

Q. What is heat wave?

Qualitatively, heat wave is a condition of air temperature which becomes fatal to human body when exposed. Quantitatively, it is defined based on the temperature thresholds over a region in terms of actual temperature or its departure from normal. In certain countries it is defined in term of the heat index based on temperature and humidity or based on extreme percentile of the temperatures.

Q. What is criterion for declaring heat wave?

Heat wave is considered if maximum temperature of a station reaches at least 40°C or more for Plains and at least 30°C or more for Hilly regions.

a) Based on Departure from Normal

Heat Wave: Departure from normal is 4.5°C to 6.4°C

Severe Heat Wave: Departure from normal is >6.4°C

b) Based on Actual Maximum Temperature

Heat Wave: When actual maximum temperature $\geq 45^{\circ}\text{C}$

Severe Heat Wave: When actual maximum temperature $\geq 47^{\circ}\text{C}$

If above criteria met at least in 2 stations in a Meteorological sub-division for at least two consecutive days and it declared on the second day.

Q. What is a criterion for describing *Heat Wave* for coastal stations?

When maximum temperature departure is 4.5°C or more from normal, *Heat Wave* may be described provided actual maximum temperature is 37°C or more.

Q. What is warm night?

It is considered only when maximum temperature remains 40°C or more. It is defined based on departures or actual minimum temperatures as follows:

Warm night: minimum temperature departure is 4.5°C to 6.4°C

Very warm night: minimum temperature departure is >6.4°C

Q. What is the period of heat wave over India?

It is occurring mainly during March to June and in some rare cases even in July. The peak month of the heat wave over India is May.

Q. What are the heat wave prone states over India?

Heat wave generally occurs over plains of northwest India, Central, East & north Peninsular India during March to June. It covers Punjab, Haryana, Delhi, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Odisha, Madhya Pradesh, Rajasthan, Gujarat, parts of Maharashtra & Karnataka, Andhra Pradesh and Telengana. Sometimes it occurs over Tamilnadu & Kerala also. Heat waves adversely affect human and animal lives. However, maximum temperatures more than 45°C observed mainly over Rajasthan and Vidarbha region in month of May.

Q. How India Meteorological Department (IMD) monitors the Heat wave?

IMD has a big network of surface observatories covering entire country to measure various metrological parameters like Temperature, Relative humidity, pressure, wind speed & direction etc. Based on daily maximum temperature station data, climatology of maximum temperature is prepared for the period 1981-2010 to find out normal maximum temperature of the day for particular station. Thereafter, IMD declared heat wave over the region as per its definition.

Q. What is the temporal range of temperature forecast issued by IMD?

IMD issues temperature forecast & warning in following range:

- a) Short to medium range (lead time/validity of 1 to 5 days)
- b) Extended range (lead time/validity upto 4 weeks)
- c) Seasonal range (lead time/validity upto 3 months)

Q. What is the spatial range of temperature forecast issued by IMD?

IMD issues location, District, Meteorological Sub-division and Homogeneous regions temperature forecast to its various users and keep in IMD Website (<https://mausam.imd.gov.in/>).

Q. How IMD predicts the Heat wave?

IMD predicts heat wave based on synoptic analysis of various meteorological parameters and from the consensus guidance from various regional & global numerical prediction models like, WRF, GFS, GEFS, NCUM, UMEPS, UM Regional etc. run in Ministry of Earth Sciences (MoES) and other international models available under bilateral multi-institutional arrangement

Q. How common man may get IMD Heat wave information?

A common man may get heat wave information from, All India Weather Forecast Bulletin (https://mausam.imd.gov.in/imd_latest/contents/all_india_forecast_bulletin.php) and special heat wave guidance bulletins (http://internal.imd.gov.in/pages/heatwave_mausam.php) during 1 April to 30 June everyday. The heat wave information is shared with concerned State Government Authority, Media and other stakeholders like Indian Railway, Health departments, Power Sector etc. The general public is informed through Print & Electronics Media.

Q. How frequently Heat wave bulletins are issued?

5 days Heat wave warnings are updated four times in day (based on 0530, 0830, 1430 & 1730 hours IST) in All India Weather Forecast Bulletin (https://mausam.imd.gov.in/imd_latest/contents/all_india_forecast_bulletin.php) by National Weather Forecasting Centre (NWFC), IMD, New Delhi. In the Morning and Evening (at 0800 & 1600 hours IST) special heat wave guidance bulletins (http://internal.imd.gov.in/pages/heatwave_mausam.php) are also issued by NWFC. The district wise heat wave warnings are issued by State level Meteorological Centre/Regional Meteorological Centres of IMD.

Q. How does IMD co-ordinate with central & state disaster managers for Heat wave?

IMD issues special heat wave warning guidance bulletins (at 0800 & 1600 hours IST) at meteorological sub-division & district levels to different users like, Ministry of Home

Affairs, National Disaster Management Authority, State Disaster Management Authority, Deputy Commissioner/District Magistrates of different districts of states, health department, Indian Railway, Road transport, Media etc. IMD conducts the pre-season exercise at state & national level. IMD also contributes in the preparation of heat wave guidelines and heat action plan. IMD provides the required past data for heat wave advisories and development.

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Q. What are favorable conditions for Heat wave?

- a. **Transportation / Prevalence of hot dry air over a region** (There should be a region of warm dry air and appropriate flow pattern for transporting hot air over the region).
- b. **Absence of moisture in the upper atmosphere** (As the presence of moisture restricts the temperature rise).
- c. **The sky should be practically cloudless** (To allow maximum insulation over the region).
- d. **Large amplitude anti-cyclonic flow over the area.**

Heat waves generally develop over Northwest India and spread gradually eastwards & southwards but not westwards (since the prevailing winds during the season are westerly to northwesterly). But on some occasions, heat wave may also develop over any region in situ under the favorable conditions.

Q. How heat discomfort is determined?

It is determined by a combination of meteorological (temperature, Relative Humidity, wind, direct sunshine), social/cultural (clothing, occupation, accommodation) and physiological (health, fitness, age, level of acclimatization) factors.

(source: <https://www.ndma.gov.in/images/guidelines/heatwaveguidelines2017.pdf>)

Q. What is heat index?

The heat index is the combination of air temperature and relative humidity, it measure of how hot it really feels when relative humidity is factored in with the actual air temperature.

Q. What is impact based heat wave warning issue by India Meteorological Department (IMD)?

India Meteorological Department issues following colour code impact based heat warning jointly with National Disaster Management Authority.

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.
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Q. Health Impacts of Heat Waves?

The health impacts of Heat Waves typically involve dehydration, heat cramps, heat exhaustion and/or heat stroke. The signs and symptoms are as follows:

- Heat Cramps: Edema (swelling) and Syncope (Fainting) generally accompanied by fever below 39°C i.e. 102°F.
- Heat Exhaustion: Fatigue, weakness, dizziness, headache, nausea, vomiting, muscle cramps and sweating.
- Heat Stroke: Body temperatures of 40°C i.e. 104°F or more along with delirium, seizures or coma. This is a potential fatal condition

(source: <https://ndma.gov.in/en/2013-05-03-08-06-02/disaster/natural-disaster/heat-wave.html>)

Q. What are the measures one should take to minimise the impact during the heat wave?

- Avoid going out in the sun, especially between 12.00 noon and 3.00 p.m.
- Drink sufficient water and as often as possible, even if not thirsty
- Wear lightweight, light-coloured, loose, and porous cotton clothes. Use protective goggles, umbrella/hat, shoes or chappals while going out in sun.
- Avoid strenuous activities when the outside temperature is high. Avoid working outside between 12 noon and 3 p.m.
- While travelling, carry water with you.
- Avoid alcohol, tea, coffee and carbonated soft drinks, which dehydrates the body.
- Avoid high-protein food and do not eat stale food.
- If you work outside, use a hat or an umbrella and also use a damp cloth on your head, neck, face and limbs
- Do not leave children or pets in parked vehicles
- If you feel faint or ill, see a doctor immediately.

- Use ORS, homemade drinks like lassi, torani (rice water), lemon water, buttermilk, etc. which helps to re-hydrate the body.
- Keep animals in shade and give them plenty of water to drink.
- Keep your home cool, use curtains, shutters or sunshade and open windows at night.
- Use fans, damp clothing and take bath in cold water frequently.

(source: <https://ndma.gov.in/en/heat-do-s-and-dont-s.html>)

Q. What you should do, if you think someone is suffering from the heat?

- Avoid going out in the sun, especially between 12.00 noon and 3.00 p.m.
- Drink sufficient water and as often as possible, even if not thirsty
- Wear lightweight, light-coloured, loose, and porous cotton clothes. Use protective goggles, umbrella/hat, shoes or chappals while going out in sun.
- Avoid strenuous activities when the outside temperature is high. Avoid working outside between 12 noon and 3 p.m.
- While travelling, carry water with you.
- Avoid alcohol, tea, coffee and carbonated soft drinks, which dehydrates the body.
- Avoid high-protein food and do not eat stale food.
- If you work outside, use a hat or an umbrella and also use a damp cloth on your head, neck, face and limbs
- Do not leave children or pets in parked vehicles
- If you feel faint or ill, see a doctor immediately.
- Use ORS, homemade drinks like lassi, torani (rice water), lemon water, buttermilk, etc. which helps to re-hydrate the body.
- Keep animals in shade and give them plenty of water to drink.
- Keep your home cool, use curtains, shutters or sunshade and open windows at night.
- Use fans, damp clothing and take bath in cold water frequently.

(source: <https://www.ndma.gov.in/Natural-Hazards/Heat-Wave/Dos-Donts>)

Q. What are symptoms of Sunburn and its first aid?

Symptoms: Skin redness and pain, possible swelling, blisters, fever and headaches.

First Aid: 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 get medical attention.

(source: <https://ndma.gov.in/images/guidelines/guidelines-heat-wave.pdf>)

Q. What are symptoms of Heat Cramps and its first aid?

Symptoms: Painful spasms usually in leg and abdominal muscles or extremities. Heavy sweating.

First Aid: Move to cool or shaded place. Apply firm pressure on cramping muscles or gentle massage to relieve spasm. Give sips of water. If nausea occurs, discontinue.

(source: <https://ndma.gov.in/images/guidelines/guidelines-heat-wave.pdf>)

Q. What are symptoms of Heat Exhaustion and its first aid?

Symptoms: Heavy sweating, weakness, skin cold, pale, headache and clammy. Weak pulse. Normal temperature possible. Fainting, vomiting.

First Aid: 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. Or call 108 and 102 for Ambulance.

(source: <https://ndma.gov.in/images/guidelines/guidelines-heat-wave.pdf>)

Q. What are symptoms of Heat Stroke (Sun Stroke) and its first aid?

Symptoms: High body temperature (106°F). Hot, dry skin. Rapid, strong pulse. Possible unconsciousness. Victim will likely not sweat.

First Aid: 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 a cool bath or sponging to reduce body temperature. Use extreme caution. Remove clothing. Use fans and/or air conditioners. **DO NOT GIVE FLUIDS.**

(source: <https://ndma.gov.in/images/guidelines/guidelines-heat-wave.pdf>)

Q. What are the measures one should do to minimize the impact during heat wave?

- Listen to Radio, watch TV, read News paper for local weather forecast to know if a heat wave is on the way
- Drink sufficient water and as often as possible, even if not thirsty
- Wear lightweight, light-coloured, loose, and porous cotton clothes. Use protective goggles, umbrella/hat, shoes or chappals while going out in sun.
- While travelling, carry water with you.
- If you work outside, use a hat or an umbrella and also use a damp cloth on your head, neck, face and limbs.
- Use ORS, homemade drinks like lassi, torani (rice water), lemon water, buttermilk, etc. which help to re-hydrate the body.
- Recognize the signs of heat stroke, heat rash or heat cramps such as weakness, dizziness, headache, nausea, sweating and seizures. If you feel faint or ill, see a doctor immediately.
- Keep animals in shade and give them plenty of water to drink.
- Keep your home cool, use curtains, shutters or sunshade and open windows at night.
- Use fans, damp clothing and take bath in cold water frequently.
- Provide cool drinking water near work place.
- Caution workers to avoid direct sunlight.
- Schedule strenuous jobs to cooler times of the day.
- Increasing the frequency and length of rest breaks for outdoor activities.
- Pregnant workers and workers with a medical condition should be given additional attention.

(source: <https://ndma.gov.in/images/guidelines/guidelines-heat-wave.pdf>)

Q. What one should not do to minimize the impact during heat wave?

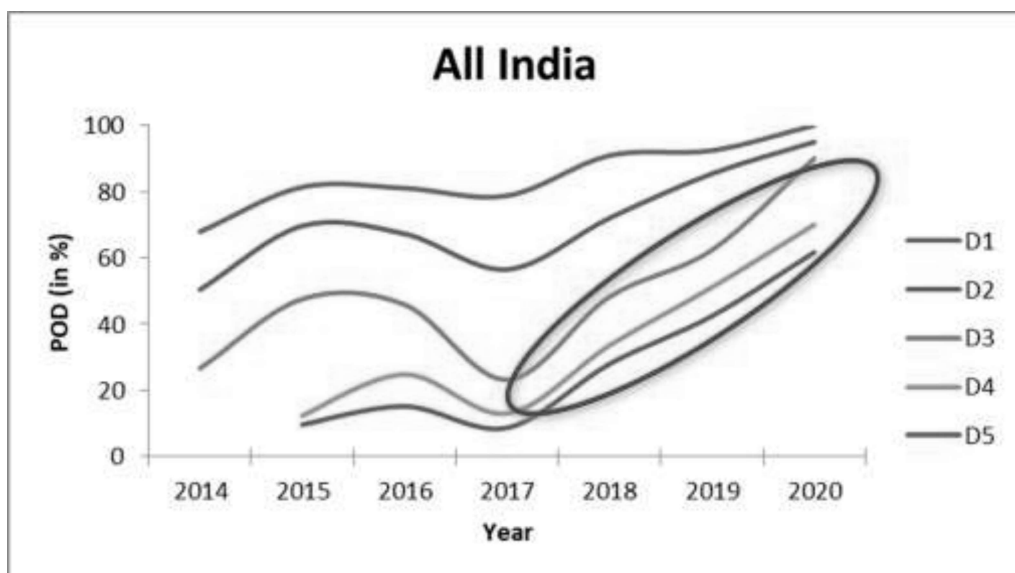
- Listen Do not leave children or pets in parked vehicles.
- Avoid going out in the sun, especially between 12.00 noon and 3.00 p.m.

- Avoid wearing dark, heavy or tight clothing.
- Avoid strenuous activities when the outside temperature is high. Avoid working outside between 12 noon and 3 p.m.
- Avoid cooking during peak hours. Open doors and windows to ventilate cooking area adequately.
- Avoid alcohol, tea, coffee and carbonated soft drinks, which dehydrates the body.
- Avoid high-protein food and do not eat stale food..

(source: <https://ndma.gov.in/images/guidelines/guidelines-heat-wave.pdf>)

Q. What is the accuracy of heat wave warning?

Heat wave skill (Probability of Detection (PoD) during 2014 to 2020 is as follow:



There is significant improvement in Day 1 (D1) to Day 5 (D5) forecast warning in the recent years specifically for Day 3 (D3) to Day 5 (D5) warning. The accuracy of warning in term of PoD is more than 80% for D1 & D2.

Q. Who can be contacted for heat wave information & warning in IMD?

Round the clock duty officer is available in National Weather Forecasting Centre, IMD, New Delhi. The contact address is given below:

National Weather Forecasting Centre,
India Metrological Department,

Lodi Road, New Delhi

Phone: 011-24631913, 42964160