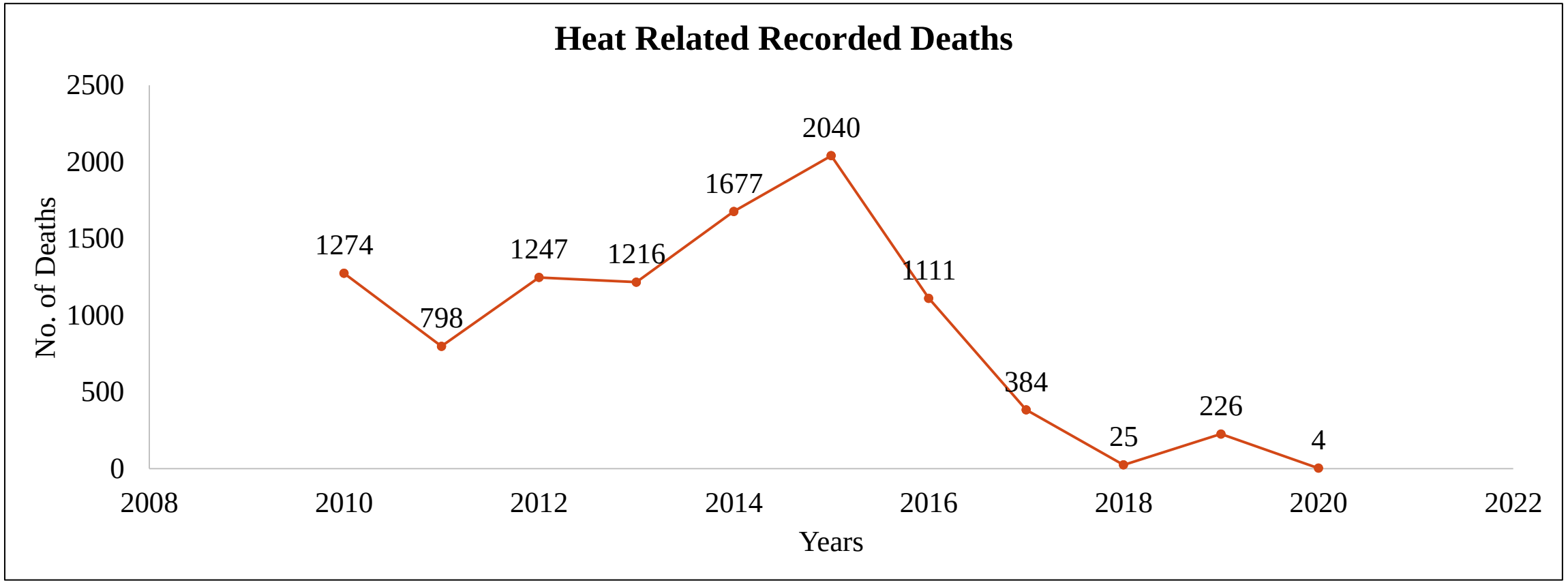
- **Average Heat Wave days have increased from 7 to 32 (2015-2019)**
- **No. of States affected increased from 9 – 23 (2015-2019)**

REVIEW OF HEAT ACTION PLANS IN SOUTH ASIA

- Heat Action Plan has **not been adopted by all cities** across India
- No City level heat action plan in South Asia except Karachi
- Existing Plans are **broad based** not considering regions, wards, vulnerable groups in planning appropriate adaption and mitigation actions
- These plans don't include impact and measures for the fires, wild life, animals and agriculture

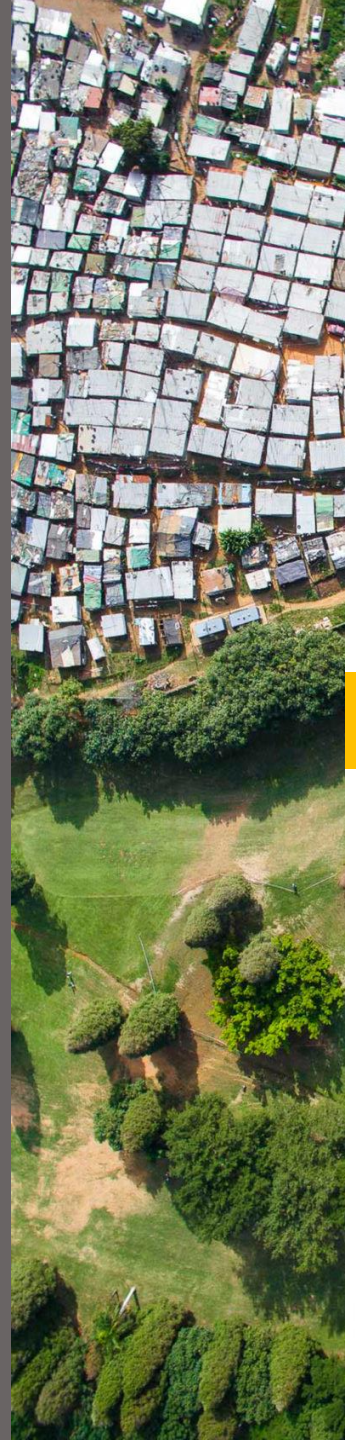
- Action Plans needs to:
  - Provide a **climate-sensitive framework for implementation**, coordination and evaluation of extreme heat response activities in cities.
  - **Alert those populations at risk of heat-related illness** in places where extreme heat conditions prevail, by adopting dynamic climate intelligence.
  - Inclusive of gender sensitivity

IMPACT OF HEAT ACTION PLANS



Source: NDMA

The introduction and adaption of the Heat action Plans across the cities of India, has helped in **decreasing Heat related mortality significantly (NDMA)**



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CLIMATE ADAPTIVE HEAT ACTION PLAN - RAJKOT

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HAPs FRAMEWORK

LITERATURE REVIEW – CITY LEVEL

- City Overview - Socio-Demographic and Urbanization,
- Historical Overview - Heat related Mortality and Morbidity

CLIMATOLOGICAL VARIANCE

- City Climatological Analysis – Temperature (Tmax, Tmin) and Relative Humidity

THERMAL HOTSPOT MAPPING

- Developing methodology
- GIS mapping of thermal hotspots - city and Ward level mapping

VULNERABILITY MAPPING & ASSESSMENT

- Vulnerable Group and Area Identification, City level Surveys and Vulnerability Assessment – Ward level

HAPs FRAMEWORK

HEAT STRESS IMPACT ASSESSMSNT

- Impact on Health, Livelihood and Productivity

STAKEHOLDER MAPPING & CAPACITY BUILDING

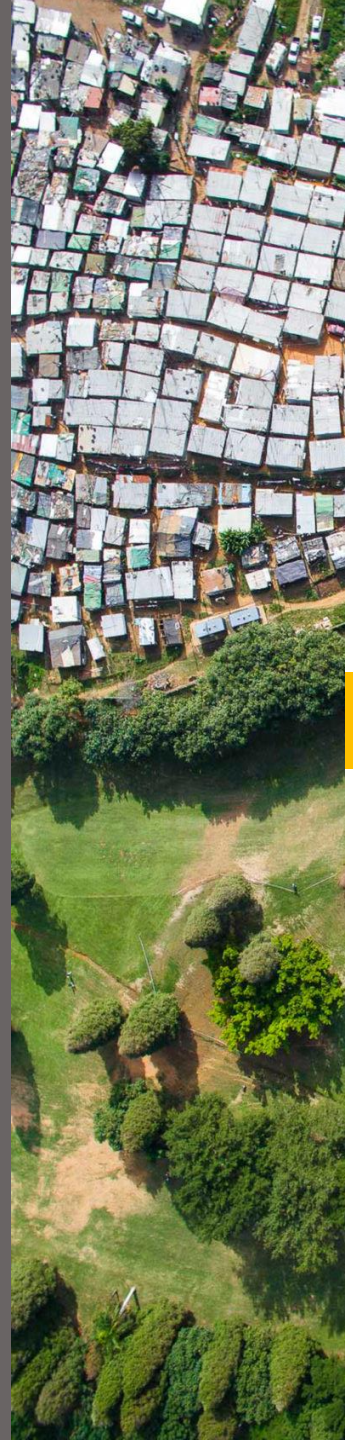
- City and State level stakeholder engagement and community participation

MITIGATION & ADAPTION STRATEGIES

- Key strategies, Pre-heat, during heat and Post heat Strategies
- Sector wise mitigation and adaption measures

DISSEMINATION, MONITORING & EVALUTAION

- Public out-reach, campaigns,
- Heat Alerts & Early warning systems



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CITY OVERVIEW

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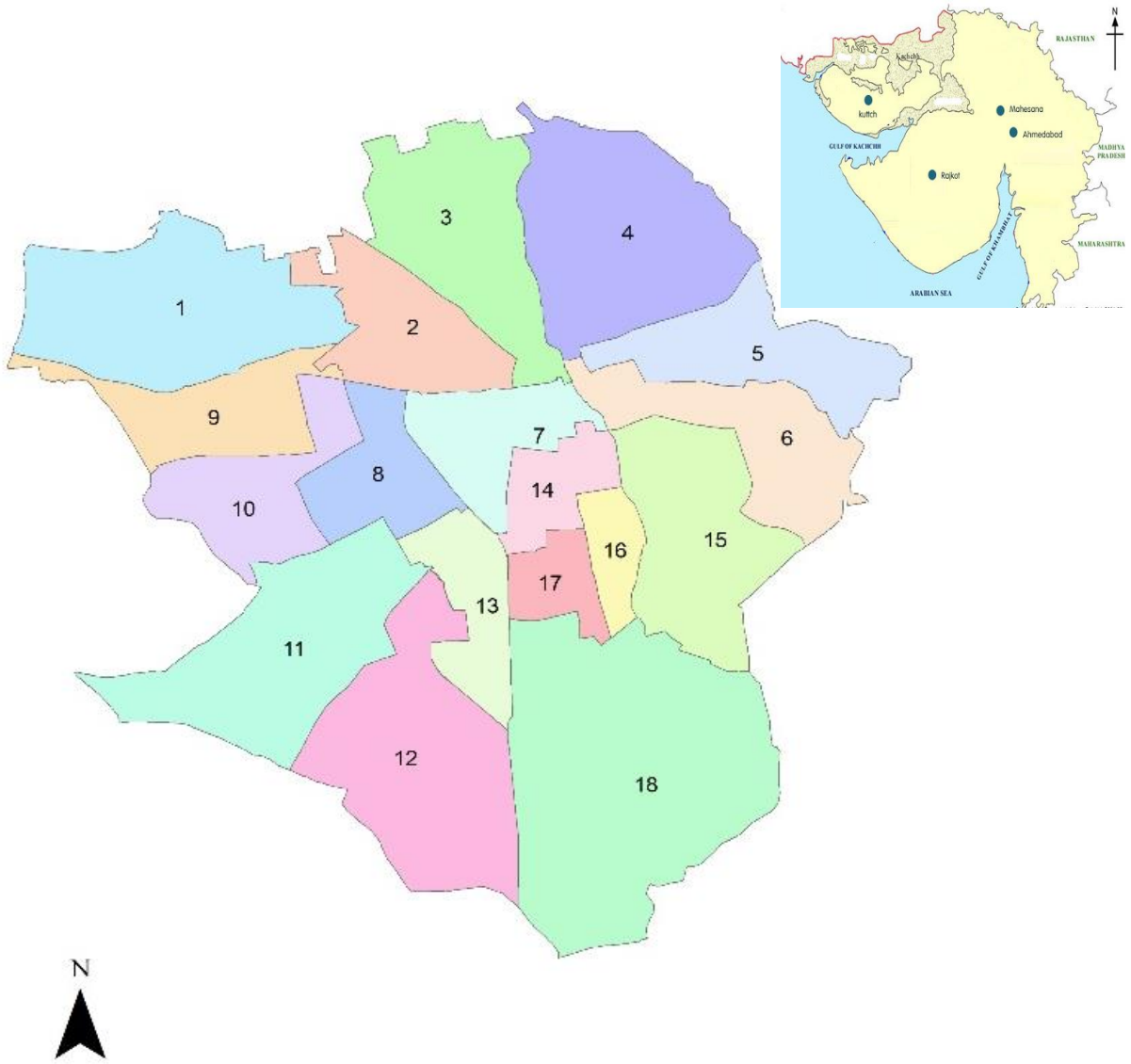
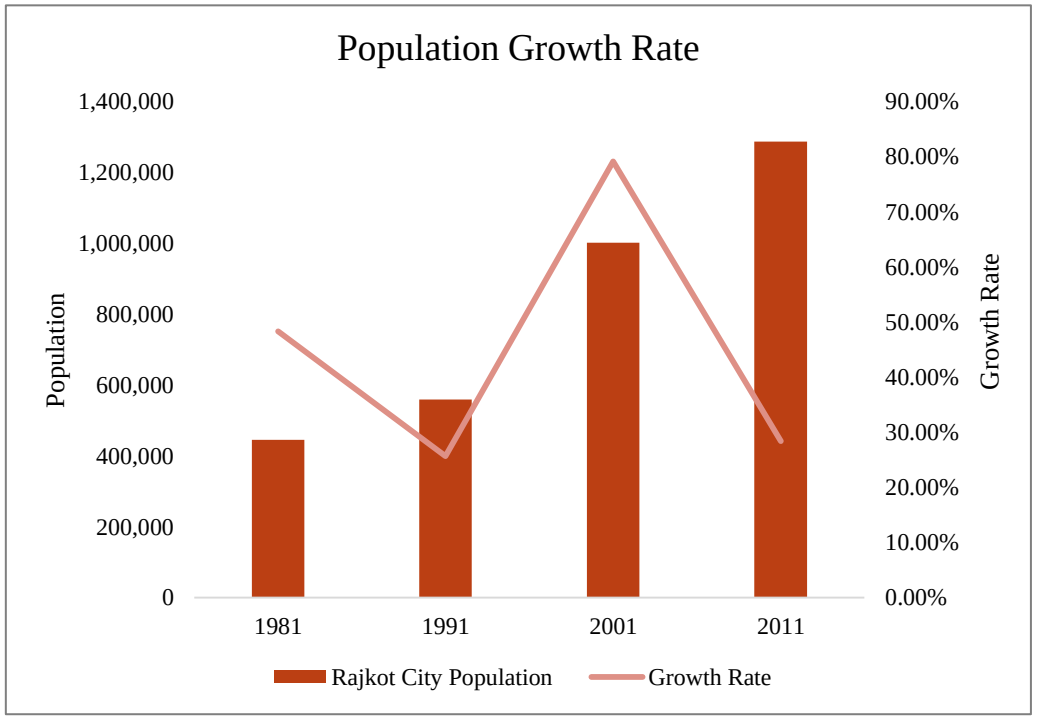
CITY OVERVIEW

- City Overview –
  - Socio-Demographic
  - Urbanization
- Historical Overview –
  - Heat related Mortality
  - Heat related Morbidity

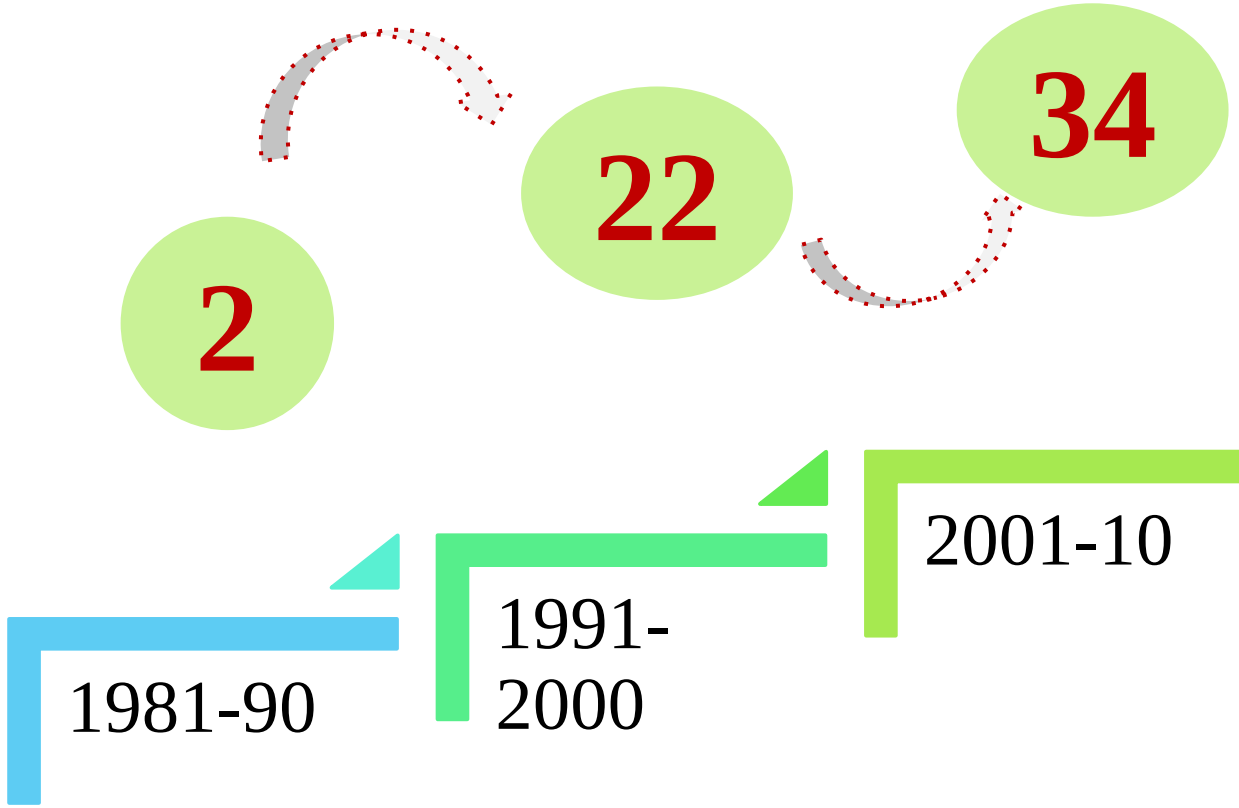
RAJKOT CITY



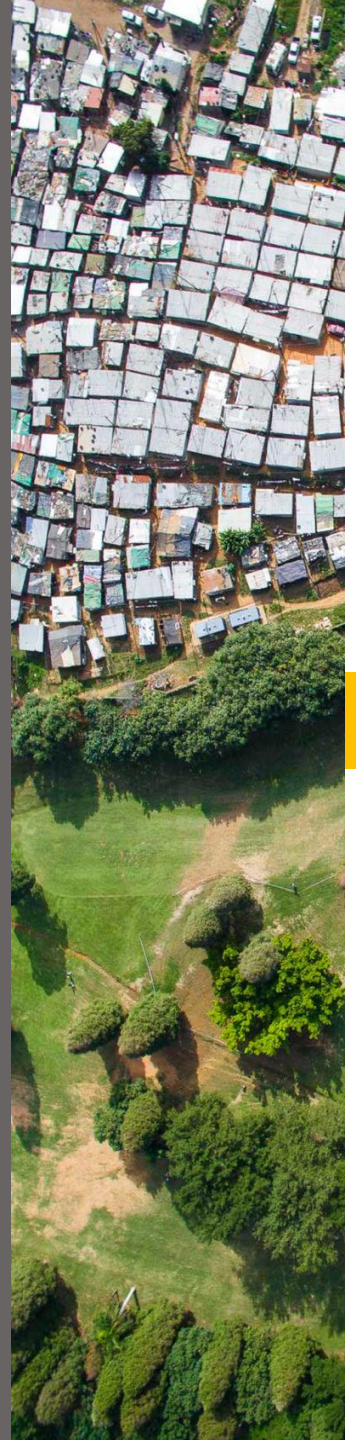
City Characteristics	
Location	22.3°N 70.78°E
Height above main sea Level	134 mts
Total area (sq. km)	104.85 (Census, 2011) 170 (Present)
No. of Wards	18
No. of Slum Pockets	145



HEAT WAVE DAYS INCREASE OVER DECADES



Source: Ray et al., 2013



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CITY CLIMATOLOGY

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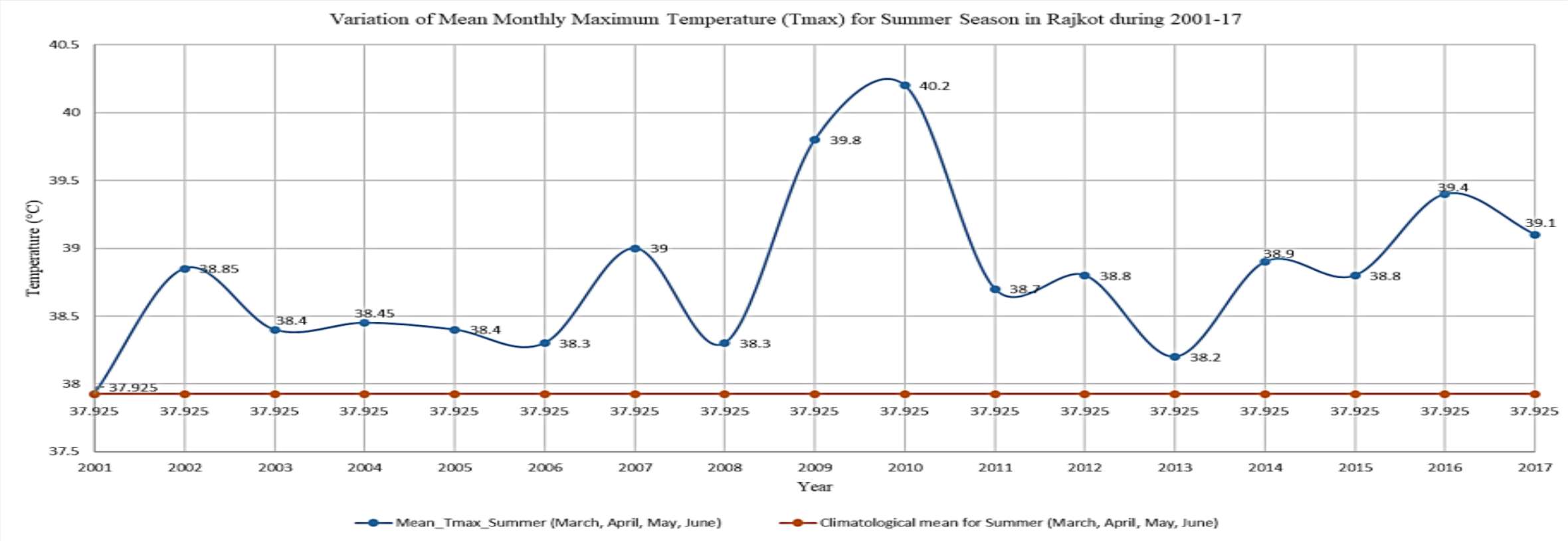
CITY CLIMATOLOGY

City Climatological Analysis

- Temperature (Tmax,Tmin)
- Relative Humidity

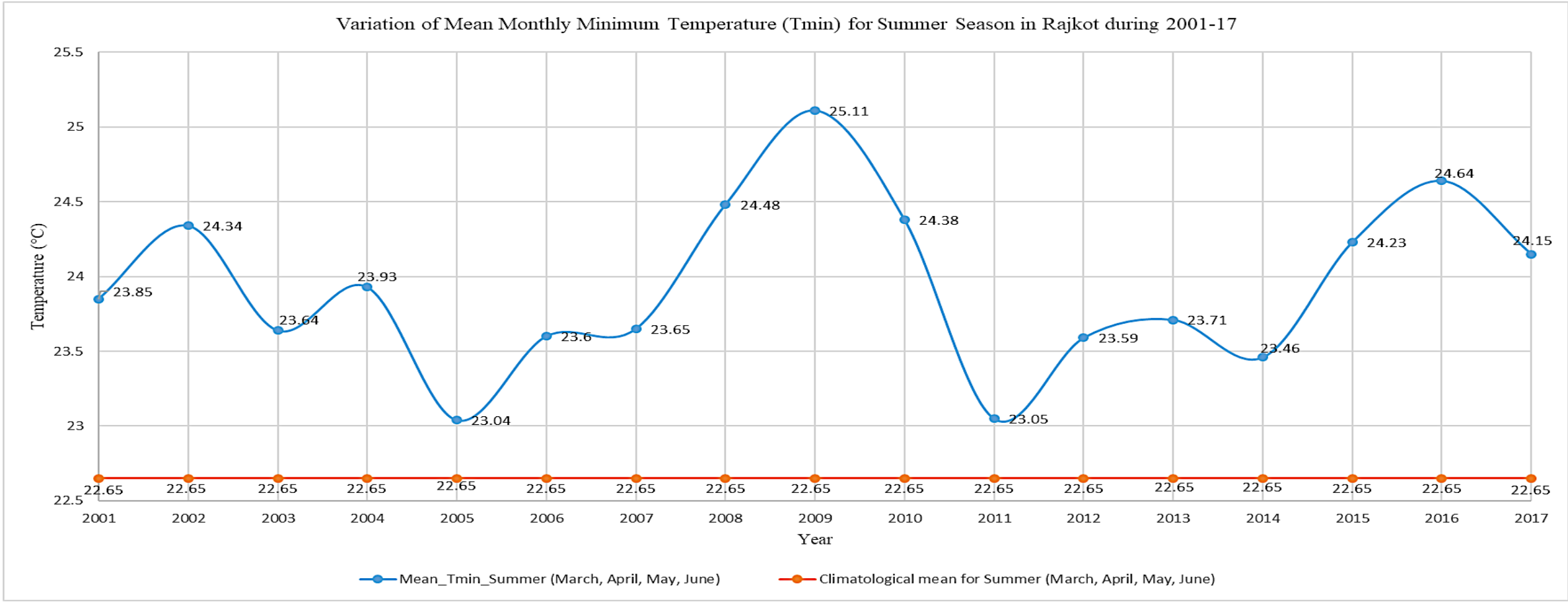
MEAN MONTHLY MAXIMUM TEMPERATURE (Tmax)



On an average, **maximum departure from climatological mean** has been observed for the month of April (1.2 °C) followed by March (1.09 °C), May (0.84 °C) and June (0.36 °C) during the study period.

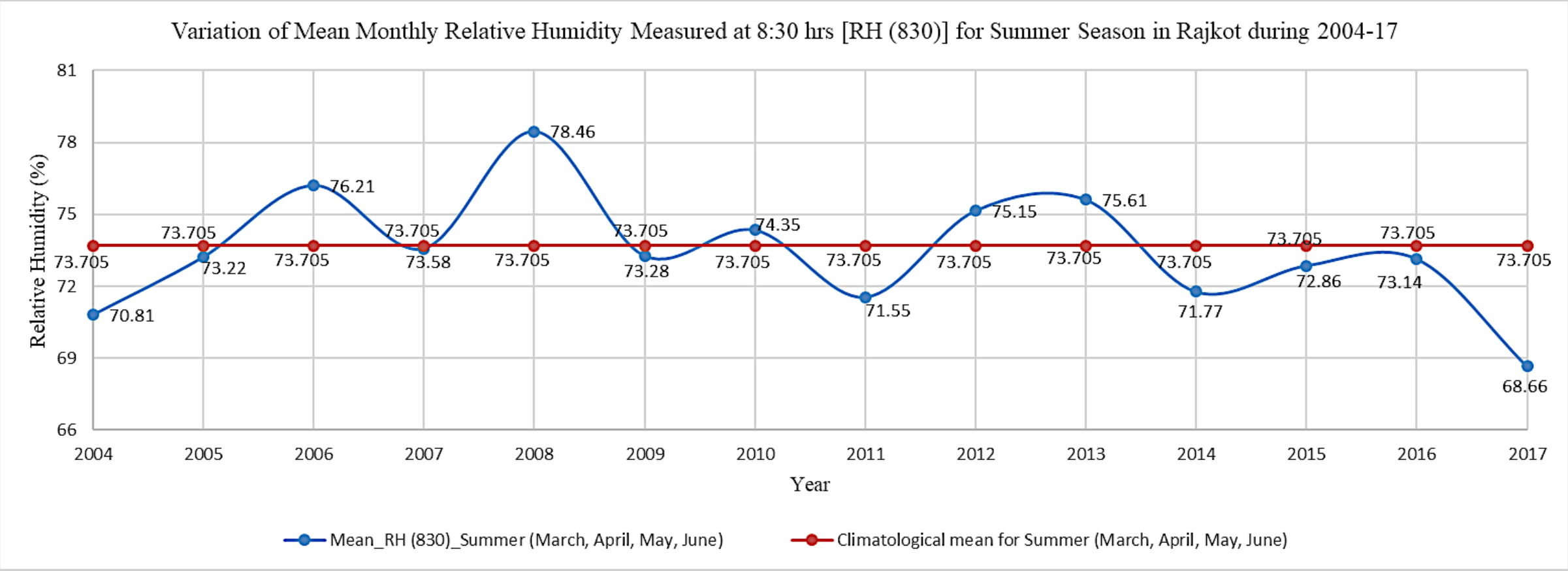
April records relatively higher temperature than other summer months

MEAN MONTHLY MINIMUM TEMPERATURE (Tmin)



Maximum deviation (increase) in Tmin value was observed for March (1.7 °C) and April (1.6 °C). March and April see increase in both minimum and maximum temperatures in comparison to reference climatological mean.

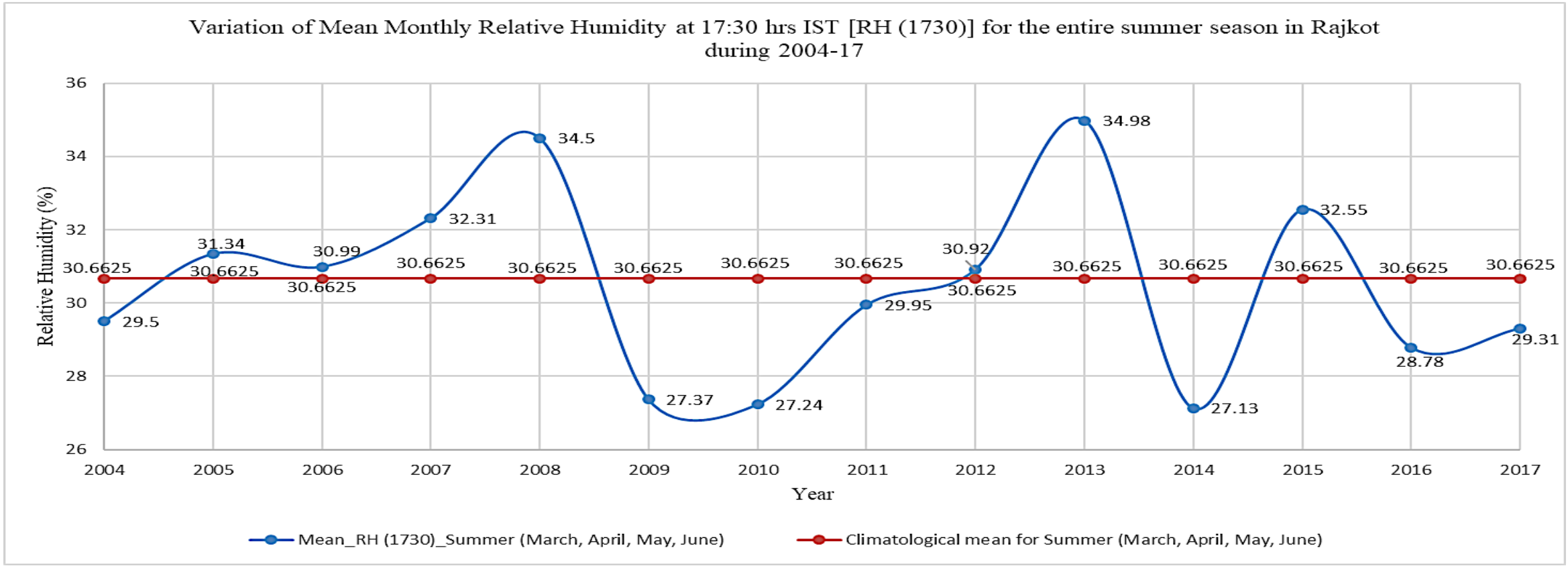
MEAN MONTHLY RELATIVE HUMIDITY (RH 830)



Mean monthly RH in the morning at 8: 30 hrs has decreased by nearly 1.33% in March, 0.42% in May and 0.29% in June for reference years 2004 to 2017, Increase of 1.12% was noticed for the month of April.

March, May, and June are becoming drier

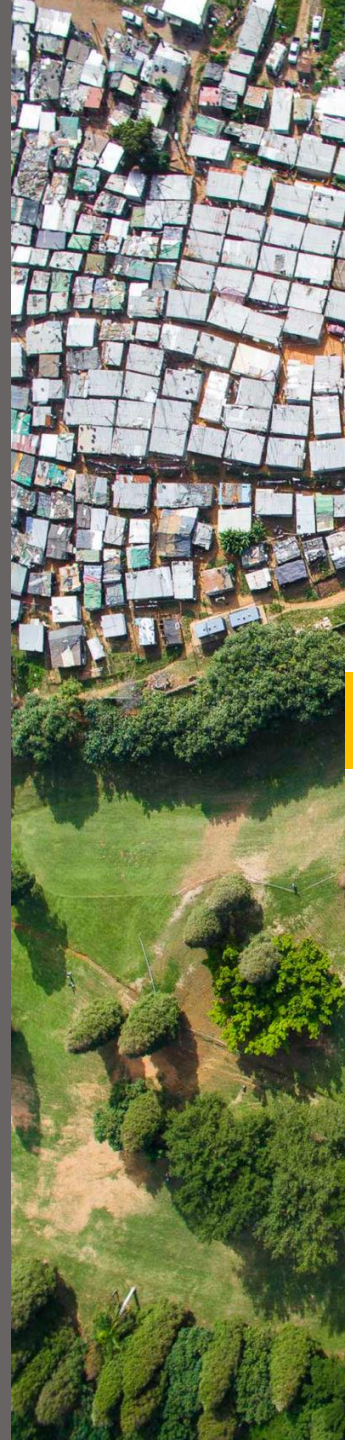
MEAN MONTHLY RELATIVE HUMIDITY (RH 1730)



Out of the four summer months studied, only June had shown positive deviation for the reference period.

March, April, and May show decline in evening mean relative humidity

March is relatively more 'drier' having negative deviations



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THERMAL HOTSPOTS MAPPING

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THERMAL HOTSPOT MAPPING

- Developing methodology
- GIS mapping of thermal hotspots,– city and Ward level

MAPPING METHODOLOGY)

'Heat hot-spots' are areas within the city which experience ambient temperature in excess of the average monthly maximum temperature.

Step 1: Data Identification

- Landsat 8 provides data with 11 spectral bands

Step 2: Conversion of DNs to Spectral Radiance values

- Band 10 of Landsat 8 data was used for retrieval of LST

Step 3: Computation of Land Surface emissivity (LSE)

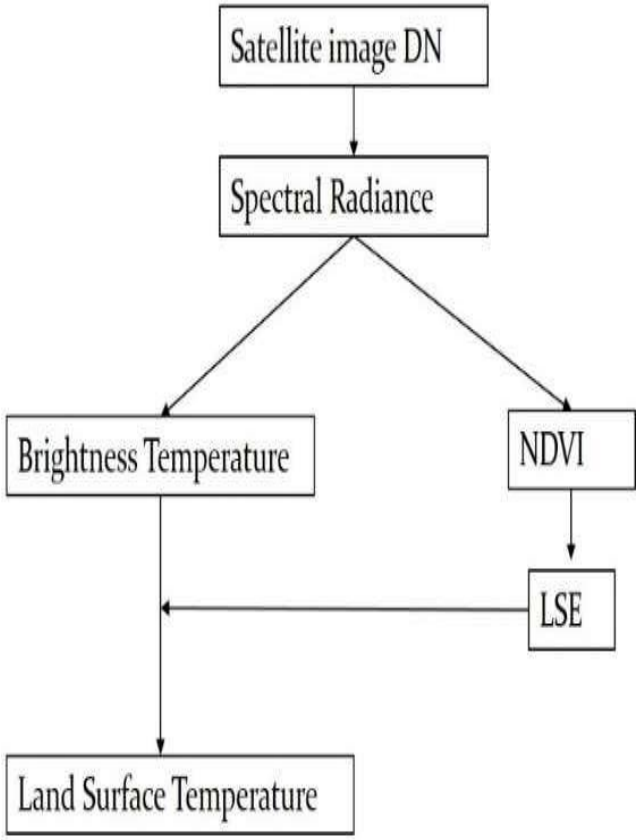
- NDVI (Normalized Difference Vegetation Index) based approach

Step 4: Converting .tiff file to shape file

- Covert the .tiff file to a .shp file in ArcGIS 10.1

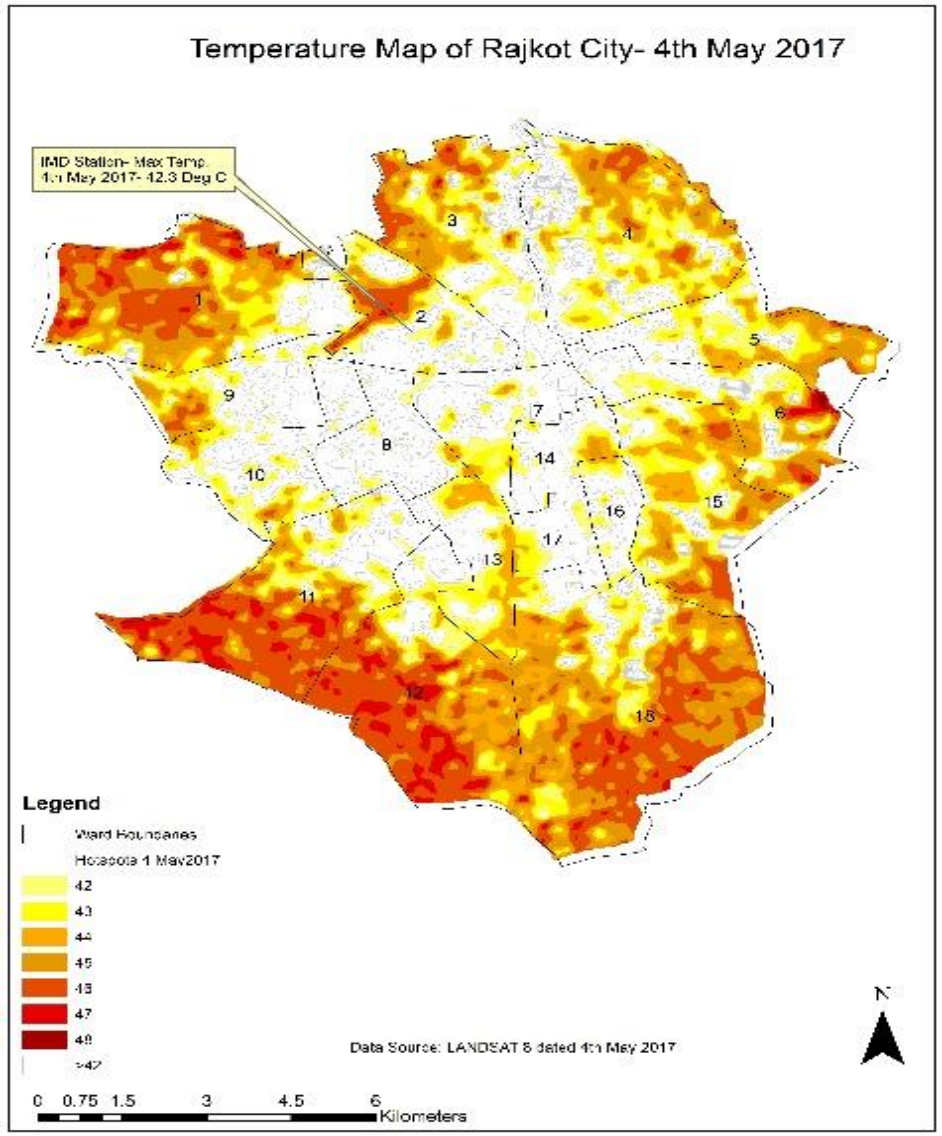
Step 5: Converting the data from the obtained shape-file in the Hotspots

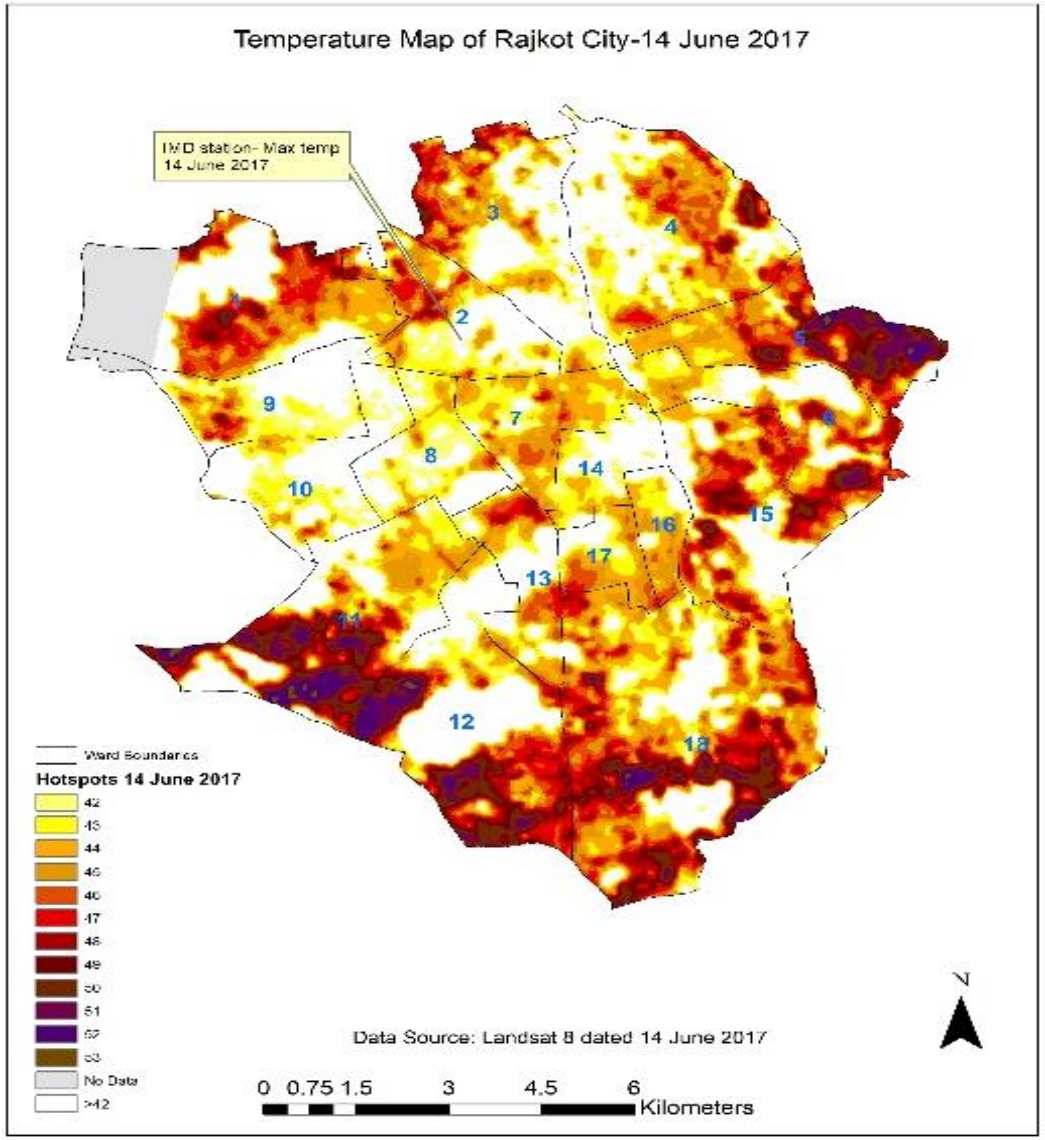
- areas having the land Surface Temperature more than 40^0C



Flowchart depicting calculation of LS

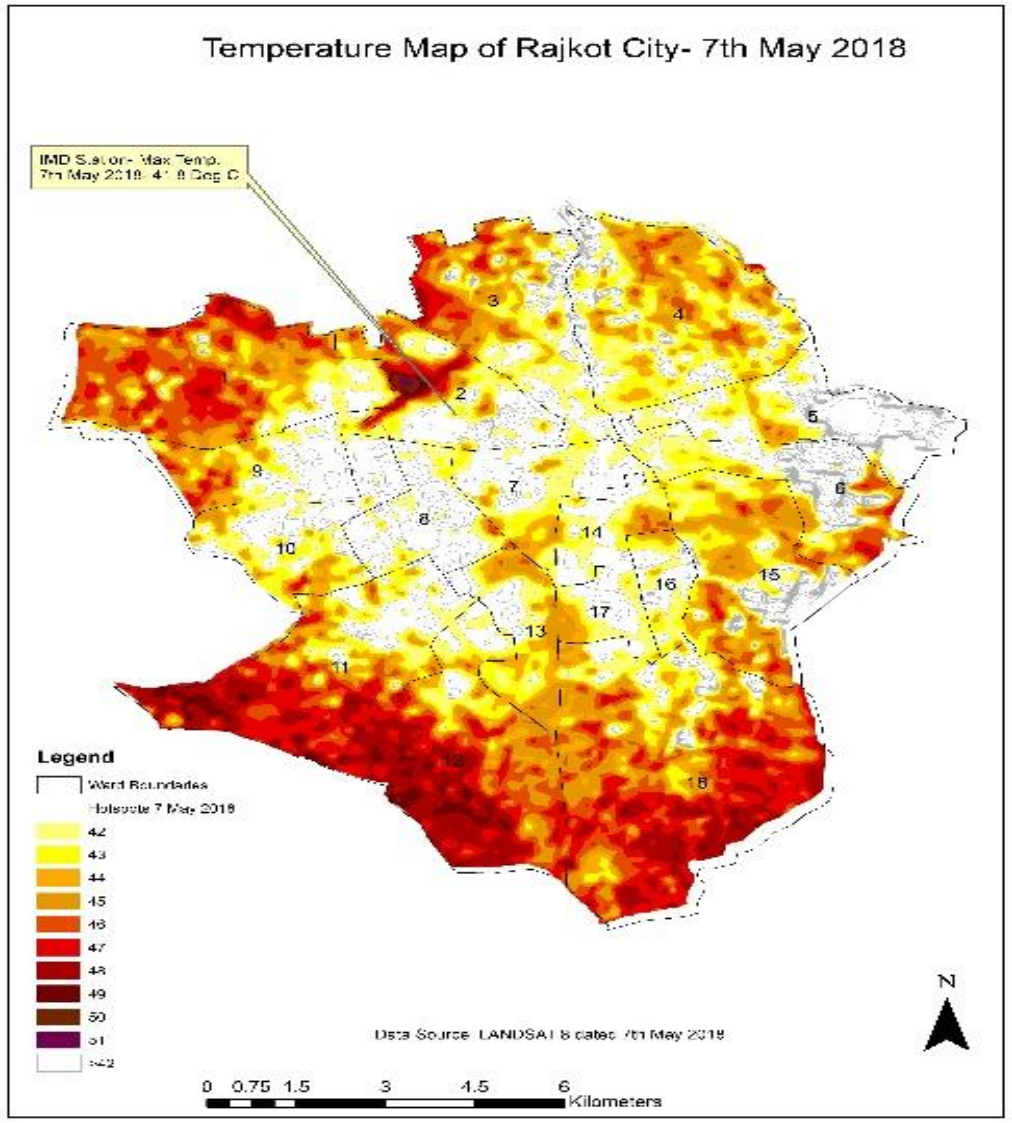
THERMAL HOTSPOTS

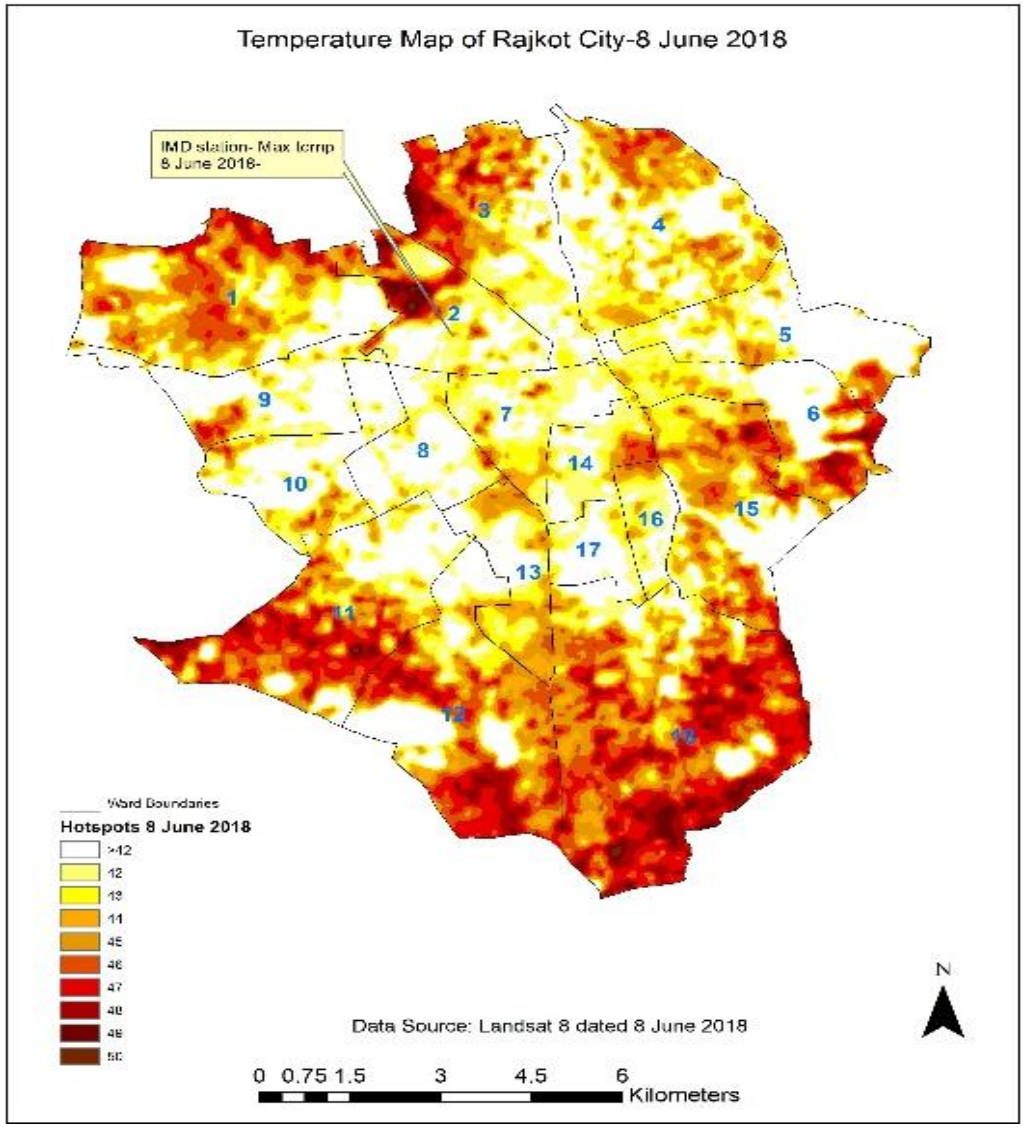




Higher temperature is consistently experienced in ward numbers 1, 2, 3, 4, 5, 6, 9, 10, 11, 12, 15 and 18.

THERMAL HOTSPOTS

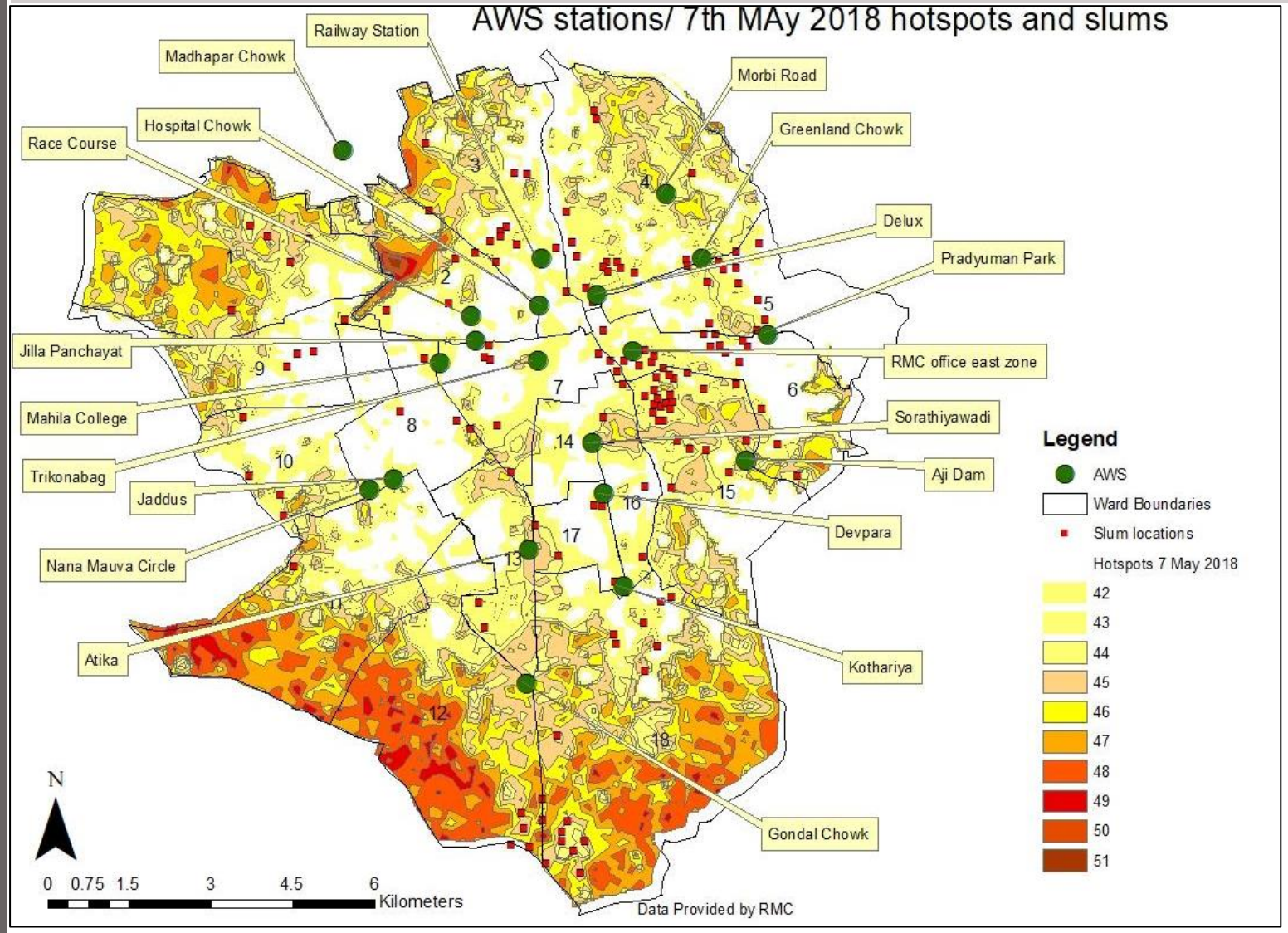




Peripheral regions show higher temperatures than the central regions

AMBIENT AIR TEMPERATURE

Thermal hotspots with LST =/> 42 ° - Rajkot

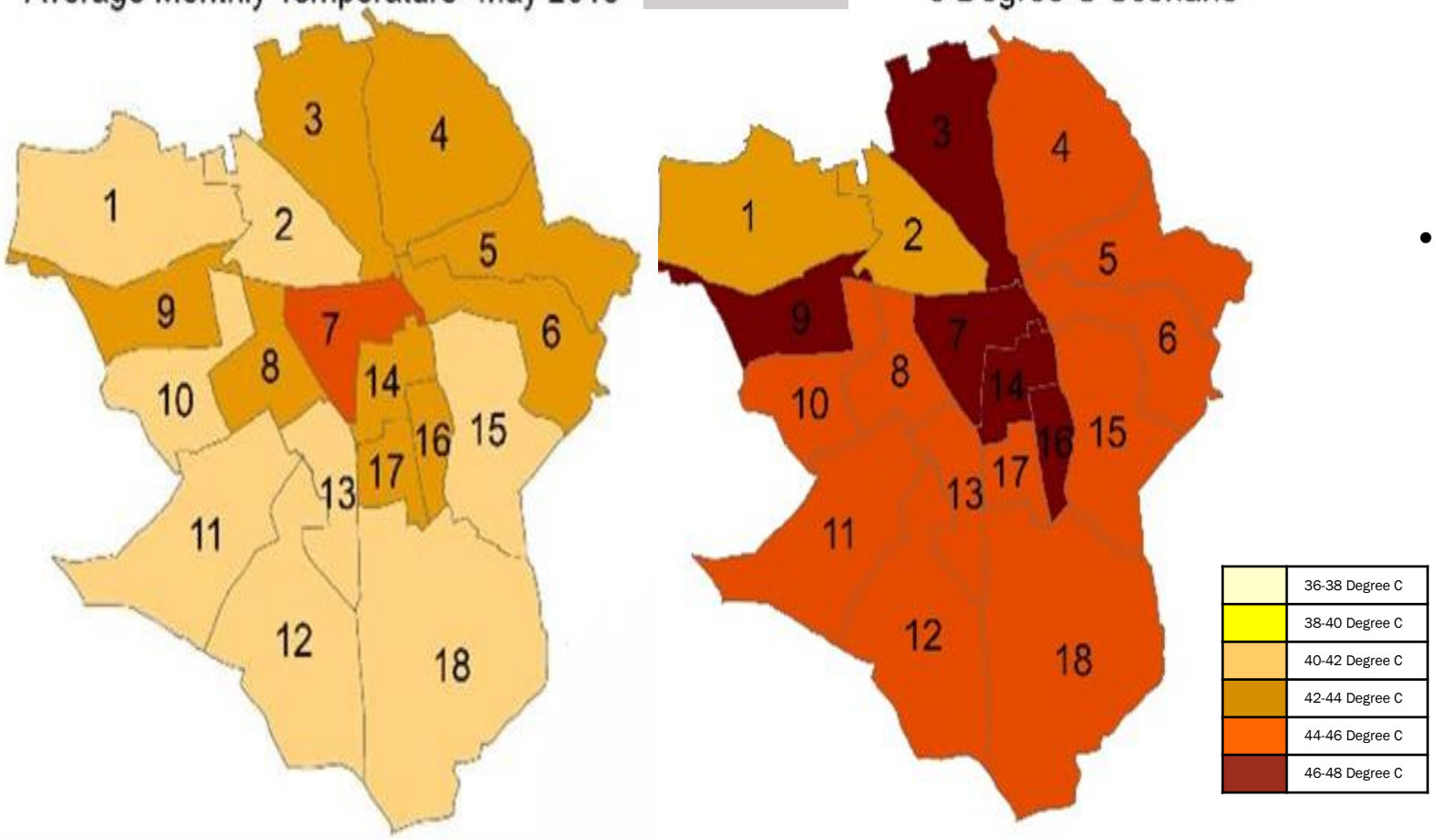


Rajkot	
Ward No	**Ward Name**
1	Rajyadhar
5	Bhimrav Nagar, Pradyuman Park, Sadhu Vasvani Road
10	Jay Bhimnagar
11	Bharatnagar,
12	Bajrang Society Rashulpura
13	Ambedkar Nagar
14	liludiwonkdi
15	Bharatnagar 1
18	Shitaldhara

The ambient air temperature of the Hots spots were also recorded using a Hygrometer

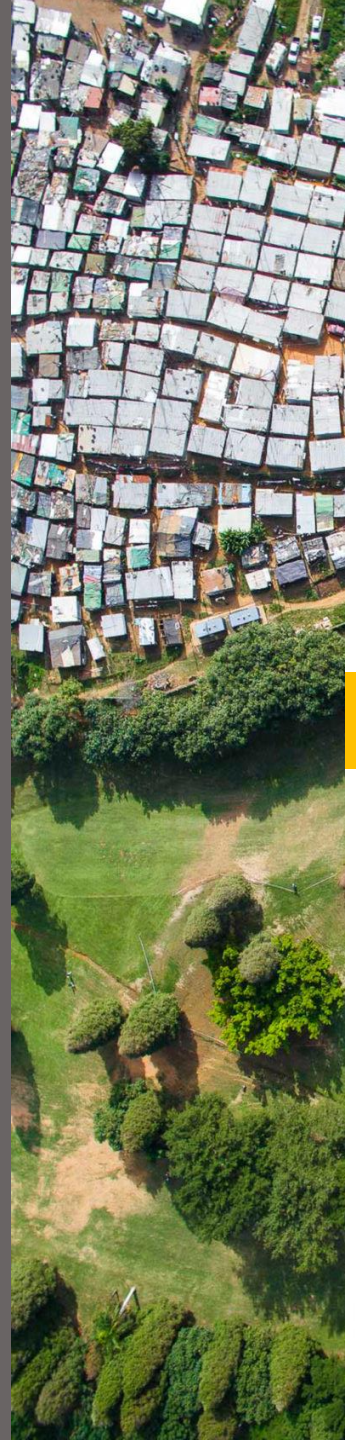
FUTURE HEAT HOTSPOT SCENARIOS FOR RAJKOT

May



- 8 wards are in the temperature range 40-42 Deg C, 9 wards in 42-44 Deg C and 1 ward in 44-46 in the Average Monthly baseline temperature of May (2018).

- In the scenario with 3 Deg C increase in temperature, 2 Wards are in the temperature range 42-44, 11 wards are in 44-46 Deg C and 5 wards in the 46-48 Deg C



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VULNERABILITY MAPPING & ASSESSMENT

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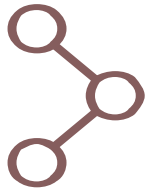
VULNERABILITY MAPPING & ASSESSMENT



- Vulnerable Group and Area Identification,
- City level Surveys
- Vulnerability Assessment – Ward level

VULNERABILITY MAPPING

Assessing geographic variability in heat wave vulnerability forms the basis for planning appropriate targeted adaptation strategies

Vulnerable areas include:

- Slums and scattered settlements,
- Minimal access to water and sanitation, and
- Minimal presence of household amenities
- Urban Heat Islands
- Industrial Belts

Vulnerable groups include:

- Economically weaker sections
- Elderly, Children, Women , Pregnant Women
- Co- morbid (Diabetes, Kidney , Heart Disease)
- Working individuals – construction workers, factory workers, transport, sweepers, laborers and vendors/street hawkers

VULNERBAILITY ASSESSMENT SECTORS

SANITATION

- Type of Toilet
- Separate Toilets

WATER

- Water Source
- Water Source Location
- Water Collection Time
- Frequency Water Supply

ELECTRICITY

- Electricity Cuts

SYMPTOMS

- Heat Exhaustion

HEALTH

- Access to Health Infra-Public/Private/Both
- Distance Hospital
- Health Insurance

TRANSPORTAION

- Preferred Mode of Transport

COOKING

- Cooking Place
- Type of Cooking Fuel

VENTILATION

- Number of Windows

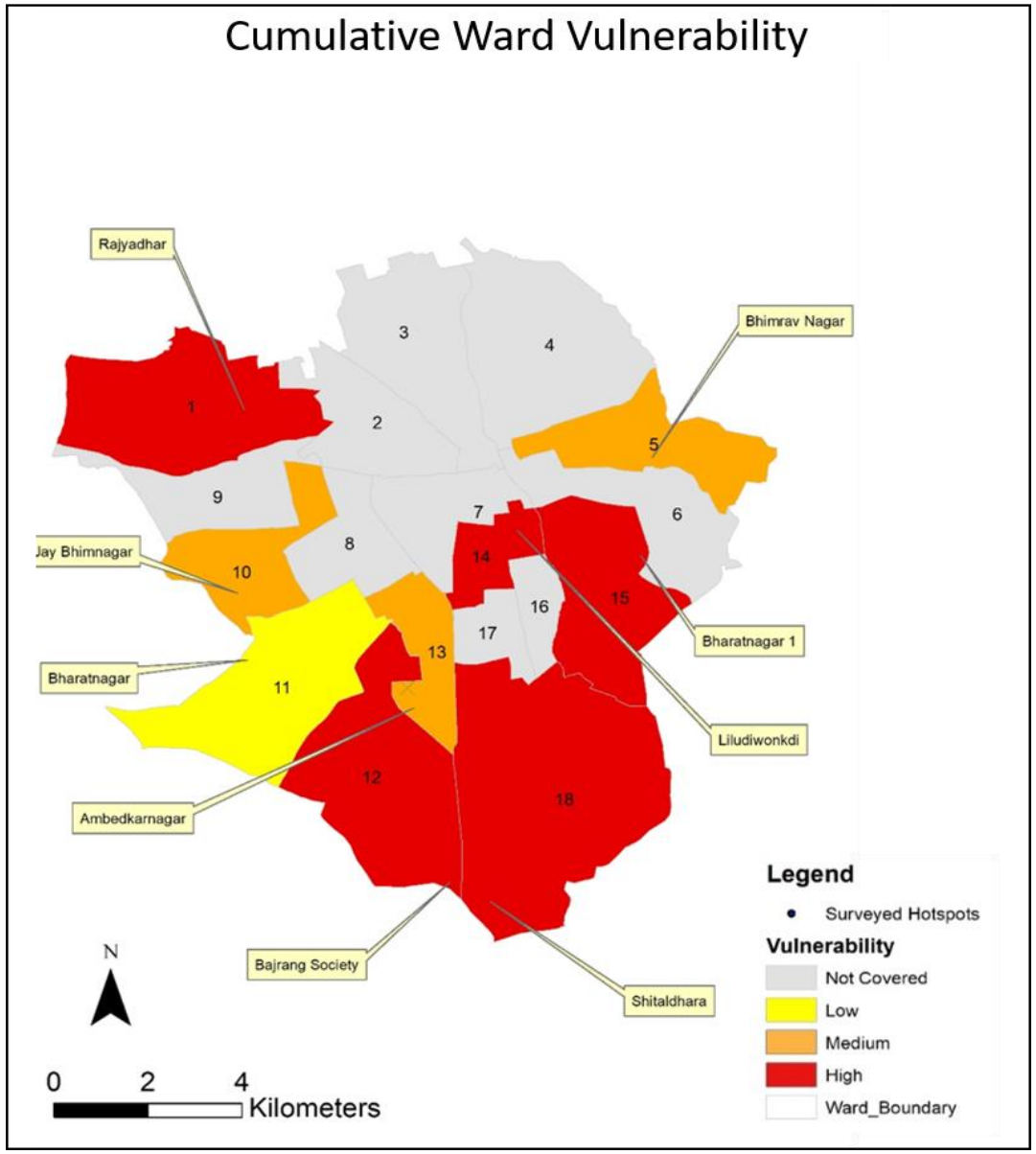
HOUSING

- Years of Occupancy
- Number of Rooms
- Type of House
- Floor Type
- Roof Type
- Wall Type
- Wall Colour

AWARENESS

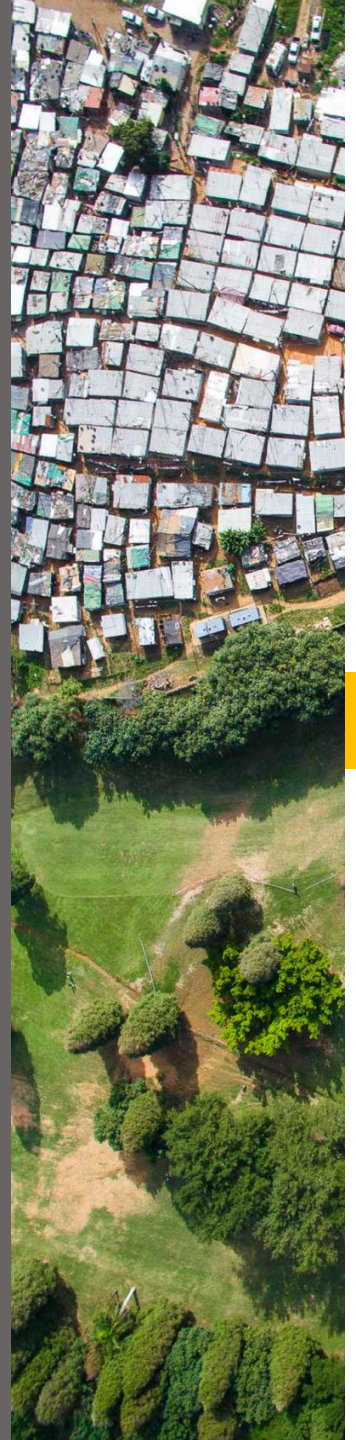
- Heat Stress Awareness
- Aware of Medical facilities for Heat
- Aware of Medical measures ULB

CUMULATIVE VULNERABILITY ASSESSMENT



Vulnerable wards	Wards Number	Total
Low	(11)	1
Medium	(10 , 13 , 5)	3
High	(14 , 15 , 18 , 12 , 1)	5

The ward wise cumulative vulnerability provides the overall vulnerability of identified hotspots in the city. Factoring in all vulnerability factors, **5 of 9 wards were found to be highly vulnerable.** Three Wards presented medium vulnerability and one ward presented low vulnerability.



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HEAT STRESS IMPACT ASSESSMENT

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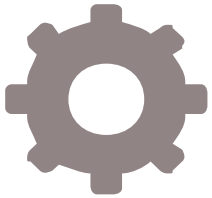
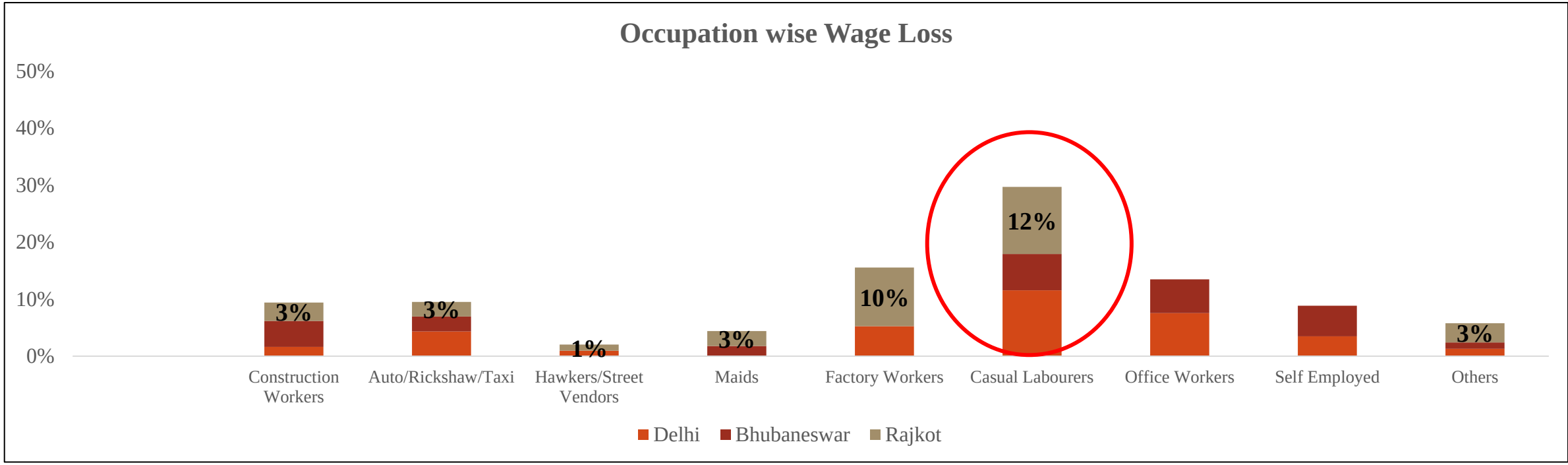
HEAT STRESS IMPACT ASSESSMENT



Impact on

- Health,
- Livelihood and
- Productivity

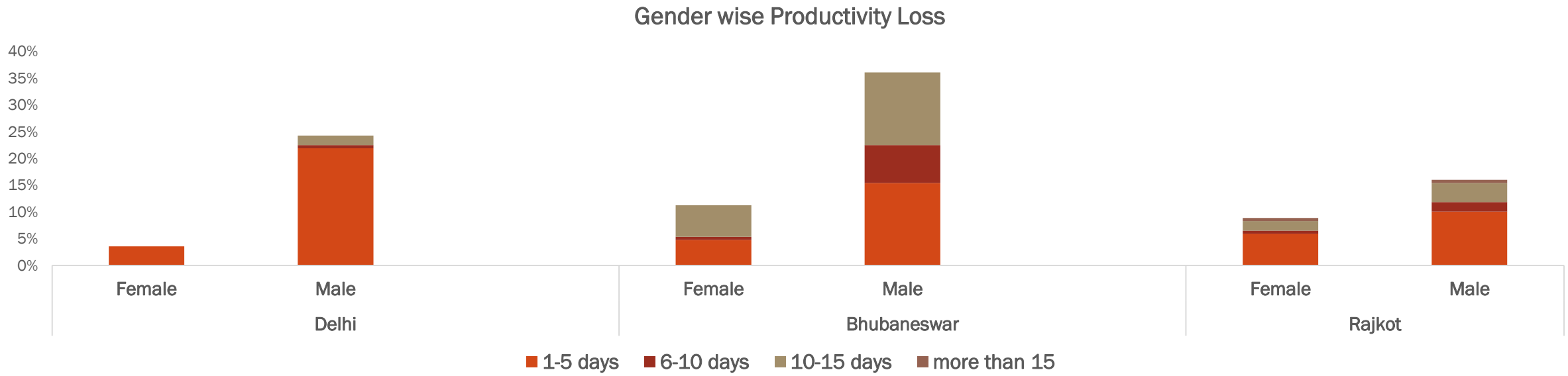
HEAT STRESS IMPACT- WAGE LOSS



Wage Loss Occupation wise

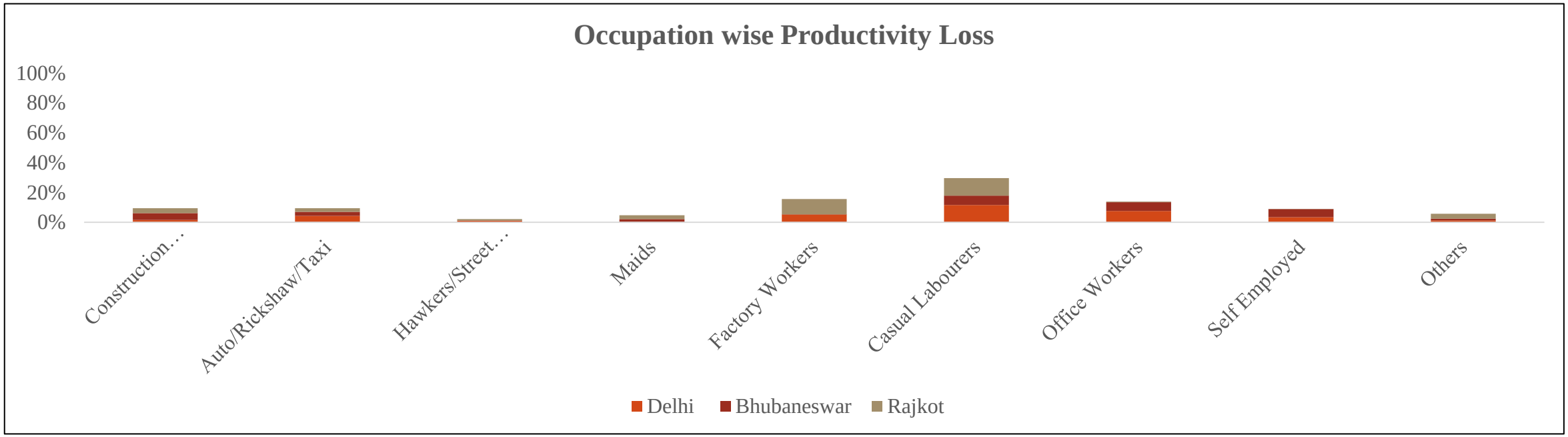
Casual Labourers
Reported maximum wage loss (30%)

HEAT STRESS IMPACT- PRODUCTIVITY LOSS



Productivity Loss Gender wise			
	Delhi	**Bhubaneswar**	**Rajkot**
Productivity loss reported by Males	25% (Total = 28%)	36% (Total = 48%)	17% (Total = 24%)
No of days	**Male-** 1 hr **Female-** 3 hr	**Female & Males- 1 day**	**Female-** 12 hr **Males-** 1 day

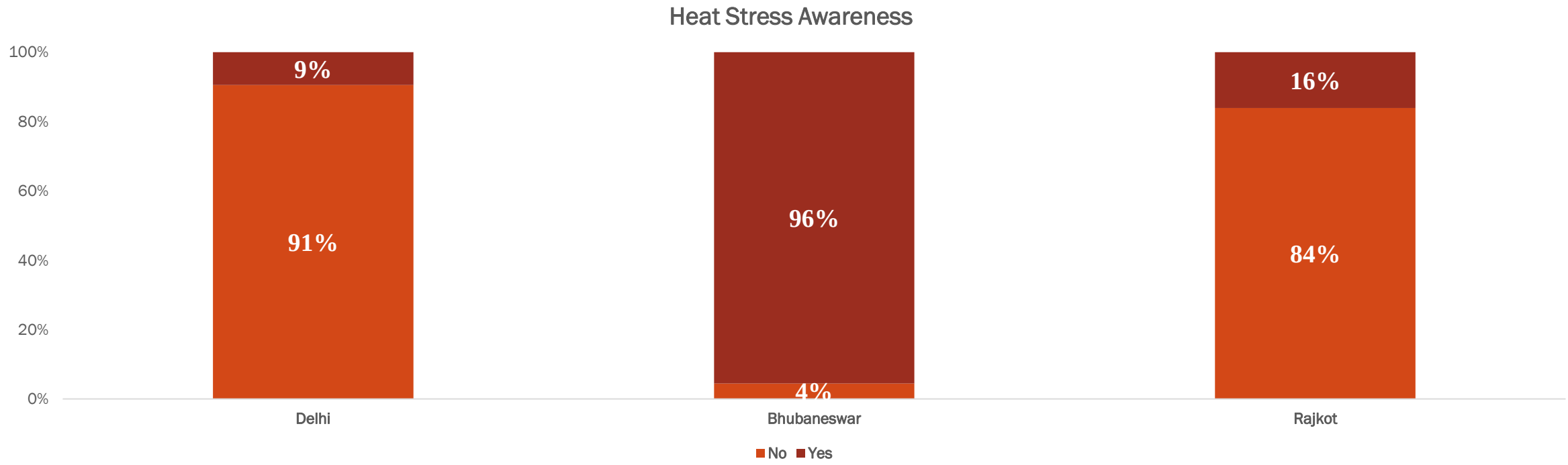
HEAT STRESS IMPACT- PRODUCTIVITY LOSS



Productivity losses Occupation wise

Casual Labourers
(Majority productivity losses observed in casual labourers 30%)

HEAT STRESS AWARENESS

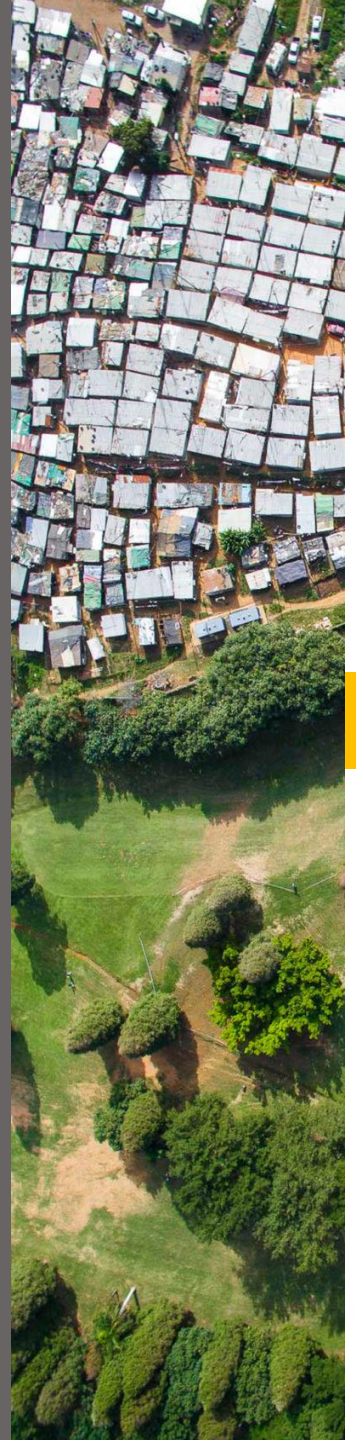


Bhubaneswar (96%) > Rajkot (16%) > Delhi (9%)

HEAT STRESS IMPACT ASSESSMENT

Wage & Productivity & Health

- The **casual labourers** are most affected by the high heat days. As the maximum wage loss is reported in the daily causal labourers (35%).
- **Majority males** (75% out of the total) experience wage loss due to heat as compared to the women
- **Majority (64%)** of the working population had reported the loss in the working days by **1 to 5 days during the heat stress period**
- **Almost 64% of respondents faced common health issues faced like heat cramps, headache, excessive perspiration and thirst, fatigue, heat rash and nausea during the summer months from March to July**
- Higher vulnerability to heat stress for **poor working women with inadequate access to resources and information.**
- Heat stress vulnerability of **pregnant women can even be higher.**



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EARLY WARNING SYSTEM AND THRESHHOLDS

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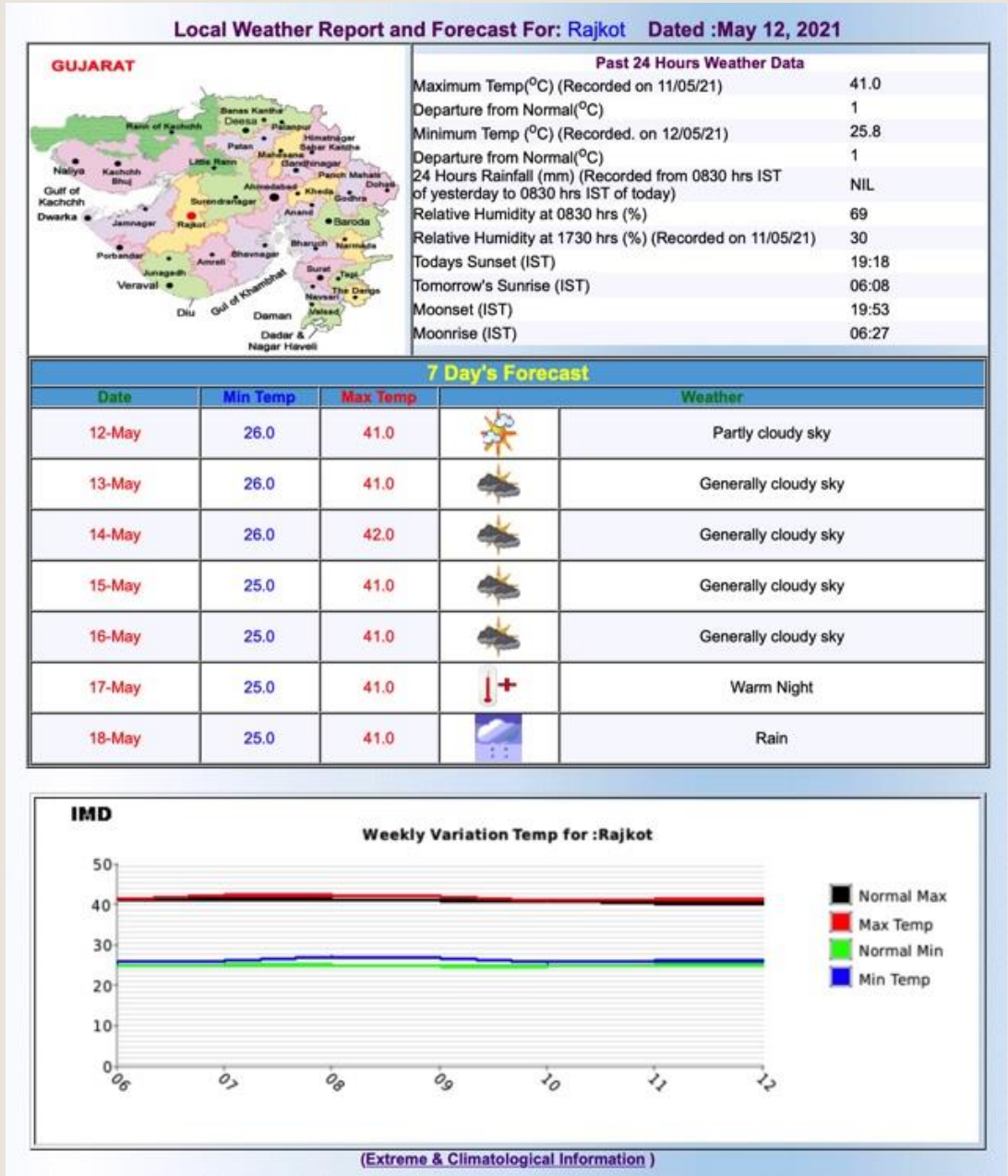
EARLY WARNING SYSTEMS

Heatwave Early Warning Systems with response plans are an approach to reduce the human health consequences of heatwaves.

Warning Mechanisms	Information Provided / Temperature Forecast	Information For
Seasonal Outlooks	Provides Information on maximum and minimum temperatures for Summer Months (March, April & May)	Country level
Extended Range Forecasts	Provides Information on maximum and minimum temperatures for 2 weeks	Country Level
Medium Range Forecasts	Colour coded warning issued daily for up to 5 days	36 Meteorological sub-divisions and 739 districts
City Forecast for ~ 470 cities/ towns	Maximum and Minimum temperatures and Heat Wave for up to 5 days	470 cities/ towns



POLICY LEVEL INTERVENTION

RMC to lower heat wave warnings by half a degree

Nimesh Khakhariya | TNN | Updated: Jun 28, 2019, 11:51 IST

A- A+

A workshop on heat stress action plan was held on Wednesday

RAJKOT: With temperatures gradually rising over the years, and in fact, the past one decade has registered the historic maximum average temperature, the Rajkot Municipal Corporation (RMC) has decided to revise its warning system to reduce heat casualty. Therefore, it will lower the standard heat wave alerts by half a degree. For example, yellow alert is issued when average temperature touches 41°C. But RMC will declare yellow alert at 40.5°C itself.

City Government

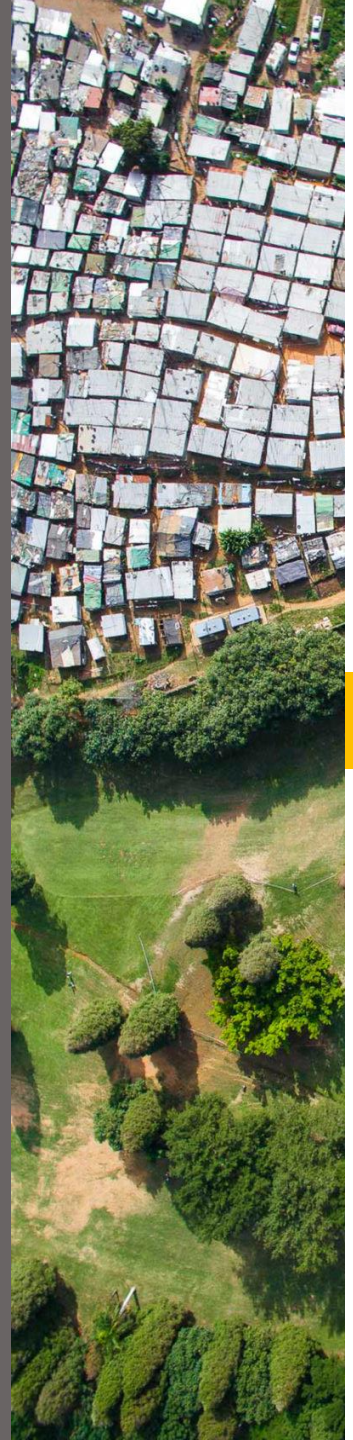
(Gujarat, India)

Revised warning system by -

lowering the heat alert by 0.5°C

The current threshold is **40.5°C**

reduced from 41°C



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STAKEHOLDER MAPPING & CAPACITY BUILDING

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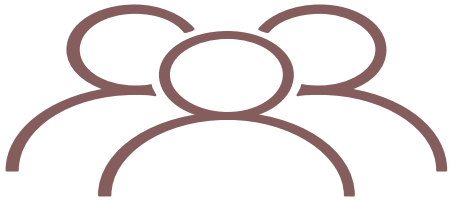
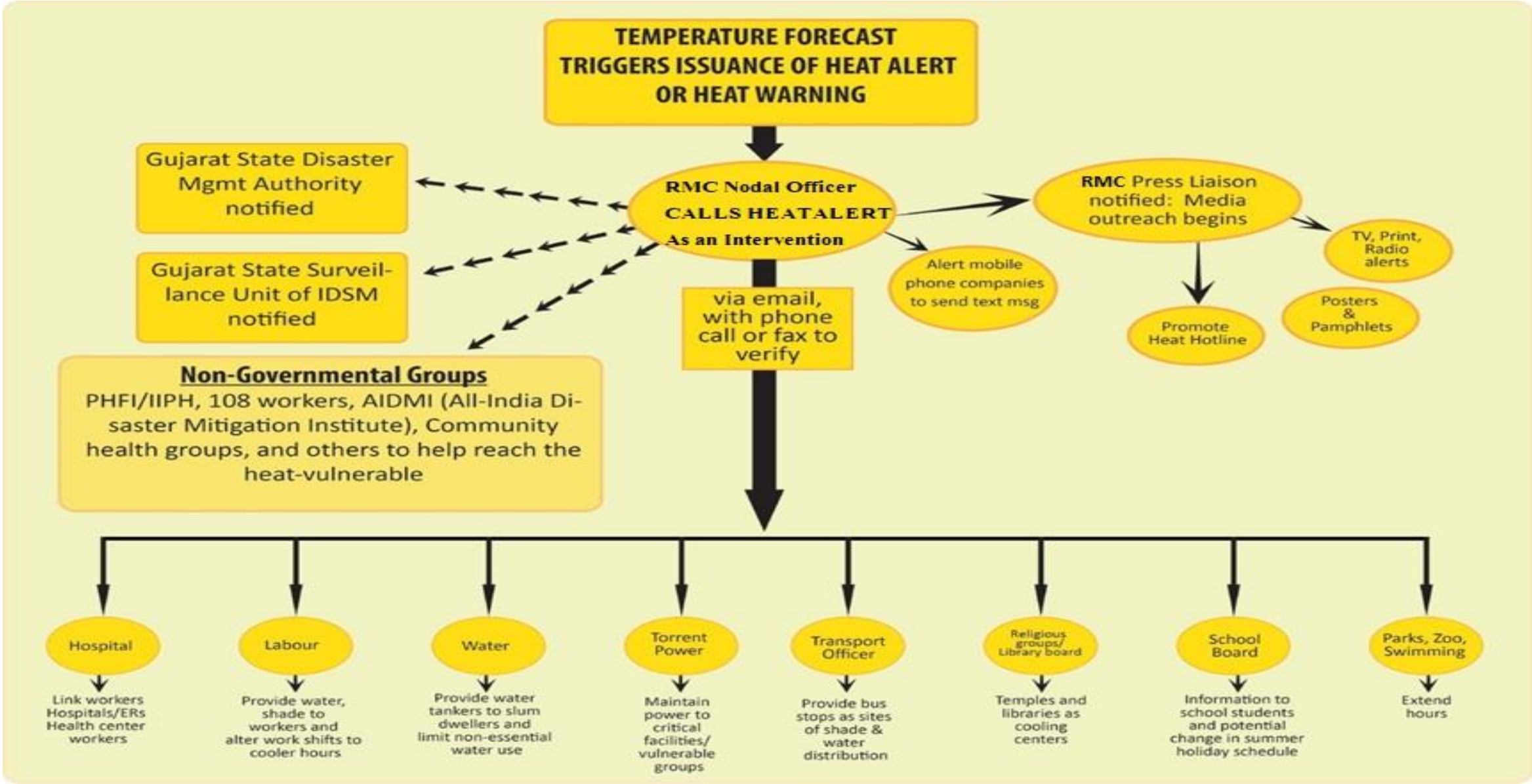
STAKEHOLDER MAPPING & CAPACITY BUILDING



- City and State level stakeholder engagement
- Community participation

STAKEHOLDER ENGAGEMENT



IMPLEMENTATION

Public Health Managers

Pre-summer

Identify vulnerable areas
Ensure adequate inventories of medical supplies in health centres
Ensure appropriate to health workers, para medics, clinicians, etc.
Identify cooling centres and barriers to access cooling centres

During Heat Event

Prepare rapid response team
Distribute pamphlets with "Dos and Don'ts" instructions among vulnerable community
Effectively send a "Take Care but Don't Panic!" message to community
Ensure access to Medical Mobile Van in the Red Zone
Ensure additional medical vans are available during red alerts

Post-summer Evaluation

Participate in annual evaluation of Heat Action Plan
Review revised Heat Action Plan and suggest needed amends

Urban Health Centres and Link Workers

Pre-summer

- ✓ Advice community on treatment and prevention of heat related illness
- ✓ Sensitize and train link workers
- ✓ Develop and execute school health programs with support from Department of Education
- ✓ Create awareness campaigns in slum communities
- ✓ Coordinate community outreach efforts with non-profits

During Heat Event

- ✓ Recheck management stock
- ✓ Ensure UHCs preparedness to respond to emergency
- ✓ Visit at-risk populations for monitoring and prevention
- ✓ Communicate information on tertiary care and 108 service

Post-summer Evaluation

- ✓ Participate in annual evaluation of Heat Action Plan
- ✓ Review revised Heat Action Plan and recommend needed amends

IMPLEMENTATION

RMC Press Officer

Pre-Summer

- Secures commercial airtime slots for health advisories and public service announcements
- Identifies public areas to display health alerts during heat season
- Organizes training for health workers and medical professionals
- Activates heat telephone-hotlines
- Places temperature forecasts in newspapers
- Installs LED screens with scrolling temperature data

During Heat Event

- Issues heat-related health warnings in the media
- Contacts local FM radio and TV stations for health and weather advisories
- Releases advisories through SMS and WhatsApp platforms using centralized mobile databases
- Contacts BRTS and transport department to place warnings on buses

Post-Summer Evaluation

- Evaluates efficacy of advocacy and campaign outreach and other communications
- Participates in annual evaluation of Heat Action Plan
- Review revised Heat Action Plan and suggests amends

Labour Department

Pre-Summer

- Organize orientation for factory medical officers and general practitioners on health effects of heat stress or exposure
- Compile list of factory medical officers and contractors for heat action communications from Nodal Officer
- Prepare outreach and advocacy strategy for unorganized labour
- Use maps of construction sites to identify high-risk outdoor workers
- Conduct advocacy campaigns in high-risk areas

During the Heat Season

- Ensure water supply at work sites
- Request use of A/C at factory facilities
- Extend work hours of Occupational Health Centres
- Consider long afternoon break or change the working hours to avoid heat exposure
- Provide emergency ice packs and heat-illness prevention kit to traffic police, BRTS transit staff and construction workers

Post-Summer Evaluation

- Participate in annual evaluation of Heat Action Plan
- Review Heat Action Plan and recommend amends

IMPLEMENTATION

108 Emergency Service

Pre-Summer

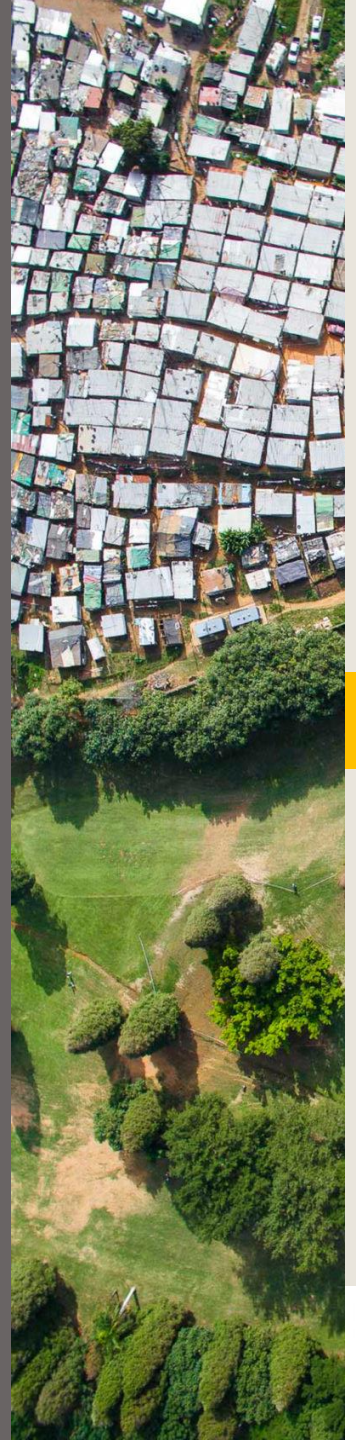
- Prepares handouts for paramedics on heat illness
- Uses informative visuals on ambulances to build public awareness
- Establishes Dynamic Strategic Deployment Plan for ambulances
- Ensures adequate supply of IV fluids
- Identifies at-risk areas
- Prepares SMS messages to disseminate during emergencies
- Identifies media point of contact

During the Heat Season

- Ensures adequate staff and stock of required medicine and equipment
- Keeps accurate record of pre-hospital care
- Sends messages to 108 Emergency Service employees on Heat Action Plan and heat alerts
- Activates Dynamic Strategic Deployment Plan for the ambulance service

Post-Summer Evaluation

- Provides data to key agency leaders
- Participates in annual evaluation of Heat Action Plan
- Review revised Heat Action Plan and recommend amends



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MITIGATION & ADAPTATION STRATEGIES

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MITIGATION & ADAPTATION STRATEGIES

- Pre-heat, during heat and Post heat Strategies
- Sector wise – short, medium & long term Measures

ADAPTATION & MITIGATION MEASURES

Pre-Heatwave

- Create and implement gender-based heat health guidelines on the diagnosis and treatment of heat stress, heat exhaustion, and heat stroke to reduce and prevent mortality and morbidity
- Ensure adequate storage of IVs, ORS and other medicines for heat stress treatment.
- Establish Cool Wards within the hospitals

During a Heatwave

- Adopt gender specific heat-focused examination procedures at local hospitals and Urban Health Centers
- Ensure availability of adequate number of Medical Mobile Van in high-risk areas of heat waves
- Ensure high risk patients are placed in rooms with air conditioning; less critical patients should at least have access to an area with air conditioning during the hottest hours of the day.

Post-Heatwave

- Share final data of gender based hospital admissions as per indicators set for reporting during heat wave with the Urban Local Body (ULB)
- Give feedbacks in annual evaluation of heat action plan
- To prepare a set of key learnings during heat wave to build on institutional memory and share it with other stakeholders

ADAPTATION & MITIGATION MEASURES

Awareness Campaigns

- ✓ Hoardings, posters, to be displayed by smart city LED TVs at various locations, distribution of pamphlets.
- ✓ Awareness workshops for occupationally exposed - traffic police, hawkers, street vendors, construction workers and school children

Mitigation measures

- ✓ Keeping gardens, cooling shelters and other possible cooling centres open with water availability.
- ✓ Availability of water and sheds at open construction sites.
- ✓ Pilot project on roof painting with white colour - cool roof and or distribution of gunny bags for putting on the tin roofs/asbestos in slums.

ADAPTATION & MITIGATION MEASURES

Mitigation measures

- ✓ Provision of water points and ORS at Construction sites, Bus stands and other Public places during processions and political and other rallies and processions during summer.
- ✓ Distribution of cool roof jackets to on duty traffic police personnel
- ✓ Water tanker campaign- Tankers to be made available on call in slums during orange/red alert days.

Early warning communication

- ✓ SMS and WHSSAPP messages for early warning to citizens, NGOs, Citizen welfare groups, construction contractors.
- ✓ Public announcement through mikes across the city through car during orange and red alert days a day before and early on the forecasted day.
- ✓ Press Releases and campaigns on radio, TV and websites.

ADAPTATION & MITIGATION MEASURES

Medical Preparedness

- ✓ Stocking ORS and cool packs at the health centres & readiness with cooling and re hydration as well as shock management treatments.
- ✓ Medical camps on day of red alerts at hotspots

Monitoring and Analysis

- ✓ Recording ward wise heat stroke cases, proper cause of death and monitoring daily mortality as well as daily hospital admission due to all causes and due to heat related causes
- ✓ Monitoring and analysis of the morning temperatures recorded from AWS sites and issue early warnings

ACTION PLAN STRATEGIES - LANDSCAPE AND URBAN

Short Term Measures

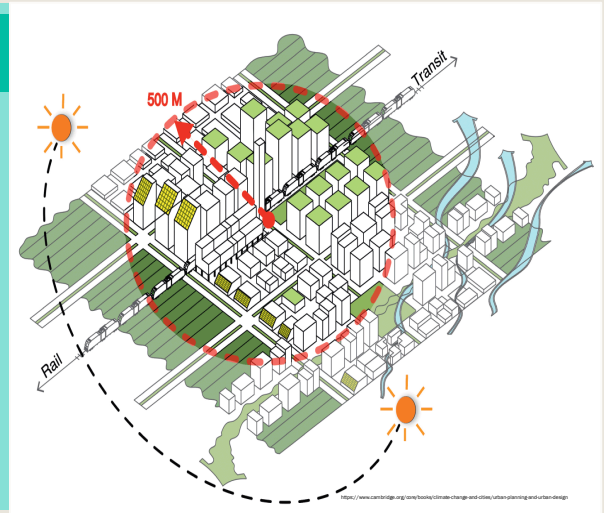
- Improvising the **urban landscapes through vertical greenery, roof gardens**

Medium Term Measures

- **Thermal Relief-** Larger parks with adequate tree canopies
- Strategically applying **shade types in cities**, eg. converting solar radiation into electricity.
- Combining **passive shading strategies with green and blue infrastructure**

Long Term Measures

- Identifying locations for **building shelters and shades in urban areas**
- Initiating **research on micro-climate**
- Encourage **investing in water bodies, fountains**
- **Evidence-based cooling strategies** during heat extremes and hot weather
- **Urban ventilation pathways**



ACTION PLAN STRATEGIES - BUILDING LEVEL

Short Term Measures

- **Rooftop sprinklers enhance evaporation**
- **Vegetated surfaces** (eg, so-called green walls) can also reduce **surface temperatures**
- The use of **cool roofs,** minimize heat retention

Medium Term Measures

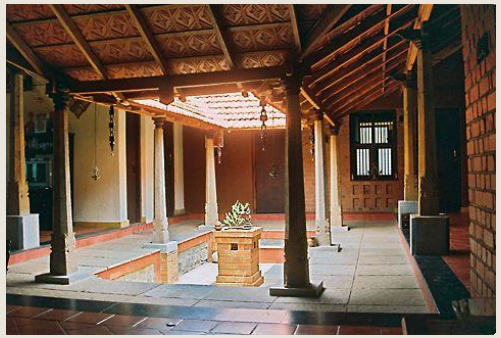
- **Natural cross ventilation** through building openings
- **Retrofitting roofing of buildings with novel coatings** that are highly reflective

Long Term Measures

- Improving **building bye-laws** along with increasing heat tolerance
- **Passive Cooling techniques** to increase thermal comfort
- Learning from **Vernacular Architecture** - ***orientation, building material, shading devices, façade treatments, openings, windows***

Closed Knit fabric – Optimum Shade

Chajaas – to prevent direct Heat

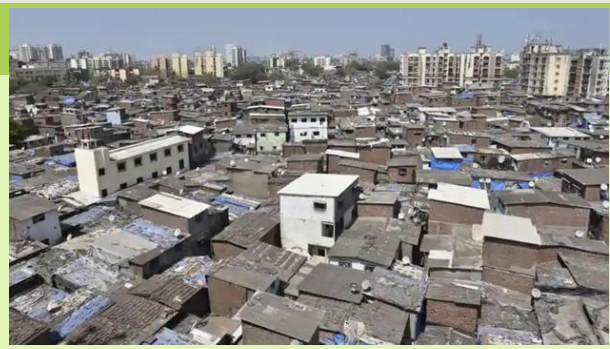


Courtyards to promote ventilation

ACTION PLAN STRATEGIES - SLUMS

Short Term Measures

- **Roof painting with white colour** - cool roof
- **Wet Gunny bags for putting on the tin roofs/asbestos** in slums.
- **Water tanker campaign-** in slums during orange/red alert



Medium Term Measures

- **Cooking stoves and/or open fires** planned ventilation
- **Open space** avoid crowding
- **Access to Information**
- **Understanding Heat Risk**

Long Term Measures

- Avoid **Heat-trapping building materials**
- Improved **water quality and sanitation to avoid**, secondarily heat increased risk of **waterborne diseases**
- Ensuring thermal comfort– **Affordable Policy intervention PMAY**

ACTION PLAN STRATEGIES - WORKPLACE

Short Term Measures

- **Electric fans** - improve manual work performance
- **Extra breaks** - in relatively hot areas
- **Access to water** for drinking and **self-dousing**
- **Work shifts** to avoid peak temperatures
- **Hydration monitoring** via urine colour and volume

Medium Term Measures

- **Awareness workshops** for **occupationally exposed**

(*traffic police, hawkers, street vendors, construction workers)*

- **Water Facilities** around the work area and
- Access to **clean lavatory facilities**

Long Term Measures

- **Well Ventilated rooms**
- **Temporary rest stations** - sun tents (Outdoor Workers)
- **Protective clothing Design** for High heat exposure

ACTION PLAN STRATEGIES - INDIVIDUAL LEVEL

Short Term Measures

- Forcing air across the skin - **electric fans**
- Applying cool tap water (about 20°C) to **large skin surface areas (self-dousing) reduces cardiovascular strain**
- **Cold water foot immersion** - during unplanned blackouts

Medium Term Measures

- **Work-to-rest ratios** - to reduce health risks in hot occupational environments

ACTION PLAN STRATEGIES - COMMUNITY LEVEL

Short Term Measures

- **Education to** community influencers
- Access to **sufficient drinking water and shaded cooling** or all **mass gatherings**
- Adequate availability of **heat prevention information**
- **Outdoor misting fans**

Medium Term Measures

- Provision of **water points and ORS** at Public places
- **Stocking ORS and cool packs** at the health centres
- Readiness with **shock management treatments**
- **Medical camps on day of red alerts** at hotspots

Long Term Measures

- Incorporation of **indigenous knowledge**
- **Capacity building**
- Implementing **sustainable cooling strategies** - accessible to **all sections of society**

ACTION PLAN STRATEGIES -EARLY WARNING SYSTEM

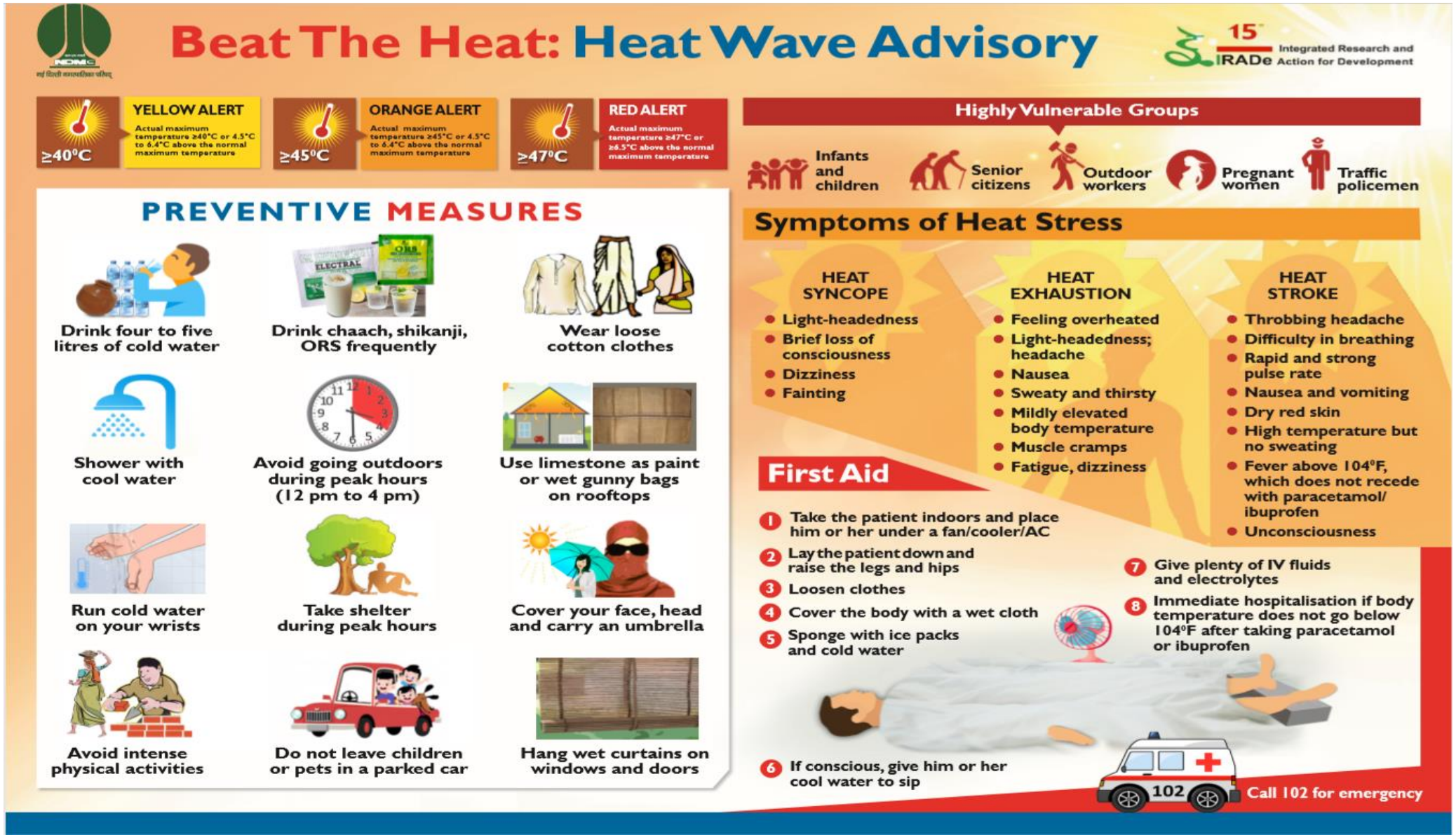
Short Term Measures

- **Hoardings, posters, to be displayed by smart city LED**
- **SMS and WHSSAPP messages for early warning** to citizens, NGOs, Citizen welfare groups, construction contractors.
- **Public announcement** during orange and red alert days a day before and early on the forecasted day.
- **Press Releases and campaigns on radio, TV and websites.**

Long Term Measures

- **Recording ward wise heat stroke** cases,
- **Monitoring daily mortality** and daily hospital admission due heat related causes
- **Monitoring and analysis of the morning temperatures recorded from AWS** sites and issue early warnings
- **Initiating early warning systems**, advisories and alerts

HEAT HEALTH ADVISORY

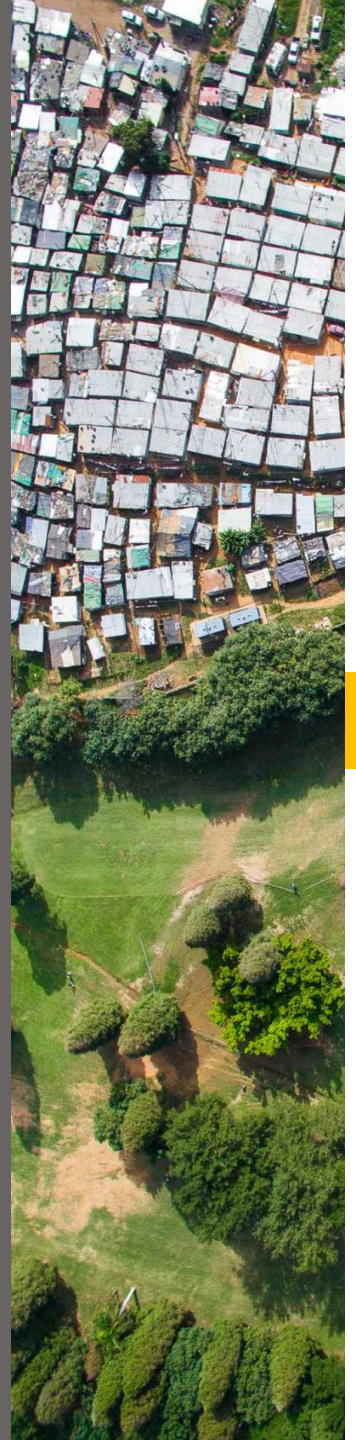


HEAT HEALTH ADVISORY

MONITORING SYSTEMS

Template for daily Heat Mortality/Morbidity data collection

Name of the Urban Primary Health Centre/ hospital									
Ward Number:-									
Health Issues	No of cases	Gender			Pregnant women if any	Age Group (Years)			
		No of male	No of Female	Other		0-14	15-35	35-60	Above 60
Heat Cramps									
Heat Exhaustion									
Heat Stroke									
Mortality due to heat stroke									



SAHHIN
South Asia Heat Health Information Network

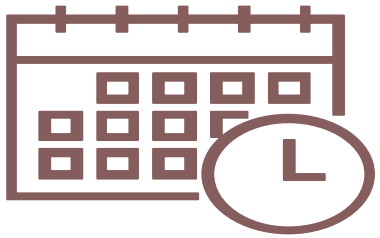
DISSEMINATION, MONITORING & EVALUATAON

IDRC · CRDI
International Development Research Centre
Centre de recherches pour le développement international

Canada

Integrated Research and Action for Development
IRADe

DISSEMINATION, MONITORING & EVALUATION



- Workshops
- Campaigns
- Community Outreach

MEDICAL PRACTITIONERS TRAINING WORKSHOP

Rajkot - May, 2019

- **To recognize and record heat related Impact**
- **Improved Sensitization Towards heat related illness and treatment – more than 50 medical facilitators trained in each city**

STAKEHOLDER CONSULTATION ON BUILDING HSAP

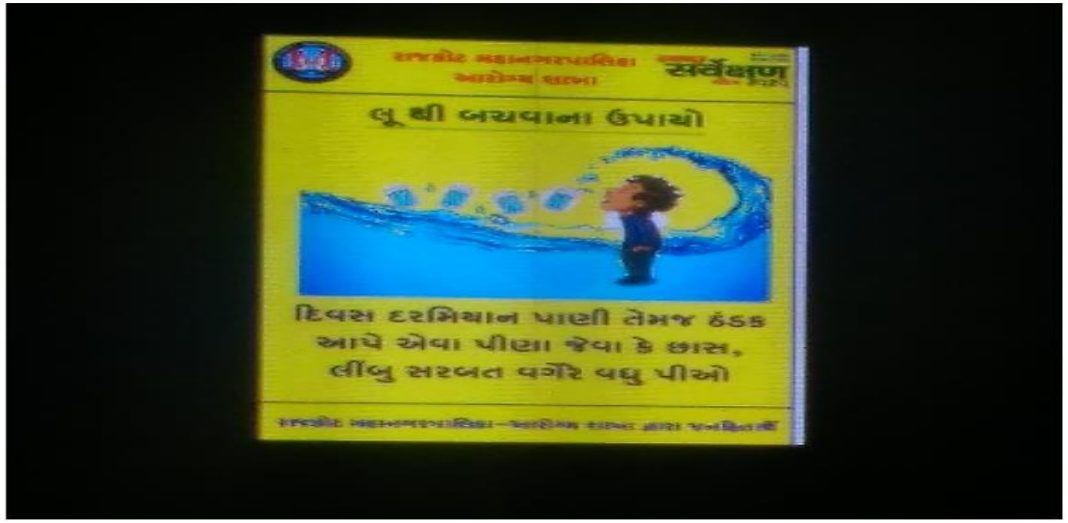
DISSEMINATION & OUTREACH

15 Hoardings at public place in Rajkot City

Dissemination of Heat Stress Advisory among 15,000 plus people in Rajkot

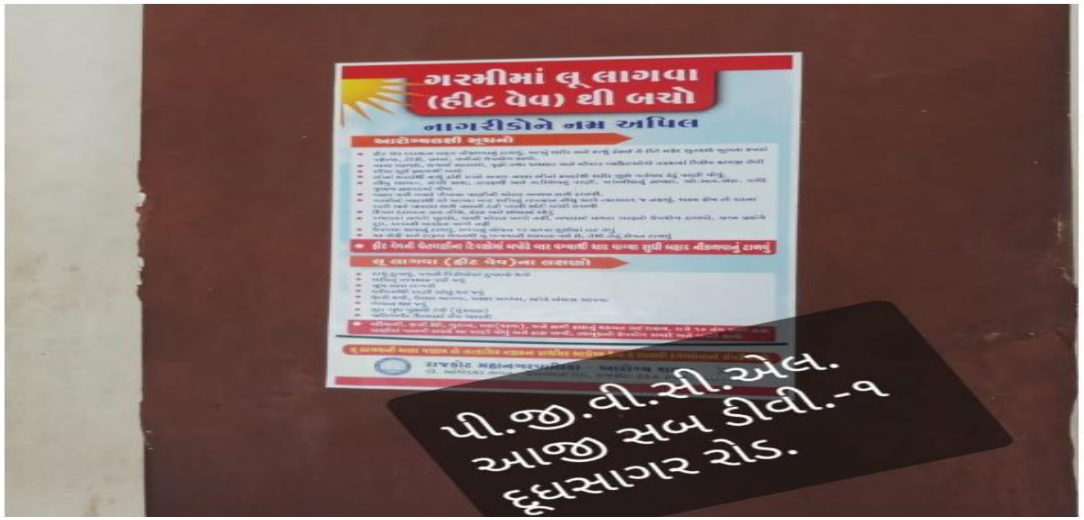
DISSEMINATION & OUTREACH

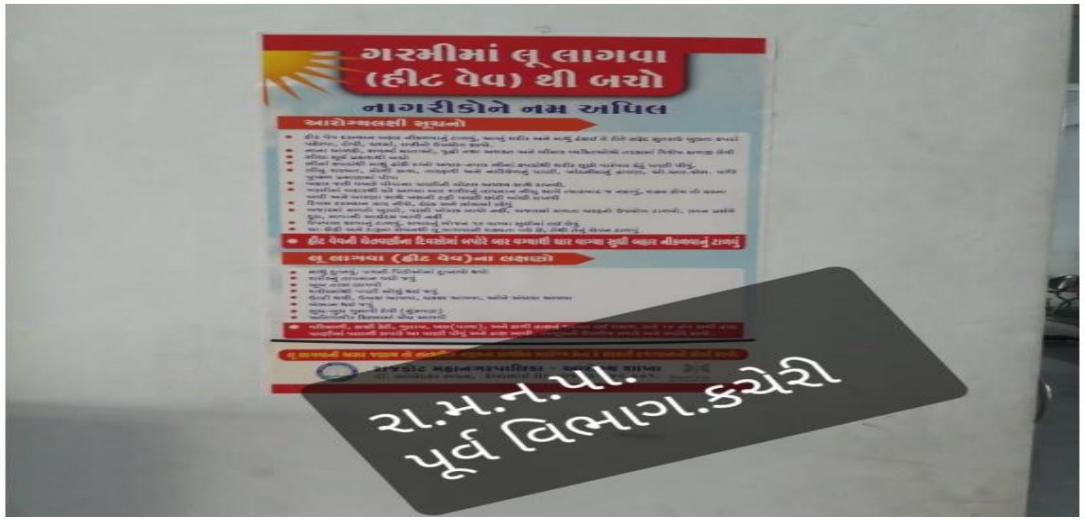
9 LED Screen at different place of Rajkot City



DISSEMINATION & OUTREACH

5263 Stickers at different place of City





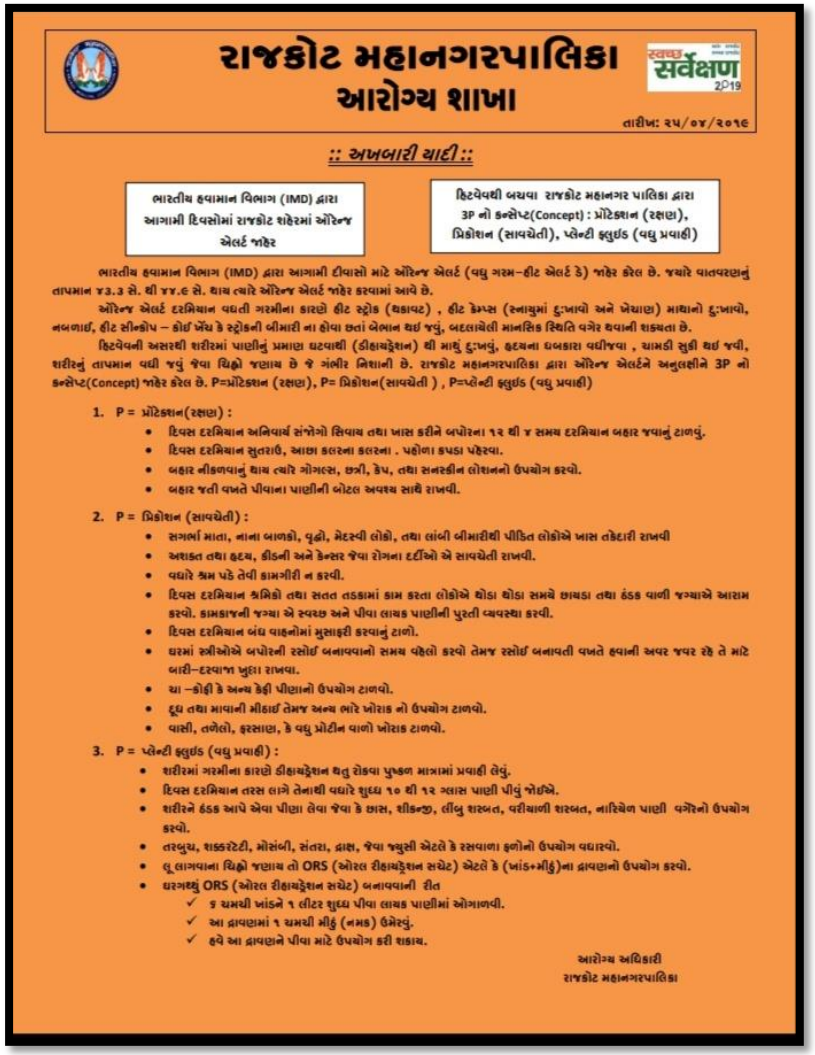
DISSEMINATION & OUTREACH

Water Points and Buttermilk distribution at more than 300 locations

ORS corner and Rapid Response Team (RRT) at all Urban Health Centres (UHC)

DISSEMINATION & OUTREACH

Heat Wave Advisory Press Notes



રાજકોટ મહાનગરપાલિકા
આરોગ્ય શાખા

સ્વચ્છ સર્વેક્ષણ 2019

તારીખ: ૨૫/૦૪/૨૦૧૯

:: અખબારી યાદી ::

ભારતીય હવામાન વિભાગ (IMD) દ્વારા આગામી દિવસોમાં રાજકોટ શહેરમાં ઓરેન્જ એલર્ટ જાહેર

હિટવેવથી બચવા રાજકોટ મહાનગર પાલિકા દ્વારા 3P નો કન્સેપ્ટ(Concept) : પ્રોટેક્શન (રક્ષણ), પ્રિકોશન (સાવચેતી), પ્લેન્ટી ફ્લુઇડ (વધુ પ્રવાહી)

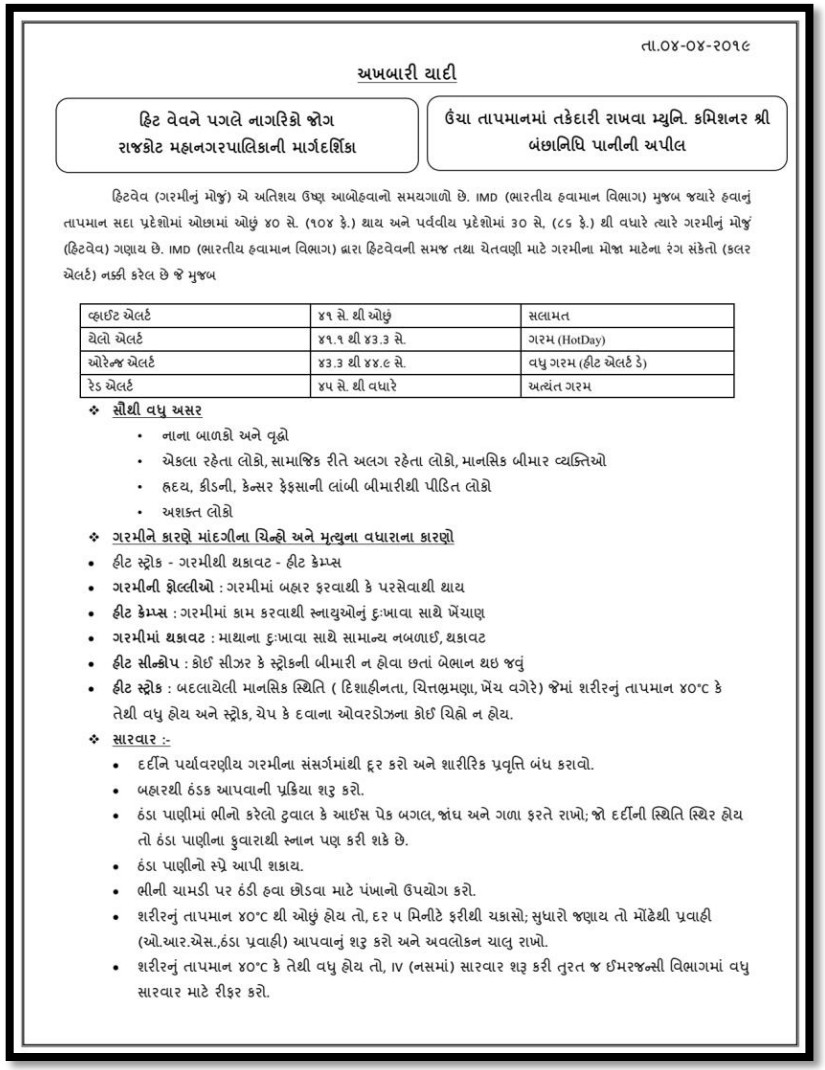
ભારતીય હવામાન વિભાગ (IMD) દ્વારા આગામી દિવસો માટે ઓરેન્જ એલર્ટ (વધુ ગરમ–હીટ એલર્ટ ડે) જાહેર કરેલ છે. જ્યારે વાતાવરણનું તાપમાન ૪૩.૩ સે. થી ૪૪.૯ સે. થાય ત્યારે ઓરેન્જ એલર્ટ જાહેર કરવામાં આવે છે.

ઓરેન્જ એલર્ટ દરમિયાન વધતી ગરમીના કારણે હીટ સ્ટ્રોક (થકાવટ) , હીટ ક્રેમ્પ્સ (સ્નાયુમાં દુઃખાવો અને ખેંચાણ) માથાનો દુઃખાવો, નબળાઈ, હીટ સીન્કોપ – કોઈ ખેંચ કે સ્ટ્રોકની બીમારી ના હોવા છતાં બેભાન થઈ જવું, બદલાયેલી માનસિક સ્થિતિ વગેર થવાની શક્યતા છે.

હિટવેવની અસરથી શરીરમાં પાણીનું પ્રમાણ ઘટવાથી (ડીહાયડ્રેશન) થી માથું દુઃખવું, હૃદયના ધબકારા વધીજવા , ચામડી સુકી થઈ જવી, શરીરનું તાપમાન વધી જવું જેવા ચિહ્નો જણાય છે જે ગંભીર નિશાની છે. રાજકોટ મહાનગરપાલિકા દ્વારા ઓરેન્જ એલર્ટને અનુલક્ષીને 3P નો કન્સેપ્ટ(Concept) જાહેર કરેલ છે. P=પ્રોટેક્શન (રક્ષણ), P= પ્રિકોશન(સાવચેતી) , P=પ્લેન્ટી ફ્લુઇડ (વધુ પ્રવાહી)

1. P = પ્રોટેક્શન(રક્ષણ) :
   - દિવસ દરમિયાન અનિવાર્ય સંજોગો સિવાય તથા ખાસ કરીને બપોરના ૧૨ થી ૪ સમય દરમિયાન બહાર જવાનું ટાળવું.
   - દિવસ દરમિયાન સુતરાઉ, આછા કલરના કલરના . પહોળા કપડા પહેરવા.
   - બહાર નીકળવાનું થાય ત્યારે ગોગલ્સ, છત્રી, કેપ, તથા સનસ્ક્રીન લોશનનો ઉપયોગ કરવો.
   - બહાર જતી વખતે પીવાના પાણીની બોટલ અવશ્ય સાથે રાખવી.
2. P = પ્રિકોશન (સાવચેતી) :
   - સગર્ભા માતા, નાના બાળકો, વૃદ્ધો, મેદસ્વી લોકો, તથા લાંબી બીમારીથી પીડિત લોકોએ ખાસ તકેદારી રાખવી
   - અશક્ત તથા હૃદય, કીડની અને કેન્સર જેવા રોગના દર્દીઓ એ સાવચેતી રાખવી.
   - વધારે શ્રમ પડે તેવી કામગીરી ન કરવી.
   - દિવસ દરમિયાન શ્રમિકો તથા સતત તડકામાં કામ કરતા લોકોએ થોડા થોડા સમયે છાયડા તથા ઠંડક વાળી જગ્યાએ આરામ કરવો. કામકાજની જગ્યા એ સ્વચ્છ અને પીવા લાયક પાણીની પુરતી વ્યવસ્થા કરવી.
   - દિવસ દરમિયાન બંધ વાહનોમાં મુસાફરી કરવાનું ટાળો.
   - ઘરમાં સ્ત્રીઓએ બપોરની રસોઈ બનાવવાનો સમય પહેલો કરવો તેમજ રસોઈ બનાવતી વખતે હવાની અવર જવર રહે તે માટે બારી–દરવાજા ખુલ્લા રાખવા.
   - ચા –કોફી કે અન્ય કેફી પીણાનો ઉપયોગ ટાળવો.
   - દૂધ તથા માવાની મીઠાઈ તેમજ અન્ય ભારે ખોરાક નો ઉપયોગ ટાળવો.
   - વાસી, તળેલો, ફરસાણ, કે વધુ પ્રોટીન વાળો ખોરાક ટાળવો.
3. P = પ્લેન્ટી ફ્લુઇડ (વધુ પ્રવાહી) :
   - શરીરમાં ગરમીના કારણે ડીહાયડ્રેશન થતુ રોકવા પુષ્કળ માત્રામાં પ્રવાહી લેવું.
   - દિવસ દરમિયાન તરસ લાગે તેનાથી વધારે શુધ્ધ ૧૦ થી ૧૨ ગ્લાસ પાણી પીવું જોઈએ.
   - શરીરને ઠંડક આપે એવા પીણા લેવા જેવા કે છાસ, શીકન્જી, તીબુ શરબત, વરીયાળી શરબત, નારિયેળ પાણી વગેરેનો ઉપયોગ કરવો.
   - તરબુચ, શક્કરટેટી, મોસંબી, સંતરા, દ્રાક્ષ, જેવા જ્યુસી એટલે કે રસવાળા ફળોનો ઉપયોગ વધારવો.
   - લૂ લાગવાના ચિહ્નો જણાય તો ORS (ઓરલ રીહાયડ્રેશન સચેટ) એટલે કે (ખાંડ+મીઠું)ના દ્રાવણનો ઉપયોગ કરવો.
   - ઘરગથ્થું ORS (ઓરલ રીહાયડ્રેશન સચેટ) બનાવવાની રીત
     - ✓ ૬ ચમચી ખાંડને ૧ લીટર શુધ્ધ પીવા લાયક પાણીમાં ઓગાળવી.
     - ✓ આ દ્રાવણમાં ૧ ચમચી મીઠું (નમક) ઉમેરવું.
     - ✓ હવે આ દ્રાવણને પીવા માટે ઉપયોગ કરી શકાય.

આરોગ્ય અધિકારી
રાજકોટ મહાનગરપાલિકા



તા.૦૪-૦૪-૨૦૧૯

અખબારી યાદી

હિટ વેવને પગલે નાગરિકો જોગ રાજકોટ મહાનગરપાલિકાની માર્ગદર્શિકા

ઉંચા તાપમાનમાં તકેદારી રાખવા મ્યુનિ. કમિશનર શ્રી બંછાનિધિ પાનીની અપીલ

હિટ વેવ (ગરમીનું મોજું) એ અતિશય ઉષ્ણ આબોહવાનો સમયગાળો છે. IMD (ભારતીય હવામાન વિભાગ) મુજબ જ્યારે હવાનું તાપમાન સદા પ્રદેશોમાં ઓછામાં ઓછું ૪૦ સે. (૧૦૪ ફે.) થાય અને પર્વતીય પ્રદેશોમાં ૩૦ સે. (૮૬ ફે.) થી વધારે ત્યારે ગરમીનું મોજું (હિટવેવ) ગણાય છે. IMD (ભારતીય હવામાન વિભાગ) દ્વારા હિટવેવની સમજ તથા ચેતવણી માટે ગરમીના મોજા માટેના રંગ સંકેતો (કલર એલર્ટ) નક્કી કરેલ છે જે મુજબ

વ્હાઈટ એલર્ટ	૪૧ સે. થી ઓછું	સલામત
યેલો એલર્ટ	૪૧.૧ થી ૪૩.૩ સે.	ગરમ (HotDay)
ઓરેન્જ એલર્ટ	૪૩.૩ થી ૪૪.૯ સે.	વધુ ગરમ (હીટ એલર્ટ ડે)
રેડ એલર્ટ	૪૫ સે. થી વધારે	અત્યંત ગરમ

❖ **સૌથી વધુ અસર**
- નાના બાળકો અને વૃદ્ધો
- એકલા રહેતા લોકો, સામાજિક રીતે અલગ રહેતા લોકો, માનસિક બીમાર વ્યક્તિઓ
- હૃદય, કીડની, કેન્સર ફેફસાની લાંબી બીમારીથી પીડિત લોકો
- અશક્ત લોકો

❖ **ગરમીને કારણે માંદગીના ચિન્હો અને મૃત્યુના વધારાના કારણો**
- હીટ સ્ટ્રોક - ગરમીથી થકાવટ - હીટ ક્રેમ્પ્સ
- **ગરમીની ફોલ્લીઓ** : ગરમીમાં બહાર ફરવાથી કે પરસેવાથી થાય
- **હીટ ક્રેમ્પ્સ** : ગરમીમાં કામ કરવાથી સ્નાયુઓનું દુઃખાવા સાથે ખેંચાણ
- **ગરમીમાં થકાવટ** : માથાના દુઃખાવા સાથે સામાન્ય નબળાઈ, થકાવટ
- **હીટ સીન્કોપ** : કોઈ સીઝર કે સ્ટ્રોકની બીમારી ન હોવા છતાં બેભાન થઇ જવું
- **હીટ સ્ટ્રોક** : બદલાયેલી માનસિક સ્થિતિ (દિશાહીનતા, ચિત્તભ્રમણા, ખેંચ વગેરે) જેમાં શરીરનું તાપમાન ૪૦°C કે તેથી વધુ હોય અને સ્ટ્રોક, ચેપ કે દવાના ઓવરડોઝના કોઈ ચિન્હો ન હોય.

❖ **સારવાર :-**
- દર્દીને પર્યાવરણીય ગરમીના સંસર્ગમાંથી દૂર કરો અને શારીરિક પ્રવૃત્તિ બંધ કરાવો.
- બહારથી ઠંડક આપવાની પ્રક્રિયા શરૂ કરો.
- ઠંડા પાણીમાં ભીનો કરેલો ટુવાલ કે આઇસ પેક બગલ, જાંઘ અને ગળા ફરતે રાખો; જો દર્દીની સ્થિતિ સ્થિર હોય તો ઠંડા પાણીના કુવારાથી સ્નાન પણ કરી શકે છે.
- ઠંડા પાણીનો સ્પ્રે આપી શકાય.
- ભીની ચામડી પર ઠંડી હવા છોડવા માટે પંખાનો ઉપયોગ કરો.
- શરીરનું તાપમાન ૪૦°C થી ઓછું હોય તો, દર ૫ મિનીટે ફરીથી ચકાસો; સુધારો જણાય તો મોંઢેથી પ્રવાહી (ઓ.આર.એસ.,ઠંડા પ્રવાહી) આપવાનું શરૂ કરો અને અવલોકન ચાલુ રાખો.
- શરીરનું તાપમાન ૪૦°C કે તેથી વધુ હોય તો, IV (નસમાં) સારવાર શરૂ કરી તુરત જ ઈમરજન્સી વિભાગમાં વધુ સારવાર માટે રીફર કરો.

DISSEMINATION & OUTREACH

Orientation meeting for Heat wave preparedness with GVK EMRI(108) , Doctors of Civil Hospital and Doctors of private hospital

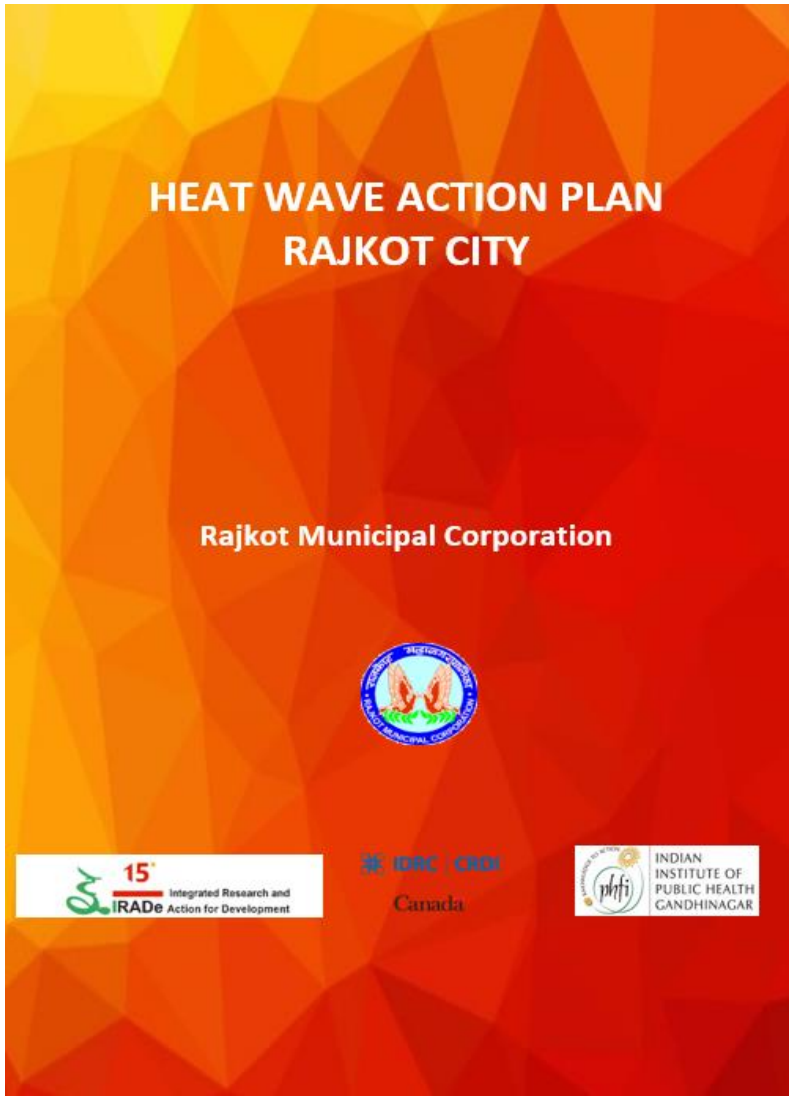
PUBLICATION

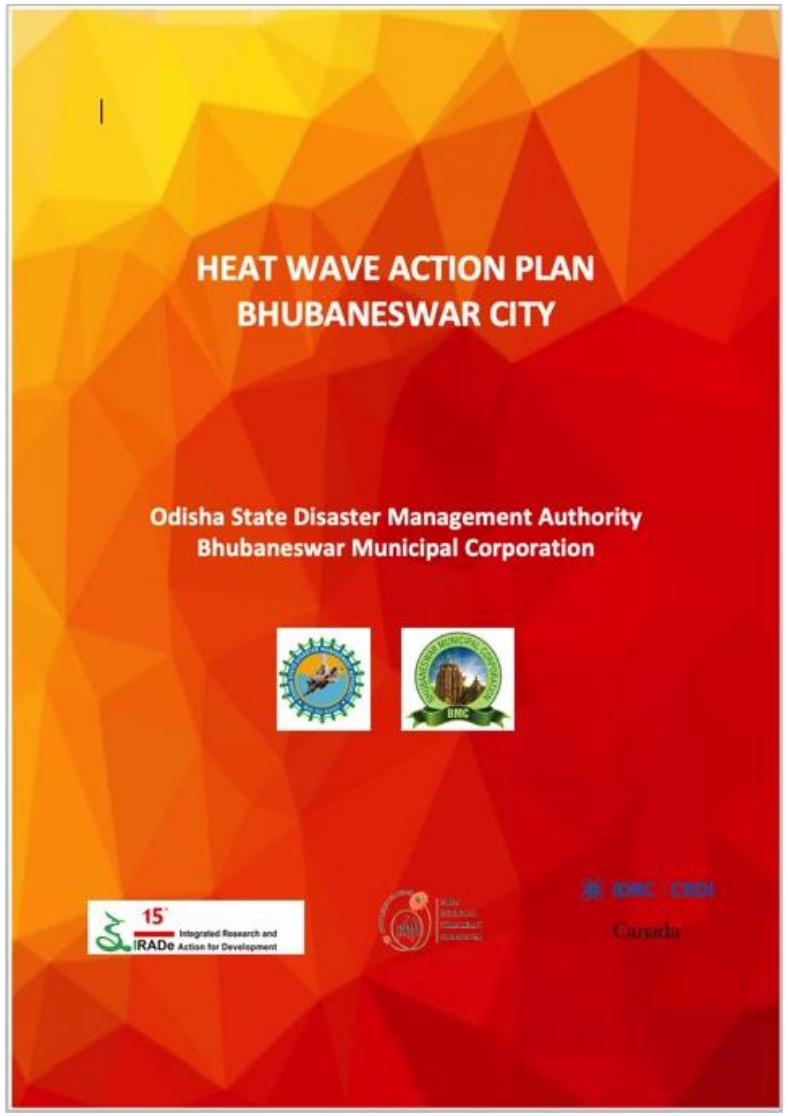
MEDICAL STAKEHOLDERS TRAINING MANUAL

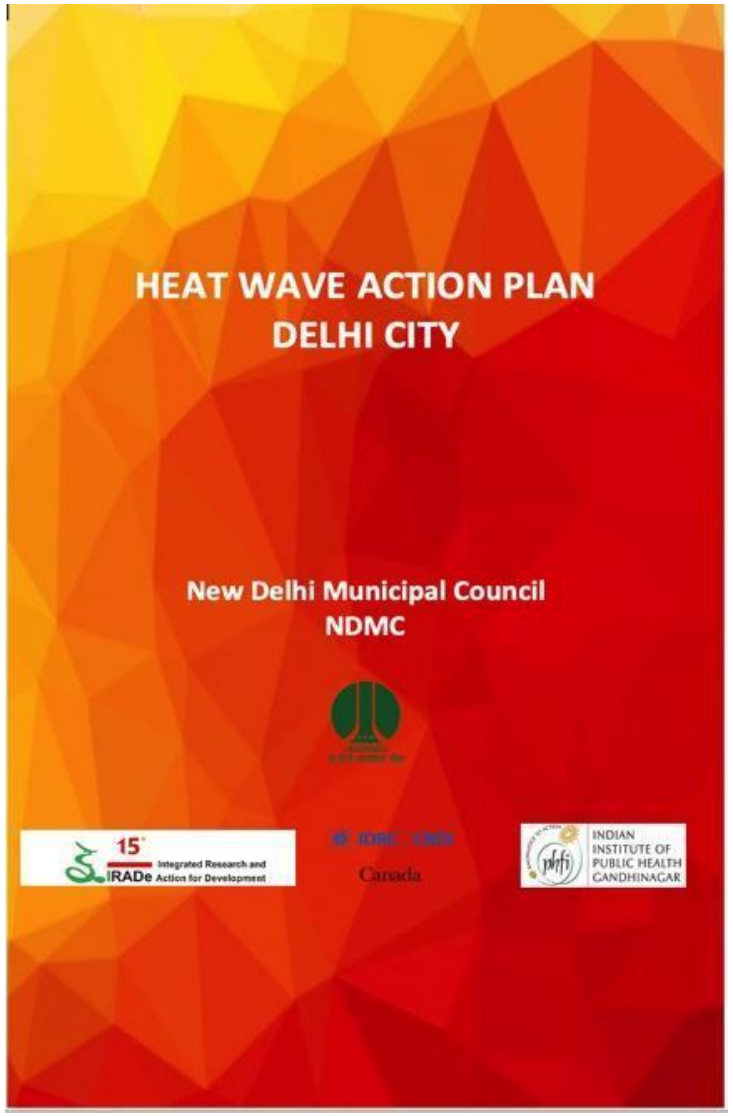
- **Raise awareness** for the implications of heat stress amongst **medical stakeholders and citizens**
- Recognizes the **social groups that are at a disproportionate risk of heat stress**,

PUBLICATION

Climate Adaptive Heat Action Plans



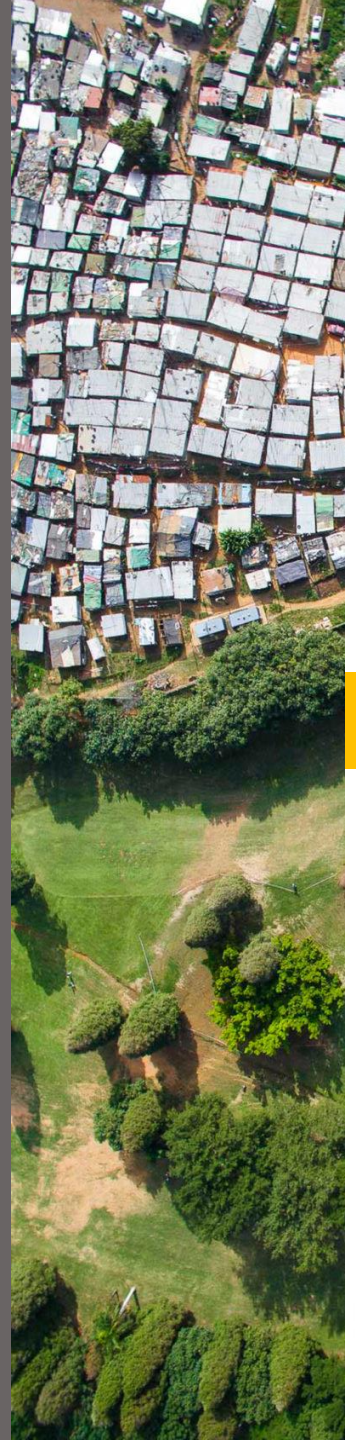




PUBLICATION

REVIEW OF HEAT ACTION PLANS

- **First-of-its-kind Review Documentation** of the available Heat Action Plans across the globe, South Asia and India
- A **qualitative review** that identifies the **key strategies**
- **Highlights the need for a Climate Adaptive HAP** which can increase the impact and efficiency of the adaptation and mitigation efforts.



SAHHIN
South Asia Heat Health Information Network

THANK YOU

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