

13– 05 – 2024

News: Heatwaves

- Russia's wildfire season, spanning eight regions since early March 2024 is expected to bring prolonged periods of "high" and "extreme" wildfire danger across most of the country this year, continuing a trend seen in previous years, such as the heatwaves in Siberia in 2019 and 2022 that led to devastating wildfires.

Heat Waves

- A Heat Wave is a period of abnormally high temperatures, more than the normal maximum temperature that occurs during the summer season in the North-Western parts of India.
- Heat Waves typically occur between March and June, and in some rare cases even extend till July.
- The extreme temperatures and resultant atmospheric conditions adversely affect people living in these regions as they cause physiological stress, sometimes resulting in death.

The Indian Meteorological Department (IMD) has given the following criteria for Heat Waves:

- Heat Wave need not be considered till **the maximum temperature of a station reaches at least 40°C for Plains and at least 30°C for Hilly regions.**
- When the normal maximum temperature of a station is less than or equal to **40°C** Heat Wave Departure from normal is 5°C to 6°C Severe Heat Wave Departure from normal is **7°C or more.**
- When the **normal maximum temperature of a station is more than 40°C** Heat Wave Departure from normal is 4°C to 5°C Severe Heat Wave Departure from normal is 6°C or more.
- When the **actual maximum temperature remains 45°C or more irrespective of normal maximum temperature, heat waves should be declared.**
- Higher daily peak temperatures and longer, more intense heat waves are becoming increasingly frequent globally due to climate change.

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 or 102°F.
- **Heat Exhaustion:** Fatigue, weakness, dizziness, headache, nausea, vomiting, muscle cramps and sweating.
- Heat Stoke: **Body temperatures of 40°C / 104°F** or more along with delirium, seizures or coma.
- This is a potential fatal condition.

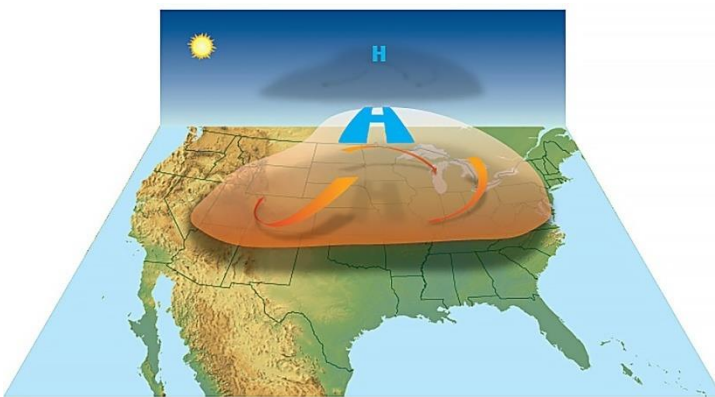
Heat Domes

- High-pressure circulation **traps hot ocean air like a lid** or a cap **trapping heat at the surface and favouring the formation of a heat wave.**
- **Higher daily peak temperatures and longer, more intense heat waves** are becoming increasingly frequent globally due to climate change.

Effects of Extreme Heat

- According to the World Health Organization (WHO), extreme heat can exacerbate **pre-existing health conditions, including respiratory diseases, heart conditions and kidney disorders.**

- The immediate effects on the human body are **heat cramps, dehydration and even potentially fatal heat strokes.**
- It can also have **a severe impact on agriculture and forests.**
- It either causes vegetables to wilt and die or **encourage the spread of plant diseases.**
- It **causes wildfires** which lead to forest cover reduction and death of fauna.
- It affects infrastructure too by **straining power grids and causing blackouts.** It can ground planes, melt roads and cause the inside of **vehicles to overheat** to dangerous levels.
- Recently, **Death Valley (USA) registered a temperature** of 54.4°C which, once verified, could be the highest temperature in more than a century.
- The temperature has been termed as preliminary and not final as it awaits verification.



Marine Heatwaves

- Marine heatwaves are periods of extremely high temperatures in the ocean.
- These events are linked to coral bleaching, seagrass destruction, and loss of kelp forests, affecting the fisheries sector adversely.
- Study showed that 85% of the corals in the Gulf of Mannar near the Tamil Nadu coast got bleached after the marine heatwave in May 2020.
- The most common drivers of marine heatwaves include ocean currents which can build up areas of warm water and air-sea heat flux, or warming through the ocean surface from the atmosphere.
- Winds can enhance or suppress the warming in a marine heatwave, and climate models like El Niño can change the likelihood of events occurring in certain regions.

Impact of Marine Heatwaves

Affect Ecosystem Structure

- Marine heat waves affect ecosystem structure, by supporting certain species and suppressing others.

- It has been **associated with the mass mortality of marine invertebrates**, and may force species to change behaviour in a way that puts wildlife at increased risk of harm.

Change Habitat Ranges of Certain Species

- Marine heatwaves can **change the habitat ranges of certain species**, such as the spiny sea urchin off southeastern Australia which has been expanding southward into Tasmania at the expense of kelp forests which it feeds upon.

Economic Losses

- Marine heatwaves can **cause economic losses through impacts on fisheries** and aquaculture.

Affect Biodiversity

- Biodiversity can be drastically affected by marine heatwaves.
- In **2016, marine heatwaves across northern Australia led to severe bleaching of the Great Barrier Reef.**

Increase the Risk of Deoxygenation and Acidification

- Often they occur alongside other stressors such as **ocean acidification, deoxygenation, and overfishing.**
- In such cases, MHWs not only further damage habitats, but also **increase the risk of deoxygenation and acidification.**

Urban Heat Islands

- Urban heat island may be defined **as the local and temporary phenomenon in which certain pockets within a city are experiencing higher heat load than its surrounding area.**
- This rise **of heat basically happens due to buildings and houses of cities made up of concrete where the heat is trapped and not able to dissipate easily.**
- Urban heat island is basically **induced due to trapped heat between establishments made up of concrete.**
- The **temperature variation can range between 3 to 5 degrees Celsius.**

Reasons behind cities being hotter than Rural Areas

- It has been observed that **greener localities experienced lower temperatures than non-green localities.**

- Green vegetation like plants, trees and forests are prominent factors to regulate the incidences of the urban heat islands.
- Rural areas are blessed with more green cover in the form of plantations, farmlands, forests, and trees than urban areas.
- Transpiration is the phenomena which the plants carry to regulate the temperature.
- Lack of green trees and shrubs in urban areas is the basic cause of Urban Heat Island in urban areas.
- Frequent construction of High rise structures, roads, parking spaces, pavements, and public transportation transit lines have accelerated the incidences of urban heat islands.
- It occurs by black or any dark colored material.
- Buildings in cities are often made of glass, bricks, cement, and concrete. All of them are dark-colored materials, which attract and absorb more heat.

Causes of Urban Heat Island

- **Manifold increase in construction activities:** For building simple urban dwellings to complex infrastructures, carbon absorbing material like asphalt and concrete is needed for the expansion of cities. They trap huge amounts of heat which increases the mean surface temperatures of urban areas.

- **Dark surfaces:** Many buildings found in urban areas have dark surfaces, thereby decreasing albedo and increased absorption of heat.
- **Air conditioning:** Buildings with dark surfaces heat up more rapidly and require more cooling from air conditioning, which requires more energy from power plants, which causes more pollution. Also, air conditioners exchange heat with atmospheric air, causing further local heating. Thus, there is a cascade effect that contributes to the expansion of urban heat islands.
- **Urban Architecture:** Tall buildings, and often accompanying narrow streets, hinder the circulation of air, reduce the wind speed, and thus reduce any natural cooling effects. This is called the Urban Canyon Effect.
- **Need for mass transportation system:** Transportation systems and the unimpeded use of fossil fuels also add warmth to urban areas.
- **Lack of Trees and green areas** which impedes evaporation and transpiration, shade and removal of carbon dioxide, all the processes that help to cool the surrounding air.

Solution to the Urban Heat Islands

- **Increase Area under Green Cover:** Plantation and effort to increase the area under green cover are the primary requirement to cut heat load within urban areas.

- **Passive Cooling to Reduce Urban Heat Islands:** Passive cooling technology, a widely-used strategy to create naturally ventilated buildings, can be a vital alternative to address the urban heat island for residential and commercial buildings.
- The IPCC report cites ancient Indian building designs that have used this technology, which could be adapted to modern facilities in the context of global warming.
- Other methods of heat mitigation include using appropriate construction materials.
- Roof and terraces should be painted in white or light colors to reflect heat and reduce the absorption.
- Terrace plantation and kitchen gardening should be promoted.