

What are the controls of Indian Climate?

Ans. India's climate is controlled by a number of factors which can be broadly divided into two groups — factors related to location and relief, and factors related to air pressure and winds.

Latitude: Northern part of the India lies in sub-tropical and temperate zone and the part lying south of the Tropic of Cancer falls in the tropical zone. The tropical zone, being nearer to the equator, experiences high temperatures throughout the year with small daily and annual range of temperature. The area north of the Tropic of Cancer which is away from the equator, experiences extreme climate with high daily and annual range of temperature.

The Himalayan Mountains: The lofty Himalayas in the north along with its extensions act as an effective climatic divide. The towering mountain chain provides an invincible shield to protect the subcontinent from the cold northern winds. These cold and chilly winds originate near the Arctic circle and blow across central and eastern Asia. The Himalayas also trap the monsoon winds, forcing them to shed their moisture within the subcontinent.

Distribution of Land and Water: India is flanked by the Indian Ocean on three sides in the south and girdled by a high and continuous mountain-wall in the north. As compared to the landmass, water heats up or cools down slowly creating different air pressure zones in different seasons in and around the Indian subcontinent. Difference in air pressure causes reversal in the direction of monsoon winds.

Mumbai among worst 'heat islands'

Mumbai's urban centre is the second most extreme urban heat island (UHI) "hot spot" recorded among six major cities across the world, with people within the city experiencing temperatures 7°C hotter than those on the outskirts, a new report showed.

UNDERSTANDING 'URBAN HEAT ISLANDS' AND THEIR IMPACT

Urban heat island (UHI) is a phenomenon that occurs when cities replace greenery and natural land cover with thick concrete structures such as sky-scrapers, buildings, pavements – resulting in the area absorbing more heat, and thus becoming an island of heat.

This not only makes conditions far more unbearable for residents leading to heat-related illnesses and death, but also increases energy consumption (air conditioning, fans etc), and air pollution levels.

"We've inadvertently designed many of our cities to be hot. We've pushed out nature – concreted our streets, built high in steel and glass. And we've largely confined our green spaces to grand parks, away from where most people live. Ponds, lakes, trees, grasses, soils and other surfaces that allow water to permeate into the ground have to be seen as vital infrastructure, essential to helping us adapt to climate change." — Dima Zogheib, Nature Positive Design

How areas impact generation of heat



What the report found

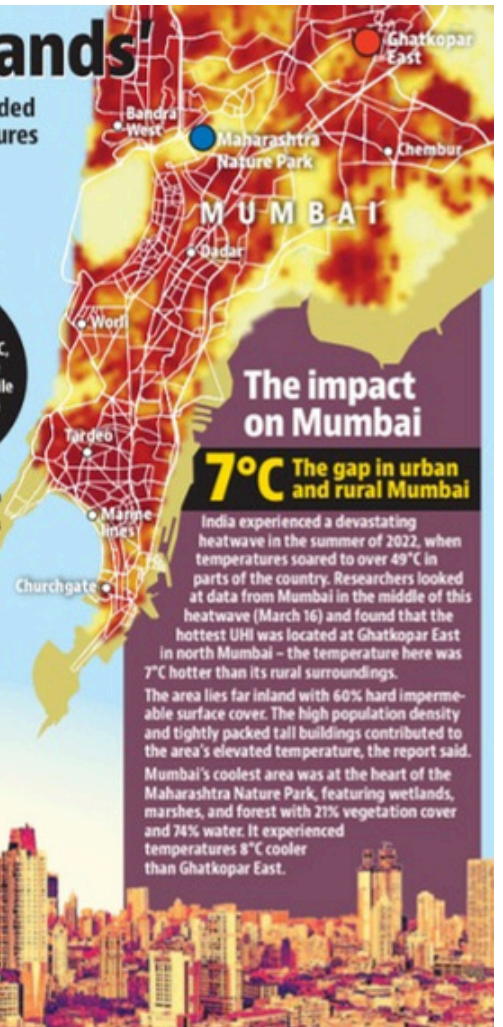
Global sustainable development consultancy Arup developed a "Urban Heat Snapshot" (UHS) to help cities understand how heat is impacting them from one neighbourhood to another. The report highlighted how city design is driving up urban temperatures – with nature often pushed out, streets asphalted, and tall buildings.

UHS mapped the most extreme hot spots in a 150km² sample of urban centres in six diverse cities – Cairo, London, Los Angeles, Madrid, Mumbai and New York – to understand the difference in temperatures on the hottest day in each city in 2022.

Mumbai had the second most severe hot spot at 7°C, behind Madrid where temp jumped 8.5°C, while NYC and London both saw hot spots of 4.5°C.

The six major cities analysed

City	UHI effect (in °C)	Most severe UHI location	Coolest spot	Gap between hottest and coolest spots
Madrid	8.5	Plaza Juan Pujol	The North of Casa de Campo	8°C
Mumbai	7	Ghatkopar East	Maharashtra Nature Park	8°C
Cairo	5	Bulaq Ad Daqr	South of Qersaya Island	6°C
Los Angeles	5	West Lake	E Debs Regional Park	5°C
London	4.5	South Hampstead	Regent's Park	7°C
New York City	4.5	Washington Heights	Ferry Point Park area	4.5°C



The impact on Mumbai

7°C The gap in urban and rural Mumbai

India experienced a devastating heatwave in the summer of 2022, when temperatures soared to over 49°C in parts of the country. Researchers looked at data from Mumbai in the middle of this heatwave (March 16) and found that the hottest UHI was located at Ghatkopar East in north Mumbai – the temperature here was 7°C hotter than its rural surroundings.

The area lies far inland with 60% hard impermeable surface cover. The high population density and tightly packed tall buildings contributed to the area's elevated temperature, the report said. Mumbai's coolest area was at the heart of the Maharashtra Nature Park, featuring wetlands, marshes, and forest with 21% vegetation cover and 74% water. It experienced temperatures 8°C cooler than Ghatkopar East.

Distance from the Sea: With a long coastline, large coastal areas have an equable climate. Areas in the interior of India are far away from the moderating influence of the sea. The seasonal contrasts in weather at places in the interior of the country such as Delhi, Kanpur and Amritsar affect the entire sphere of life.

Altitude: Temperature decreases with height. Due to thin air, places in the mountains are cooler than places on the plains. For example, Agra and Darjeeling are located on the same latitude, but temperature of January in Agra is 16°C whereas it is only 4°C in Darjeeling.

Relief: The physiographic or relief of India also affects the temperature, air pressure, direction and speed of wind and the amount and distribution of rainfall. The windward sides of Western Ghats and Assam receive high rainfall during June-September whereas the southern plateau remains dry due to its leeward situation along the Western Ghats.

The differences in local climates of India, is caused by the mechanism of the following three factors:

- Distribution of air pressure and winds on the surface of the earth.
- Upper air circulation caused by factors controlling global weather and the inflow of different air masses and jet streams.
- Inflow of western cyclones generally known as disturbances during the winter season and tropical depressions during the south-west monsoon period into India, creating weather conditions favorable to rainfall.