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HEAT WAVES IN INDIA

Bulletin - 21st March 2023

INTRODUCTION

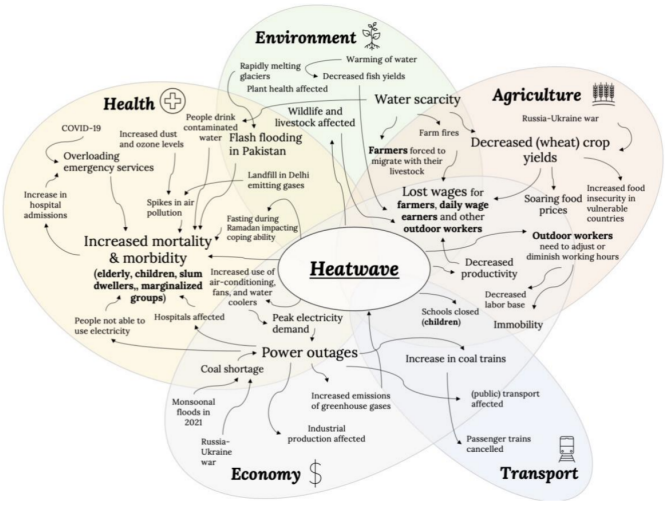
Heat wave is a stretch of unusually hot weather with temperatures that are higher than average and often last three days or longer. The Intergovernmental Panel on Climate Change ,6th assessment report highlighted that heatwaves and humid heat stress would be more intense in South Asia. A new rapid attribution study by climate scientist has indicated that India is 30 times more likely to be gripped by extreme heat waves due to climate change. Every season, on average, two to three heatwave events are anticipated. Factors contributing to the heat waves are rising surface temperature, large scale atmospheric circulations, El-Nino effect, deforestation, urbanization, and higher carbon emissions.

Heatwaves are considered based on departure of 4.5°C to 6.4°C from the normal temperature and severe heatwave on departure of >6.4°C. from the normal temperature. However, based on actual maximum temperature, heat waves are -

- For plains - When actual maximum temperature ≥ 45°C
- For coastal regions - When actual maximum temperature is 37°C or more
- For hilly regions - When actual maximum temperature is at least 30°C or more

Heatwave period in India is from March to July. May is the peak month of the heat wave. In 2022, March was reported to be the hottest in 122 years. Heatwaves are increasing in incidence.

IMPACT MAP OF HEATWAVE



Source - World Meteorological Organisation

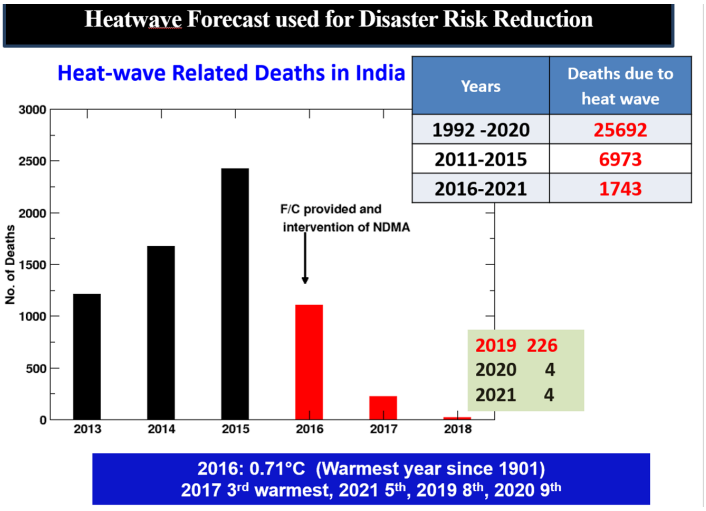
The cascading effects of heat waves are felt across different sectors including the environment, health, education, economy, agriculture, energy and water.

- Increased health risk and High medical expenditure
- Reduced livelihood and productivity of poor, agriculture and construction sector due to the loss of working days In 2019, ILO reports that India lost 4.3% of working hours and around 34 million full-time loose jobs in 2030 due to heat stress.
- Reduction in agricultural productivity and livestock sector. 10-35% reduction in crop yields is seen in Haryana, Punjab & UP
- Increased the risk of forest fires, causing a sudden rise in demand for electricity and irrigated water. Rise in electricity household production by 15% to 20%

HEALTH RISK

Heat waves adversely affect human heath and pose severe public health emergencies on prolonged exposure. Heatwaves are associated with an increased heat-related morbidity such as - heat stroke, heat cramps, heat exhaustion, dehydration, etc. Risk is high for patients with cardiovascular and chronic disease. Stress, anxiety and sadness is likely to increase due to heat waves which could aggregate mental, behavioral and cognitive disorders.

Heatwave is the second most lethal disaster after the flood. In India, more than 41,000 people lost their lives to heat waves from 1967 to 2020. State wise, the highest number of people have been killed in Utter Pradesh (6745), followed by Andhra Pradesh (5088), Bihar (3364), Maharashtra (2974), Punjab (2720), Madhya Pradesh (2607), West Bengal (2570), Odisha (2406), Gujarat (2049), Rajasthan (1951), Tamil Nadu (1443), Haryana (1116), Telangana (1067), Delhi (996), Jharkhand (855), Karnataka (560), Assam (348), and 954 people killed across the remaining 12 states of India. Mostly the poor and out door workers (daily wage laborers, farmers, street hawkers, construction workers,rickshaw pullers, school children, elders, etc) are particularly vulnerable to heat waves.



Source - World Meteorological Organisation

PREDICTING HEAT WAVES

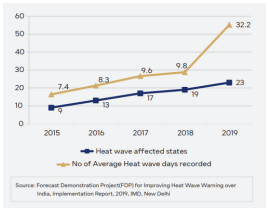
- Heat waves are generally developed over Northwest India and gradually spread eastwards & southwards and In Situ over an area where favorable conditions for Heat waves exist.
- As part of National Monsoon Mission, the Ministry of Earth Sciences has improved forecast system for early heatwave warnings. India Meteorological Department (IMD) can predicts heat wave based on various meteorological parameters (temperature, relative humidity, pressure, wind speed, direction, etc) up to four or five days or one season in advance
- Multi-model ensemble (MME) and higher-resolution global /numerical predictions models could be used for forecasting
- All India Weather Forecast Bulletin and Special heat wave guidance bulletin is updated by the National Weather Forecasting Centre (NWFC), IMD, New Delhi.
- IMD issues color code impact based heat warning jointly with National Management Authority - Green (Normal Day; Yellow Alert (Heat Alert); Orange Alert (Severe Heat); Red Alert Extreme Heat), so that states can take necessary mitigation measures

HEAT VULNERABILITY

Generally, plains of northwest, central east as well a coastal areas are reported to face heatwaves frequently. Maximum temperature is observed in Rajasthan and Vidharbha region. Heat waves are expanding to southern regions. A wet bulb temperature condition is also on the rise in eastern part including states of Andhra Pradesh, Telangana and Odisha.

A trend of increasing heat wave phenomena has been recorded in the country over the past several years, whereby several states, districts and cities have been severely affected. There has been increasing trend in terms of the number of heat-wave days in India. In 2015, 9 states were affected by heat waves. In 2020, as many as 23 states have been affected by heat waves. The number of heatwave days in India has increased from 413 over 1981-1990 to 600 over 2011-2020 (India Meteorological Department (IMD), Pune).

Year	Number of states
2015	9
2016	13
2017	17
2018	19
2019	23
2020	23



Source - NDMA Report

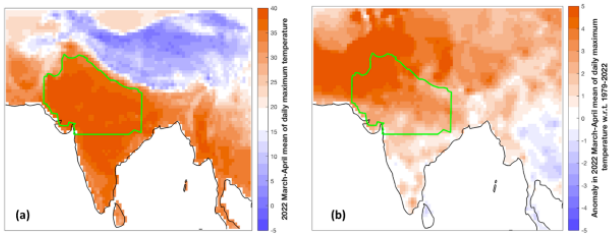


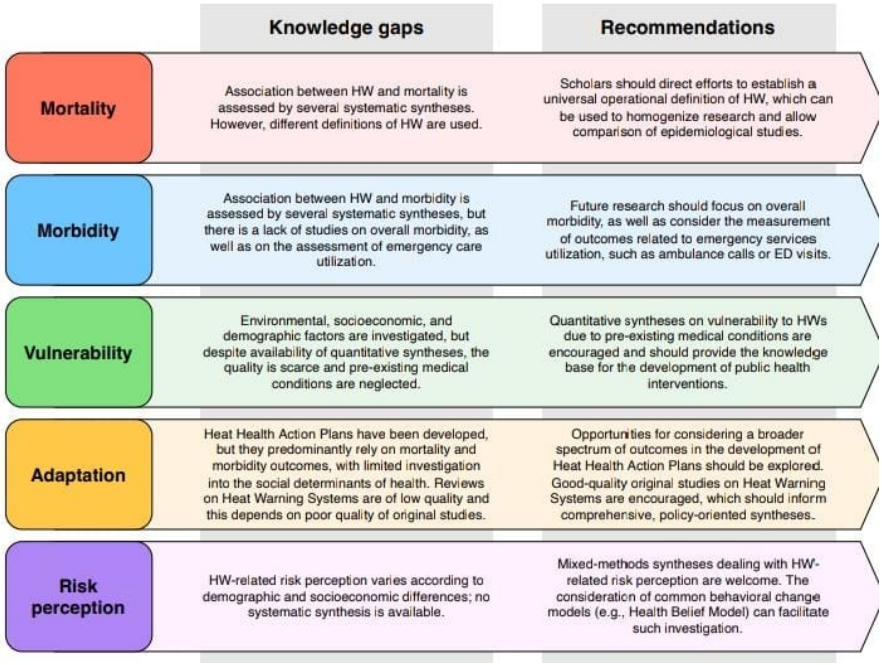
Figure 1: (a) March-April average daily maximum temperature for the year 2022 as observed in the CPC dataset. The study region is highlighted by the green polygon. (b) same as (a) for anomalies w.r.t. 1979-2022.

Source - World Weather Attribution

GUIDELINES

- Prior to 2015, national-level heatwave action plan was not available fro heatwaves. In 2016, NDMA issued comprehensive guidelines titled 'Guidelines for Preparation of Action Plan-Prevention and Management of Heatwave'.
- National framework for heat action plans and National guidelines 'Preparation of Action Plan–Prevention and Management of Heat Wave' provides framework to develop measures and strategies for heatwave assessment, prevention, preparedness and mitigation measures through coordinated efforts with inter-agency coordination among the IMD, Ministry of Earth Science, Integrated Disease Surveillance Program (IDSP) of the National Centre for Disease Control (NCDC), Ministry of Health and Family Welfare (MoH&FW), and other concerned ministries/departments
- NDMA provides technical assistance to states for operation of their Heat Wave Action Plans and development of institutional mechanisms to prevent, mitigate and respond to heat waves.
- 17 heat-wave prone states have prepared their Heat Wave Action Plans. And more than 120 districts/cities from 14 states have also prepared their own Action Plans. Ahmadabad is the first city in India to develop and implement a city-wide heat health adaptation in 2013.
- National guidelines on Heat wave also underlies - Development of a Framework for Heat Vulnerability Mapping and a model Heat Wave Action Plan for Indian Cities, and Assessment of Vulnerability and Threshold of Heat-related Hazards in cities.
- Heat-health early warning systems and action plans
- Heat-wave illness and casualty data are being collected by the IDSP- NCDC of the Ministry of Health and Family Welfare. Committee system to verify/confirm deaths resulting from heat waves.
- The Sendai Framework for Disaster Risk Reduction 2015-30, emphasizes on the disaster risk reduction with sharing responsibility of government and the NGO sector.
- Essentially of creating comprehensive disaster management plan to safeguard our communities against heatwaves

GAPS & RECOMMENDATION FOR RESEARCH



Source- Conti A, et. al, 2022

DOCTORS FOR YOU HEATWAVE ACTIVITIES

In the month of March to July, Doctors For You undertake awareness on preventive measures of heat waves and strengthen its health care facilities to attend to patients of heat related illness, dehydration and heat strokes.

Farmers in the states of Punjab and Haryana and Vulnerable communities mobilized in NCT Delhi to avoid going out in the sun at peak time of 12 noon to 3 pm, carry water while travelling, drink sufficient water, wear light-colored, loose, and porous cotton clothes, use umbrella/hat, while going out in the sun, stay hydrated with use of ORS, homemade drinks like lassi, torani (rice water), lemon water, buttermilk, etc and consult doctors if feel faint or ill, immediately.

PREVENTIVE MEASURES

- Installing, developing or improvising early warning system and sending heat alerts in advance
- NDMA issues advisories on heat waves to all heat-wave prone states and union territories
- Building capacity of the local health care providers (medical officers, paramedical workers , community health professionals) to identify and treat illnesses of heat waves
- Prevention and management of heat-related medical conditions and lower mortality and morbidity
- Disseminating heatwave threats, preventive measures and tackling heat waves are widely circulated through social media, print/electronic media, and short TV commercial films for community sensitization and awareness generation
- Improving heat proof shelter facilities at bus stops, construct temporary shelters where necessary using reflective surface and green cover , easing access to public drinking water through water kiosk, afforestation, bettering water delivery systems via tankers in public spaces to combat heat waves.
- The other measures could be rescheduling of working hours for outdoor workers, reducing outdoor exercises, increase in health facilities, stocking of ORS packets at health centers, placement of cooling systems

Colour Code	Alert	Warning	Impact	Suggested Actions
Green (No action)	Normal Day	Maximum temperatures are near normal	Comfortable temperature. No cautionary action required.	Nil
Yellow Alert (Be updated)	Heat Alert	Heat wave conditions at isolated pockets persists on 2 days	Moderate temperature. Heat is tolerable for general public but moderate health concern for vulnerable people e.g. infants, elderly, people with chronic diseases	(a) Avoid heat exposure. (b) Wear lightweight, light-coloured, loose, cotton clothes. (c) Cover your head: Use a cloth, hat or umbrella
Orange Alert (Be prepared)	Severe Heat Alert for the day	(i) Severe heat wave conditions persists for 2 days (ii) Through not severe, but heat wave persists for 4 days or more	High temperature. Increased likelihood of heat illness symptoms in people who are either exposed to sun for a prolonged period or doing heavy work. High health concern for vulnerable people e.g. infants, elderly, people with chronic diseases.	(b) Avoid heat exposure– keep cool. Avoid dehydration. (b) Drink sufficient water- even if not thirsty. (c) Use ORS, homemade drinks like lassi, torani (rice water), lemon water, buttermilk, etc. to keep yourself hydrated
Red Alert (Take Action)	Extreme Heat Alert for the day	(i) Severe heat wave persists for more than 2 days. (ii) Total number of heat/severe heat wave days exceeding 6 days.	Very high likelihood of developing heat illness and heat stroke in all ages.	Extreme care needed for vulnerable people.

Source - IMD & NDMA Publication

Heat Disorder	Symptoms	First Aid
Heat rash	Skin redness and pain, possible swelling, blisters, fever, headaches.	Take a shower using soap to remove oils that may block pores preventing the body from cooling naturally. If blisters occur, apply dry, sterile dressings and seek medical attention.
Heat Cramps	Painful spasms usually in leg and abdominal muscles or extremities. Heavy sweating.	Move to cool or shaded place. Apply firm pressure on cramping muscles or gently massage to relieve spasm. Give sips of water. If nausea occurs, discontinue.
Heat Exhaustion	Heavy sweating, weakness, Skin cold, pale, headache and clammy extremities. Weak pulse. Normal temperature possible. Fainting, vomiting.	Get victim to lie down in a cool place. Loosen clothing. Apply cool, wet cloth. Fan or move victim to air-conditioned place. Give sips of water slowly and if nausea occurs, discontinue. If vomiting occurs, seek immediate medical attention, call 108 and 102 for ambulance.
Heat Stroke (Sun Stroke)	High body temperature. Hot, dry skin. Rapid, strong pulse. Possible unconsciousness or altered mental status. Victim will likely not sweat.	Heat stroke is a severe medical emergency. Call 108 and 102 for ambulance for emergency medical services or take the victim to a hospital immediately. Delay can be fatal. Move victim to a cooler environment. Try spraying water, cold water on body & fan the wet body. If possible sponging or cool bath sponging to reduce body temperature. Use extreme caution. Remove clothing. Use fans and/or air conditioners. **DO NOT GIVE FLUIDS ORALLY if the person is not conscious.**

REFERENCE

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