

RSTV

PERSPECTIVE: HEAT WAVES AND CLIMATE CHANGE - 13 MAY, 2022

IN NEWS:

- India is witnessing intense heat for the past few weeks due to **rising temperatures in large parts of the country.**
- At several places, the maximum temperature touched 50 degrees Celsius.
- As large parts of India experience rising temperatures, the World Meteorological Organisation (WMO) said that it is premature to conclude that the extreme heat is only due to climate change.
- The WMO has also highlighted that now the **Heat waves are more frequent and more intense and starting earlier than in the past.**
- The India Meteorological Department (IMD) said April was the hottest in northwest India in 122 years

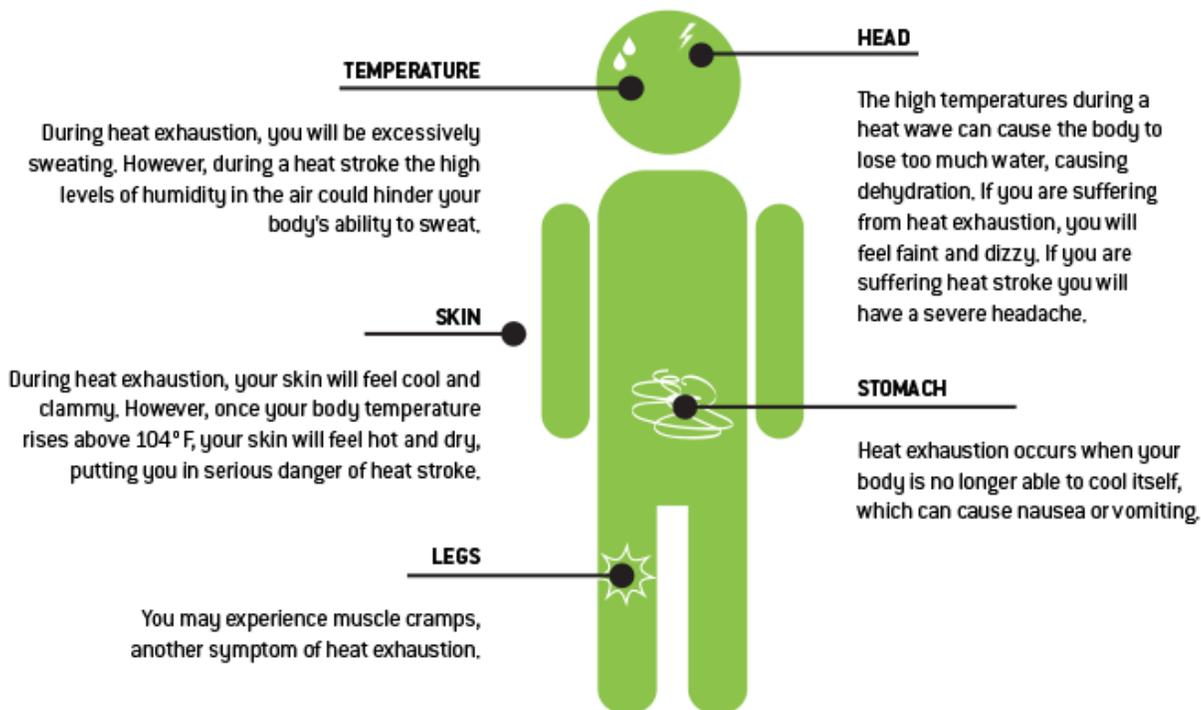
What is a Heat Wave?

- A heatwave is a **period of excessively hot weather, with high humidity, especially in oceanic climate areas.**
- Heatwaves are usually measured relative to the usual weather in the area and relative to normal temperatures for the season.
- The **definitions of heatwave vary from region to region.** Temperatures that people from a hotter climate consider normal can be called a heatwave in a cooler area if they are outside the normal climate pattern for that area.
- Severe heatwaves have caused **catastrophic crop failures, thousands of deaths from hyperthermia and widespread power outages due to increased use of air conditioning.**
- A heat wave is considered extreme weather that can be a natural disaster and a danger because heat and sunlight may overheat the human body.
- Heatwaves can usually be **detected using forecasting instruments** so that a warning call can be issued.
- Climate models reveal that future heatwaves will have a more intense geographic pattern. The world will experience more intense, more frequent, and longer-lasting heat waves in the second half of the 21st century.
- Increased anthropogenic activities causing increased greenhouse gas emissions show that heatwaves will be more severe.
- Heatwaves and droughts, as a result, minimise ecosystem carbon uptake. Carbon uptake is also known as carbon sequestration.
 - This will cause changes in the ecosystem's carbon cycle feedback because there will be less vegetation to hold the carbon from the atmosphere, which will only contribute more to atmospheric warming.

How do heatwaves form?

- A heatwave is formed when static high pressure is generated in the upper atmosphere over a region for several days up to several weeks.
- This static high pressure generates a hot mass of air, which is stagnant for many days and weeks, which results in the trapping of more heat that also reduces the convection currents.
- The high pressure acts as a barrier and forces the mass of air to sink to the surface of the land that preventing heat from rising.
- This hot mass of air accumulates only heat and humidity without any trace of precipitation that causes abnormally high temperatures. It is very common during the summer season, from May to November in the northern hemisphere.
- The seal keeps out convection currents that form clouds and eventually rain clouds, both of which would help the area affected cool off.
- Instead, the result is a heatwave that has both high heat and high humidity near the ground.
- These heat waves can last from days to weeks.

How does a heat wave affect humans?



- A heatwave occurs when a system of high atmospheric pressure moves into an area and lasts two or more days.
 - In such a high-pressure system, air from the upper levels of our atmosphere is pulled toward the ground, where it becomes compressed and temperature increases.
- This high concentration of pressure makes it difficult for other weather systems to move into the area, which is why a heatwave can last for several days or weeks.
 - The longer the system stays in an area, the hotter the area becomes.
- **The high-pressure system also prevents clouds from entering the region; sunlight can become punishing, heating the system even more.**
- The combination of all of these factors comes together to create the exceptionally hot temperatures we call a heatwave.
- This is common in summer (in both Northern and Southern Hemispheres) as the jet stream 'follows the sun'.

Heatwave in India

- In India, a **region or locality is considered to be under the influence of a heatwave if the maximum temperature reaches or exceeds;**
 - 40 degrees Celsius in the plains.
 - 30 degrees Celsius in hilly regions.
 - 37 degrees Over the coastal regions
- When the maximum temperature departure ranges between 4.5 and 6 degrees, the India Meteorological Department (IMD) declares a heatwave.
 - For example; If the normal temperature of a locality should be 40 degrees, and the actual recorded temperature is 45 degrees, the locality is under a heatwave.
 - A severe heatwave is declared when the recorded maximum temperature of a locality departure from normal is over 6.4 degrees.
- In India, heat waves occur from March to June, occasionally in July. The peak heatwave events have been reported in May.
- As per the IMD, the most heatwave prone states are Punjab, Haryana, Delhi, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Odisha, Madhya Pradesh, Rajasthan, Gujarat, Vidarbha, and parts of Karnataka, Andhra Pradesh, Telangana, and occasionally over Tamil Nadu and Kerala.

Implications of Heat Waves

Social impacts

- Extreme heat can lead to **heat-related illness and death, particularly in elderly populations, the poor, outdoor workers, and urban areas.**
- Heatwaves exacerbate the **urban heat island effects**, amplifying temperatures in built environments, and resulting in poorer air quality due to the creation of ozone that negatively impacts health.
- **Heat-related mortality is expected to be higher in cities**, particularly those characterised by high population density, inequalities, limited access to health care, high pollution levels and fewer green spaces.

Economic impacts

- Multiple areas of the economic sector **experience reduced worker productivity** during heatwaves, especially agriculture and construction.
- Globally, 2% of total working hours are projected to be lost every year, either because it is too hot to work or because workers have to work at a slower pace.
- **Lost productivity from heat stress at work**, particularly in developing countries, is expected to be valued at \$ 4.2 trillion per year by 2030, driving more inequality.
- The agricultural sector, where 940 million people earn their livelihood, is set to be harder hit by hotter temperatures, pushing workers, crops and livestock past their physiological heat and drought tolerances.
- This will result in **lost labour, smaller harvests for farmers and higher prices for consumers**, and negative impacts on livelihoods.
- A World Bank report suggests that by 2050, about 600 million Indians will live in places that could experience a loss of living standards, which could cost 2.8% of the GDP, stalling efforts to pull large parts of the population out of poverty.
- **Increasing energy demand for cooling** also comes as an extensive economic cost to residents, businesses, and governments.
- With these extreme heat events, the need for access to cooling should be viewed as a basic necessity – not just for health and productivity reasons but, in some cases, even for survival.

Ecological impacts

- Heatwaves, without concomitant increases in precipitation, can lead to **water shortages and increased stress for plants, particularly in arid regions.**
- This has the **effect of reducing plant growth**, the basis of energy production and the food chain, with an overall drying-out of the landscape.

- For example, the 2003 European heatwave resulted in a 10% loss in glacier mass in Europe, which was five times more than the average annual loss.
- Similar impacts were reported for the French Alps in 2019.
- Over time, such deep permafrost warming and thawing could cause landslides and rockfalls, continuing the negative ecological impacts.

Health Impacts of Heat Waves

- The health impacts of Heat Waves typically involve **dehydration, heat cramps, heat exhaustion and/or heat stroke**.
- Children, the elderly and those with pre-existing morbidities are particularly vulnerable.
- Vegetable vendors, cab drivers, construction workers, police personnel, roadside kiosk operators and mostly weaker sections of the society have to work in the extreme heat to make their ends meet and are extremely vulnerable to the adverse impacts of heatwaves such as dehydration, heat and sunstrokes.

Why India is experiencing more heat waves?

- Magnified effect of paved and **concrete surfaces in urban areas and a lack of tree cover**.
- **Urban heat island effects can make ambient temperatures feel 3 to 4 degrees more than they are**.
- Higher daily peak temperatures and longer, more intense heat waves are becoming increasingly frequent globally due to climate change.

Mitigation and Adaptation Strategies

- The Mitigation and Adaptation Strategies are intended to **mobilise individuals and communities** to help protect their neighbours, friends, relatives, and themselves against avoidable health problems during spells of very hot weather.
- The **Government agencies need to play a critical role in preparing and responding to heatwaves at a local level**, working closely with health and other related departments on a long term strategic plan.
- **Establish Early Warning System and Inter-Agency Coordination** to alert residents on predicted high and extreme temperatures. Who will do what, when, and how is made clear to individuals and units of key departments, especially for health.
- **Capacity building/training programme for health care professionals** at the local level to recognize and respond to heat-related illnesses, particularly during extreme heat events.

- These training programmes should focus on medical officers, paramedical staff and community health staff so that they can effectively prevent and manage heat-related medical issues to reduce mortality and morbidity.
- **Public Awareness and community outreach** - Disseminating public awareness messages on how to protect against the extreme heatwave through print, electronic and social media and Information, Education and Communication materials such as pamphlets, posters and advertisements and Television Commercials on Do and Don't and treatment measures for heat-related illnesses.
- **Collaboration with non-government and civil society** to improve bus stands, build temporary shelters, wherever necessary, improve water delivery systems in public areas and other innovative measures to tackle Heatwave conditions.
- **Identifying heat hot spots through appropriate tracking of meteorological data** and promoting timely development and implementation of local Heat Action Plans with strategic inter-agency coordination, and a response which targets the most vulnerable groups.
- Review of existing occupational health standards, labour laws and sectoral regulations for worker safety in relation to climatic conditions.
- Policy intervention and coordination across three sectors health, water and power are necessary.
- Expedite the rollout of the National Action Plan on Climate Change and Health.
 - Preventing temperature-related morbidity and mortality could be a key programme under this mission.
 - Ensure an adequate supply of water. Timely access to drinking water can help mitigate this escalation.
- Further research using sub-district level data to provide separate indices for urban and rural areas to enable more targeted geographical interventions.
- **Provision of public messaging (radio, TV)**, mobile phone-based text messages, automated phone calls and alerts.
- Promotion of traditional adaptation practices, such as staying indoors and wearing comfortable clothes.
- Popularisation of simple design features such as shaded windows, underground water storage tanks and insulating housing materials.
- **Advance implementation of local Heat Action Plans**, plus effective inter-agency coordination is a vital response that the government can deploy to protect vulnerable groups.

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