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Cold Wave Situation Report

22nd January, 2023

INTRODUCTION

In recent years, cold waves, heavy snowfall/rainfall, fog, and snow storms have become prominent weather hazards affecting various parts of the country. Cold waves, localized seasonal phenomena prevalent in most regions except southern India, are meteorological events characterized by a sharp drop in air temperature, increased atmospheric pressure, strengthened wind speed, and associated hazardous conditions like frost and icing.

The Indian Meteorological Department (IMD) defines a Cold Wave based on minimum temperature criteria. For plains, it's 10°C or less, and for hilly regions, it's 0°C or less. Severity is categorized by negative departures from normal temperatures, with a Severe Cold Wave having a departure of more than 6.4°C. Coastal stations use a departure of -4.5°C or less, with a minimum temperature of 15°C or less to indicate a Cold Wave.

Cold waves, often occurring from November to February and primarily affecting northern India, bring extreme low temperatures due to incursions of dry, cold winds from the north. These events lead to discomfort, illnesses, and sometimes even loss of lives. The damage extent depends on factors such as temperature, exposure duration, humidity levels, and wind speed at freezing temperatures.

COLD WAVE EVENTS (CWE)

- Cold Wave Events (CWEs) significantly impact various aspects of life in India, including health, agriculture, livestock, energy, and transportation. December and January witness the highest occurrence of CWEs and associated mortality in Northwest India and Central Northeast India.
- According to the "Disastrous Weather Events' Report" from IMD Pune, 8520 mortalities were caused by 606 cold wave events, averaging 230 mortalities per year over 37 years (1978–2014). Between 2001 and 2019, 4712 individuals lost their lives due to cold waves in India. Cold waves contributed to 34% of deaths from extreme weather events in North India during 2001-2014.
- A significant concentration of approximately 75% of cold wave mortalities is observed in just two states, Bihar (44%) and Uttar Pradesh (31%). Between 1980 and 2018, cold waves surpassed heat waves in causing the highest human death toll in 23 of the last 38 years, according to IMD. There has been a striking 506% increase in the number of cold waves in India between 2010 and 2018, indicating a growing trend in their frequency and impact.
- Uttar Pradesh has reported the maximum number of CWEs, followed by Rajasthan, Bihar, Punjab, Jharkhand, and Haryana.

HIGHLIGHTS - 21ST JAN 2024

- Since December 29, 2023, maximum temperatures have been below normal by 5-8 degrees Celsius, resulting in a prolonged cold spell. A brief respite occurred on January 7 and 8 due to a passing western disturbance, but cold conditions returned from January 9. The cold wave is likely to prevail in Punjab, Haryana-Chandigarh, West Rajasthan, Uttar Pradesh, Bihar and north Madhya Pradesh, expanding to more parts of North India during January 21-26.
- On 21st January 2024, moderate fog was reported in Haryana, Sub-Himalayan regions, West Bengal, and Sikkim, while shallow fog was observed in isolated areas of Punjab, Jammu Division, Uttarakhand, Uttar Pradesh, and Assam. The cold day to severe cold day conditions prevailed in many parts of Punjab, Uttar Pradesh, Bihar, Delhi, Rajasthan, and Haryana.
- Flight and rail services have been disrupted, with several flights and trains delayed or canceled due to zero visibility
- Northern India is currently experiencing severe cold wave conditions marked by a significant drop in temperatures and widespread dense fog. New Delhi has been particularly affected, with disruptions in flights and delays in train services. According to the India Meteorological Department (IMD), the minimum temperature in the region reached 4.8°C, with the maximum temperature of 15.8°C.

Maximum Temperatures & their Departure over the Plains of North India Dated: 21-01-2024

Station	Maximum Temperature (°C)	Departure from Normal (°C)
Delhi		
Palam	13.1	-7.1
Safdarjung	15.8	-4.5
Ridge	15.7	-4.4
Ayanagar	15.8	-4.2
Haryana & Chandigarh		
Chandigarh	9.4	-8.9
Ambala	10.3	-8.3
Hissar	11.0	-9.0
Rohtak	11.4	-9.0
Punjab		
Amritsar	9.5	-8.3
Ludhiana	12.4	-6.0
Patiala	10.7	-7.7
Rajasthan		
Ganganagar	9.6	-10.8
Bikaner	18.6	-4.7
Churu	18.6	-4.4
Jaisalmer	20.5	-3.2
Uttar Pradesh		
Meerut	13.4	-6.3
Bareilly	12.5	-7.7
Bahraich	11.4	-9.9
Lucknow	12.6	-9.4
Fursatganj	16.0	-6.1
Gorakhpur	15.5	-5.7
Sultanpur	15.6	-5.7
Bihar		
Bhagalpur	16.7	-5.1
Gaya	16.8	-6.3
Supaul	13.1	-8.2
Patna	13.5	-8.7
Darbhanga	13.2	-9.7
Muzaffarpur	13.2	-8.8
Odisha		
Balasore	18.2	-8.9
Keonjhargarh	19.9	-6.8
Sambalpur	23.6	-5.1
Hirakud	24.3	-4.8
Chandbali	21.7	-5.9
Madhya Pradesh		
Rewa	18.0	-5.8
Nowgong	19.5	-4.7
Satna	21.7	-1.9
Sidhi	20.8	-3.8

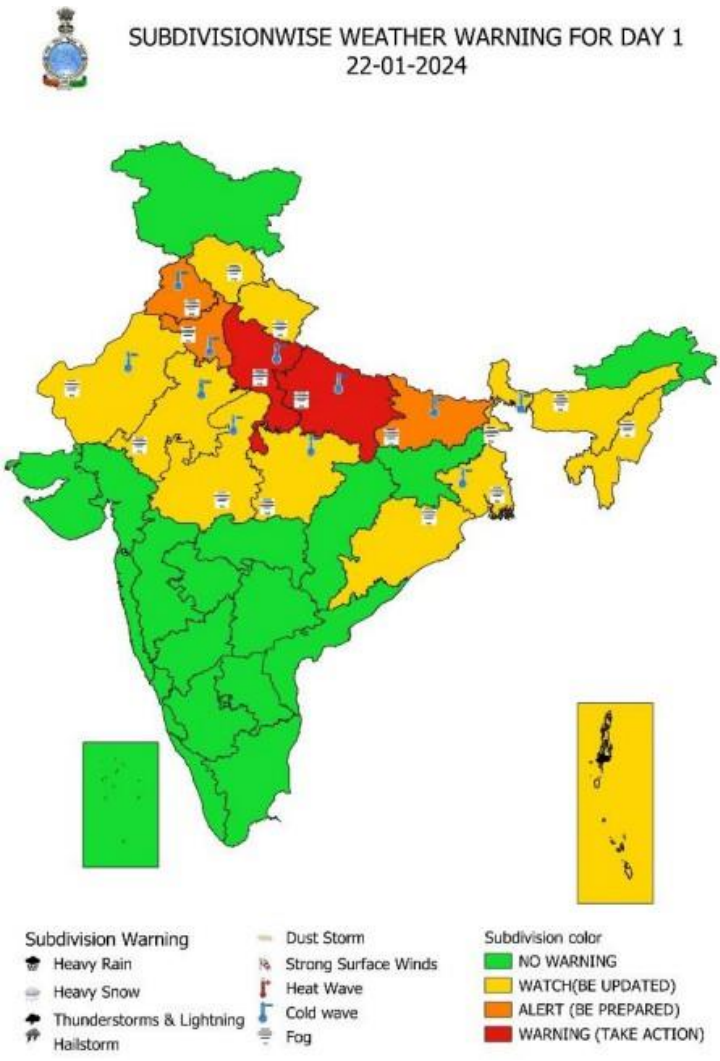
Source - IMD

MAJOR FACTORS

Cold Wave occurrences over India are influenced by several factors:

- Build-up of a Ridge in the Jetstream: An extended area of relatively high atmospheric pressure in the jetstream over northwest Asia contributes to the development of Cold Waves.
- Formation of Surface High-Pressure Systems: High-pressure systems over north and central India play a crucial role in creating conditions conducive to Cold Waves.
- Movement of Cold Air Masses: The movement of cold air masses is guided by upper-level winds, contributing to the establishment of cold conditions.
- Triggering Mechanisms: Strong westerly waves approaching northwest India enhance winds, facilitating the southeastward transport of cold air, acting as triggering mechanisms for Cold Waves.
- Extensive Snow Covers: The presence of extensive snow covers over the northwest Himalayas further contributes to the intensification of Cold Waves across the region.

SUB-DIVISIONAL WEATHER WARNING



STATEWISE VARIATIONS

- As per the Indian Meteorological Department (IMD), the 'Core Cold Wave Zone' comprises 17 States / Union Territories
- The northern parts of India, especially hilly regions like Jammu and Kashmir, Himachal Pradesh, and Uttarakhand, along with adjoining plains, are frequently influenced by transient disturbances in the mid-latitude westerlies, often with weak frontal characteristics. States such as Punjab, Haryana, Rajasthan, Delhi, Uttar Pradesh, Bihar, Jharkhand, and some subdivisions of Marathwada, Vidharbha, Saurashtra, and Madhya Maharashtra are highly affected by cold waves.
- Eleven states, including Arunachal Pradesh, Assam, Goa, Karnataka, Kerala, Manipur, Mizoram, Nagaland, Sikkim, Tamil Nadu, and Tripura, have never experienced CWEs and associated mortalities.

COLD WAVE EVENTS AND HEALTH

- 'Core Cold Wave Zone' encompasses 17 India States/Union Territories, with a population of 90.90 crores, of which 26% are either below 10 years or above 60 years, making them more vulnerable to cold waves.
- In India, cold wave (CW) conditions prevail from November to March, with damages and casualties typically associated with CWs. These conditions significantly impact human health, leading to various issues such as coughs, colds, respiratory diseases, blood pressure problems, skin issues, and bone, joint, and muscle pain due to reduced sunlight exposure. Vulnerable populations, particularly the poor, face serious health consequences, with extreme cases resulting in casualties.
- Exposure to cold waves has been linked to an increased risk of carbon monoxide (CO) poisoning events. The risk varies based on temperature thresholds and duration of the cold wave, emphasizing the importance of preventive measures and establishing early warning platforms for CO poisoning.
- Cold waves influence respiratory hospitalizations, emergency department visits, and inpatient admissions, with an observed lagged effect on respiratory diseases likely tied to the latency and incubation periods of respiratory viruses. Meteorological factors such as cold, dry air are correlated with increased incidence, hospitalization, and mortality related to influenza and pneumonia.
- Overall, cardiovascular mortality risk increases during both heat waves and cold waves. The effects vary with the characteristics of the waves, such as intensity, duration, and timing. Vulnerable populations, including those with ischemic heart disease, females, the elderly, and individuals with lower education levels, are more susceptible to the impacts of heat and cold waves. These findings emphasize the importance of developing early warning systems and response plans to mitigate health threats, particularly for vulnerable populations, during extreme weather events.
- Prolonged exposure to cold increases the risk of illnesses like flu, nosebleeds, and frostbite. Shivering is an early sign of heat loss; take action by getting indoors. Frostbite can occur, causing pale, hard, and numb skin with black blisters on exposed body parts. Seek immediate medical attention for severe frostbite.

Cold wave Disorders:Symptoms and First Aid for Human beings

Disorder	Symptoms	Prevention	First Aid/Treatment
HYPOTHERMIA: Defined as a lowered core body temperature usually below 34.4 degree C.(94 degree F.)			
1. Mild Hypothermia (90 degree to 95 degree F.) 2. Moderate Hypothermia: (82 degree to 89 degree F.) 3. Severe Hypothermia (less than 82 degree F.)	• Shivering • Dizzy, drowsy • Irritability • Confusion • Slowed, slurred speech • Altered vision	• Avoid exposure to cold. • Eat properly & often. • Warm liquids & water. • Wear uniform/clothes properly & preferably in layers. • Wear cap and socks. • Keep active. • Us warming tents. • Get plenty of rest.	• Remove wet clothing. • Warm the centre of their body first followed by chest, neck, head and groin region using an electric blanket if available. • Use skin to skin contact under loose, dry layers of blankets, clothing, towels, or sheets. • Warm beverages may help increase the body temperature, but do not give alcoholic beverages. • **Do not give fluids orally if the person is unconscious.** • After their body temperature has increased, keeps the victim dry and wrapped in a warm blanket including the head and neck. • If victim has no pulse, begin Cardiopulmonary Resuscitation (CPR).
FROSTBITE: Frostbite is freezing of body tissue often accompanied with hypothermia. When ice crystal form between the cells of the skin and grow by extracting fluid from the cells, the circulation is obstructed, causing additional damage to the tissue affected. It commonly affects hands, feet, ears, nose and cheeks.			
Frostbite	• Initially manifests as redness in light coloured skin or greyish in dark coloured skin. • Tingling, stinging sensation. • Turns numb, yellowish, waxy or grey color. • Exposed body parts feel cold, stiff and woody	• Wear uniform/ clothes properly and in layers. • Keep socks, gloves and clothing dry. • Protect yourself from wind-chill. • Drink hot fluids and eat often. • Insulate yourself from the ground. • Prevent skin contact with super cooled metal or fuel.	• Get into a warm room as soon as possible. • Unless absolutely necessary do not walk on frostbitten feet or toes as this increases the damage. • Immerse the affected area in warm but not hot water (the temperature should be comfortable for unaffected parts of the body). Ask an unaffected person to test the water temperature as patient may not be able to feel correct

Source - Prevention and Management of Cold Wave and Frost, NDMA 2021

Cold wave Disorders:Symptoms and First Aid for Human beings

Disorder	Symptoms	Prevention	First Aid/Treatment
		• Seek medical aid for suspected cases.	temperature due to numbness of body parts and end up getting burnt. • Warm the affected are using body heat; for example, the heat of an armpit can be used to warm frostbitten fingers. • Do not rub or massage the frostbitten area; doing so may cause more damage. • Do not use a heating pad, heat lamp or the heat of a stove, fireplace, or radiator for warming.Affected areas are usually numb and can be easily burnt.
CHILBLAINS: Caused due to exposure to cold, wet and humidconditions (between 32-60 degree F). Repeated, prolonged exposure of bare skin lead to development, only in a few hours. Ears, Nose, Cheeks, Fingers and toes are most commonly affected.			
Chilblains	• Skin is initially pale and colourless. • Worsens to achy, prickly sensation followed by numbness. • Red, swollen, hot, itchy, tender skin upon rewarming. • Blistering in severe cases	• Keep dry and warm. • Cover exposed skin. • Wear uniform/clothes properly. • High risk during wet weather, in wet areas or sweat accumulated in boots or gloves.	• Prevent further exposure • Avoid scratching • Slowly warm the skin, Don't massage or rub • Use corticosteroid creams to relieve itching and swelling • Dry sterile dressing • Keep blisters and ulcers clean and covered • Seek medical aid
DEHYDRATION: Loss of body fluids to the point of slowing or preventing normal body functions. Dehydration increases chance of becoming a cold weather casualty.			
Dehydration	• Dark urine • Headache, Dizziness, nausea and Weakness • Dry mouth, tongue, throat, lips • Lack of appetite • Irritability • Stomach cramps or vomiting • Increased or rapid heartbeat	• Monitor urine color • Do not wait until you are thirsty • Drink hot liquids for warmth	• Drink water or other warm liquids • Avoid caffeinated liquids • Do not eat snow • Rest
CARBONMONOXIDE POISING (CMP): Carbon monoxide is a colourless, odourless, tasteless gas resulting from incomplete combustion of fuel from engines, stoves, heaters etc. In conditions of inadequate ventilation such as falling asleep in a motor with running engine in a closed garage, inhalation of excessive amount of carbon monoxide may lead to poisoning.			
CMP	• Headache • Dizziness • Weakness • Ringing in ears • Nausea • Drowsiness • Bright red lips, eyelids	• Ensure proper ventilation. • Turn heaters off when not needed. • Never sleep in vehicle with engine running. • Ensure heaters are regularly serviced.	• Move to fresh air immediately. • Provide mouth- to-mouth resuscitation if victim is not breathing. • Seek medical aid promptly.
SNOW BLINDNESS: Inflammation and sensitivity of the eyes caused by ultraviolet rays of the sun reflected by the snow or ice.			
SNOW BLINDNESS	• Gritty feeling in eyes. • Redness and tearing. • Eye movement will cause pain. • Headache.	• Eye protection. • Dark UV protective glasses. • Do not wait for discomfort to begin.	• Remove from direct sunlight. • Blindfold both eyes or cover with cool, wet bandages. • Recovery may take 2-3 days.
TRENCH FOOT: A painful condition of the feet caused by prolonged immersion in cold water or mud and marked by blackening and death of surface tissue.			
TRENCH FOOT	• Reddening of skin. • Numbness, leg cramps, swelling. • Tingling pain, Blisters or ulcers, bleeding under the skin, gangrene(the foot may turn dark purple, blue or grey).	• Thoroughly clean and dry your feet. • Put on clean, dry socks daily.	• Remove shoes/boots and wet socks. • Dry their feet • Avoid walking on feet, as this may cause tissue damage. • Treat the affected part by applying warm packs or soaking in warm water (102° to 110° F) for approximately 5 minutes. • Obtain medical assistance as soon as possible.

Source - Prevention and Management of Cold Wave and Frost, NDMA 2021

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