

Why Does the Heat Feel More Humid?

What Indian city and ocean data are telling us

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There is a familiar complaint in many Indian cities now: “It is not only hot. The air itself feels heavier.” In Chennai and Kolkata, people often describe the heat as sticky or oppressive. Mumbai residents know the same feeling well. Even in Delhi, where dry summer heat has traditionally dominated the conversation, humidity increasingly seems to shape how uncomfortable the weather feels.

This article asks a simple question: is this only perception, or do the data support it? The answer is that there is a real moisture signal. Temperature is part of the story, but it is not the whole story. In many cities, the air also appears to be carrying more water vapour.

That matters because our bodies cool mainly by evaporating sweat. When the air already contains a lot of water vapour, sweat evaporates more slowly. A day that is only a little warmer on the thermometer can therefore feel much more exhausting when the air is also more humid.

What do observed city data show?

A useful observational comparison comes from a 2024 analysis by the Centre for Science and Environment (CSE), based on India Meteorological Department station data for major Indian cities. It compared the 2014–2023 decadal summer average with a 2001–2010 baseline.^[1]

CSE reported that decadal summer relative humidity was higher in nearly every metro studied: about 8% higher in Delhi, 7% in Mumbai, and 5% in Kolkata and Chennai, while Bengaluru showed little net change. These are *relative percentage changes* reported by CSE, not percentage-point changes. Summer air temperature changed less uniformly: about +0.6 °C in Mumbai, +0.5 °C in Bengaluru, +0.4 °C in Chennai, around +0.2 °C in Kolkata, and -0.6 °C in Delhi.^[1]

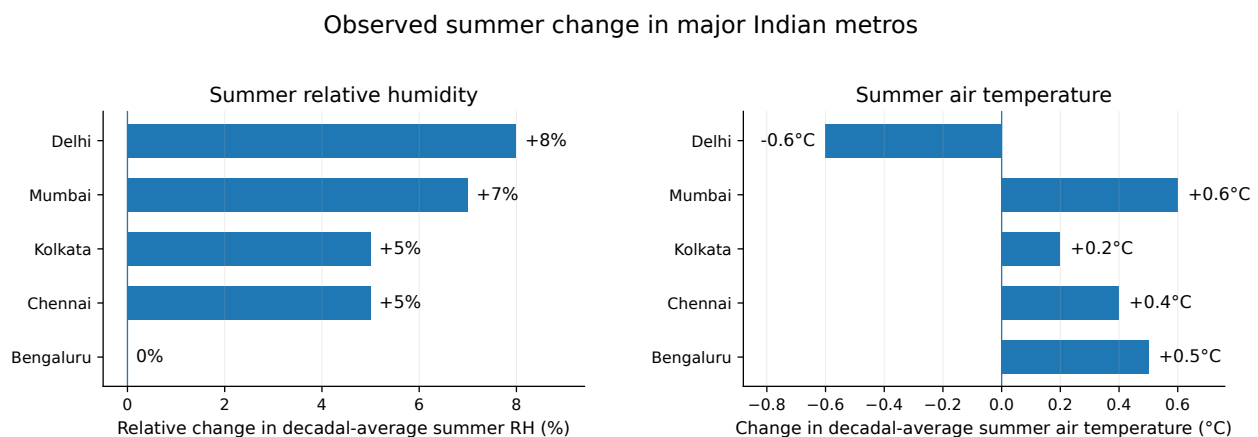


Figure 1: Observed summer change in major metros. Values compare the 2014–2023 decadal average with the 2001–2010 baseline. Relative humidity increased in most metros, whereas air-temperature changes were more mixed. Source: CSE analysis of IMD station data.^[1]

This is an important clue. If humidity rises even where the temperature change is flat or temporarily lower, the change cannot be explained only by a warmer thermometer. The atmosphere must also be gaining moisture, or transporting and retaining that moisture differently.

To examine recent year-to-year behaviour consistently across cities, the next figures use one gridded dataset: NASA POWER meteorological data derived from MERRA-2, as tabulated in WeatherBlaze city climate summaries. NASA POWER provides MERRA-2-based meteorological data from 1981 onward.^[6, 7] These figures are therefore a reanalysis-based city-scale comparison, not a replacement for local IMD station observations.

Five metro trends, year by year

Each panel below shows annual values for 2016–2025. The long-period 1981–2025 average or estimated reference is written directly on the dashed horizontal line; the fitted 2016–2025 trend is labeled beside the trend line. A ten-year fit is descriptive and should not be read as a 45-year climate trend.

Annual relative humidity, 2016-2025

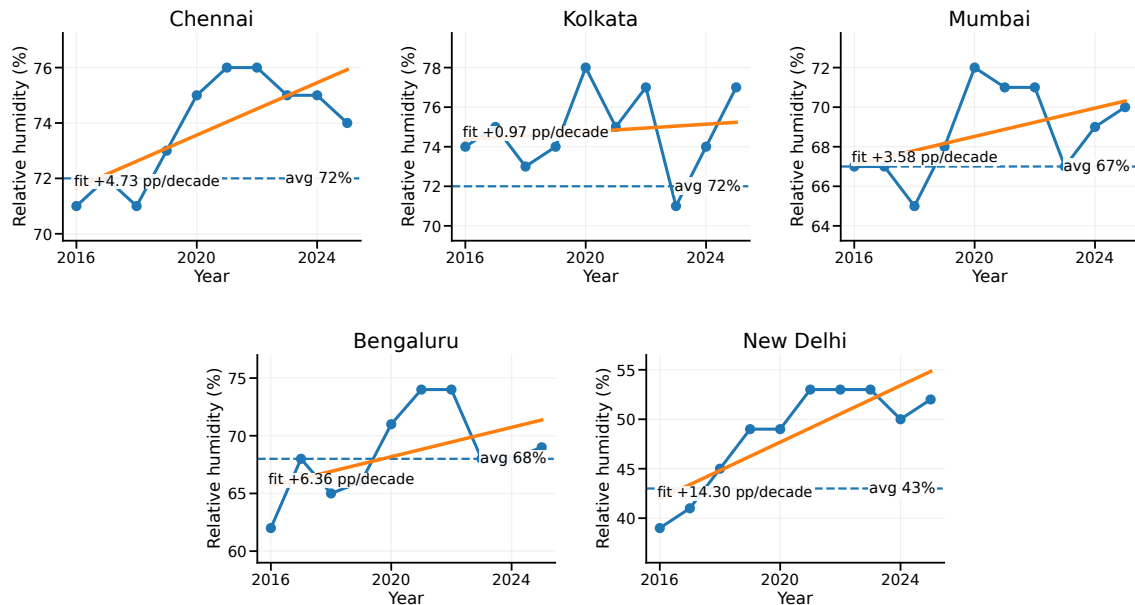


Figure 2: Relative humidity in Chennai, Kolkata, Mumbai, Bengaluru and New Delhi. The dashed line is the 1981–2025 average for each city; the straight line is the fitted 2016–2025 trend. Source annual T/RH: NASA POWER/MERRA-2 city summaries.[7, 6]

Annual air temperature, 2016-2025

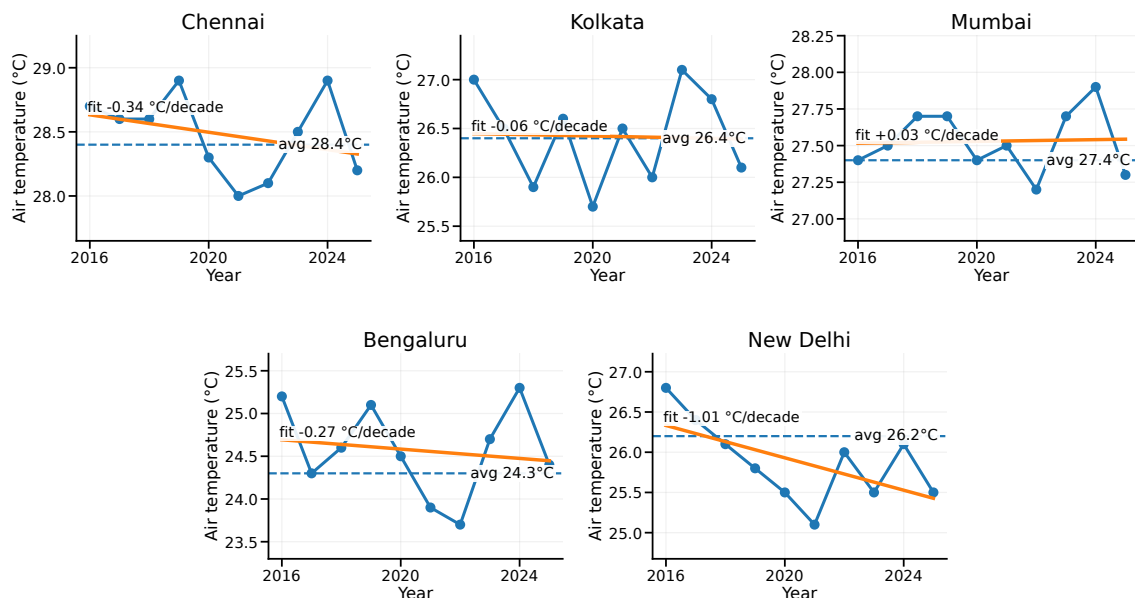


Figure 3: Air temperature in the same five metros. Recent temperatures do not rise smoothly in every city, even where several recent years remain above the long-period average. Source: NASA POWER/MERRA-2 city summaries.[7, 6]

Estimated annual dew point, 2016-2025

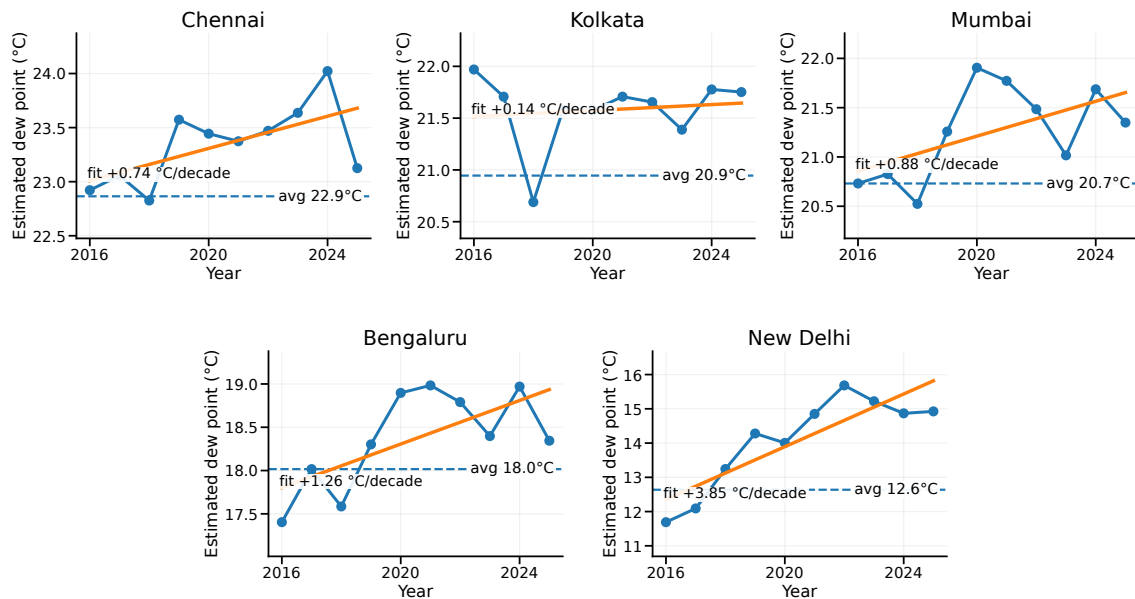


Figure 4: Estimated dew point. Higher dew point means more water vapour is present and the air generally feels muggier. Values are calculated from annual mean temperature and RH, so exact absolute values are approximate; the directional comparison is the main purpose.[8]

Estimated annual specific humidity, 2016-2025

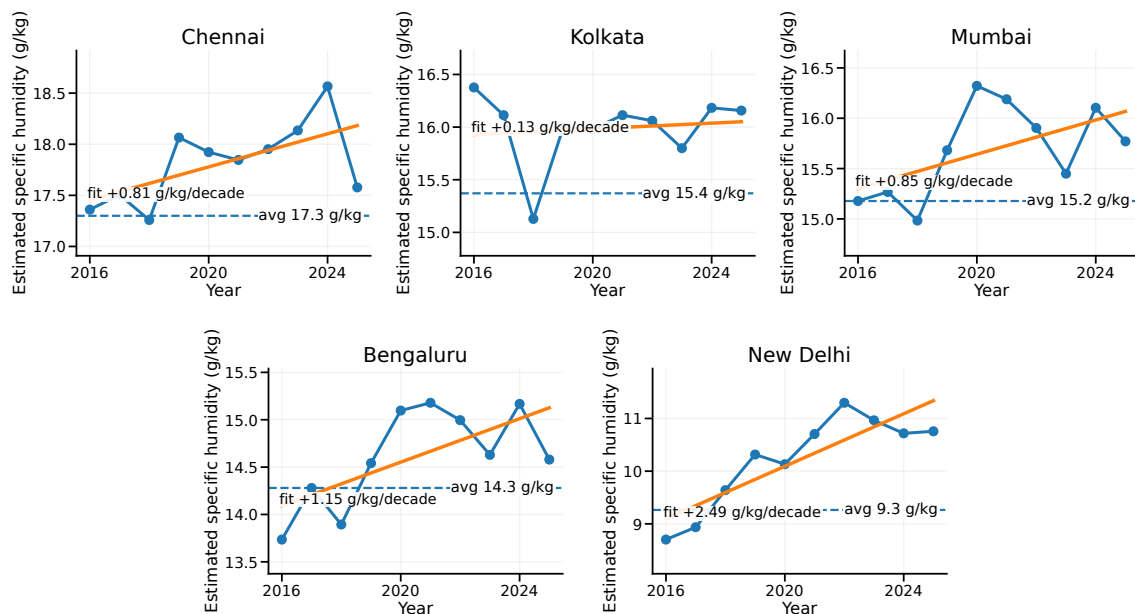


Figure 5: Estimated specific humidity. This is an estimate of actual water-vapour mass in the air. Values are calculated from annual mean temperature and RH using representative local surface pressure; they are not direct annual means of hourly/daily QV2M.[9]

What the five-city charts actually tell us

The key is to separate two questions. First: are recent years above the longer-term norm? Second: is the fitted slope within just the latest ten years positive? Those are not the same question. A city can sit above its historical average even if the last decade itself is flat or slightly downward.

Chennai. The long-period reference is 28.4 °C and 72% RH. The 2016–2025 temperature average is about 28.48 °C, only slightly above the long-period mean, while the decade averages about 73.8% RH. Estimated dew point and specific humidity also sit above their long-period references. Recent Chennai air has therefore

generally been more moisture-laden even without a smooth year-by-year temperature rise.

Kolkata. Kolkata is another Bay of Bengal-influenced city. Its 2016–2025 average temperature, about 26.42 °C, is almost identical to its 26.4 °C long-period reference. But the decade averages about 74.8% RH versus 72% over 1981–2025. Estimated dew point and specific humidity are also elevated relative to their reference levels.

Mumbai. Mumbai shows a similar moisture story on the Arabian Sea coast. Its recent decade is only about 0.13 °C warmer than its long-period annual mean, while RH averages about 1.7 percentage points higher. The fitted dew-point and estimated-specific-humidity lines rise over 2016–2025.

Bengaluru. Bengaluru is inland and at higher elevation. The decade averages about 24.57 °C compared with a 24.3 °C long-period mean, while RH averages about 68.5% versus 68%. The fitted humidity, dew-point and estimated-specific-humidity slopes are positive, showing that the moisture story can extend inland through monsoon circulation.

New Delhi. Delhi is the strongest reminder that moisture transport is regional, not merely coastal. Its 2016–2025 mean temperature is about 25.88 °C versus a 26.2 °C long-period mean in this dataset, yet RH averages about 48.4% compared with 43%. Estimated dew point and specific humidity rise strongly. This does not establish a long-term cooling trend for Delhi; it shows that a short annual-temperature fit is not a good proxy for moisture change.

Across the five cities, the most consistent recent feature is therefore not an identical temperature curve. It is the elevation or rise of moisture-related indicators. That conclusion is also consistent with independent coastal-India research showing a long-term warming-and-moistening tendency.[2]

Three different ways to talk about humidity

The word “humidity” sounds simple, but three measurements answer different questions.

Measure	In plain terms	Why it matters
Relative humidity	How full the air is compared with the maximum it could hold at that temperature.	Useful for comfort, but strongly affected by temperature.
Dew point	The temperature at which condensation would begin. A higher dew point means more moisture is present.	A simple way to judge how muggy the air actually is.
Specific humidity	The actual mass of water vapour in the air, usually in grams per kilogram.	One of the clearest indicators of real atmospheric moistening.

Relative humidity is the number shown most often in weather apps, but it can be misleading if viewed by itself because warmer air can hold more water vapour. Dew point and specific humidity help answer the more direct question: is there actually more moisture in the air?

A 2026 peer-reviewed study of India’s coastal regions examined temperature, wet-bulb temperature and specific humidity over 1981–2020. It found a persistent warming-and-moistening tendency along the coasts, with the East Coast showing a particularly strong contribution from humidity to heat stress.[2]

Where could the extra moisture be coming from?

For coastal India, the obvious moisture reservoir is the ocean. Chennai and Kolkata are strongly influenced by the Bay of Bengal. Mumbai is influenced by the Arabian Sea. Moist air from these seas is carried inland by sea breezes, monsoon winds and larger weather systems. Bengaluru is inland but still connected to oceanic moisture through the monsoon. Delhi is farther away, yet seasonal circulation can transport moisture hundreds of kilometres.

The oceans themselves have warmed. India’s Ministry of Earth Sciences reports that the tropical Indian Ocean

warmed by about 1 °C between 1951 and 2015.[3] A like-for-like comparison of the two northern Indian Ocean basins also found long-term sea-surface warming in both the Arabian Sea and Bay of Bengal.[4, 5]

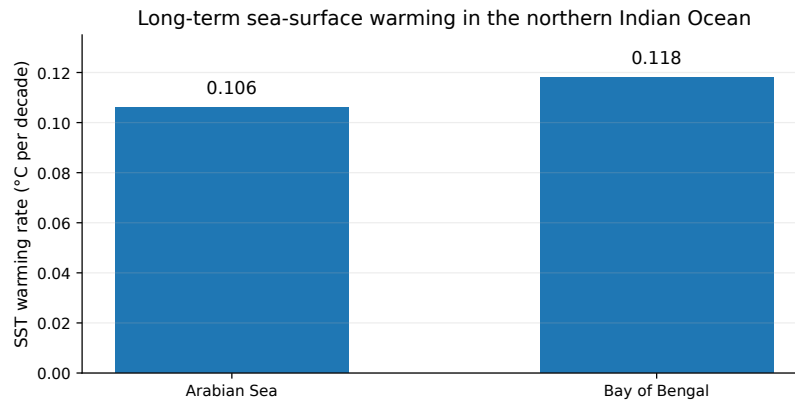


Figure 6: Long-term sea-surface warming rates in the northern Indian Ocean. The plotted values are a like-for-like 1960–2011 comparison: about 0.106 °C per decade in the Arabian Sea and 0.118 °C per decade in the Bay of Bengal.[5]

The physical link is straightforward. Warmer sea water can support more evaporation. If winds and atmospheric conditions allow it, more moisture can be transferred from the sea to the atmosphere and then carried over land. A warmer atmosphere can also carry more water vapour before becoming saturated.

This makes warmer surrounding seas a plausible contributor to rising atmospheric moisture. But it is important not to turn that into a single-cause claim. Monsoon circulation, rainfall, soil moisture, wind direction, urbanisation, vegetation loss and local heat-island effects can all change how hot and humid a city feels.

So, is the “more humid heat” real?

Yes. The feeling that the air has become heavier is supported by several lines of evidence. Relative humidity has risen in many metro comparisons. Dew point and specific humidity point toward more moisture in the air. At the same time, both the Bay of Bengal and Arabian Sea have warmed over the long term.

The strongest public message is not that every Indian city is warming at exactly the same rate every year. The more useful message is that many cities are experiencing heat in a moister atmosphere. That combination matters because humid heat is harder for the human body to tolerate than dry heat at the same temperature.

The data do not prove that every increase in city humidity is caused directly by warmer seas. But the overall picture is physically consistent: warmer seas provide a larger potential moisture source, monsoon circulation moves that moisture over land, and several cities show higher humidity or moisture indicators than their longer-term norms.

Sources and data notes

References

- [1] Centre for Science and Environment (2024), *CSE study tracks heat wave; exposes dangerous trends in India's biggest cities*. CSE analysis of IMD station data; reported decadal summer comparisons are 2014–2023 versus 2001–2010. <https://www.cseindia.org/cse-study-tracks-heat-wave-exposes-dangerous-trends-in-india-s-biggest-cities-12205>
- [2] P. Rohini, M. Rajeevan, C. T. Sabeerali and O. P. Sreejith (2026), “Long-Term Trends of Heat Stress Over the Coastal Regions of India,” *International Journal of Climatology*, 46(6), e70307. <https://doi.org/10.1002/joc.70307>
- [3] Ministry of Earth Sciences, Government of India, summaries and assessments on Indian Ocean warming; tropical Indian Ocean SST warming about 1 °C during 1951–2015. <https://www.moes.gov.in/>
- [4] P. K. Dinesh Kumar et al. (2016), “Comparison of long-term variability of Sea Surface Temperature in the Arabian Sea and Bay of Bengal,” *Regional Studies in Marine Science*, 3, 67–75. <https://doi.org/10.1016/j.rsma.2015.05.004>
- [5] J. R. D’Mello (2018), *Processes Controlling the Variability of Sea Surface Temperature in the North Indian Ocean*, Goa University doctoral thesis; reports 1960–2011 area-averaged SST trends of 0.0106 °C/year for the Arabian Sea and 0.0118 °C/year for the Bay of Bengal.
- [6] NASA POWER, meteorological data and API documentation; MERRA-2-derived meteorology from 1981 onward. <https://power.larc.nasa.gov/>
- [7] WeatherBlaze city climate-history summaries for Chennai, Kolkata, Mumbai, Bengaluru and New Delhi. The pages state that their 1981–2025 climate histories use NASA POWER/MERRA-2 data. <https://weatherblaze.com/weather-history/india/>
- [8] NASA POWER, Dew Point Temperature methodology and validation. <https://power.larc.nasa.gov/docs/methodology/meteorology/dew-point/>
- [9] NASA POWER, Specific Humidity methodology and validation. <https://power.larc.nasa.gov/docs/methodology/meteorology/specific-humidity/>

Data note. Dew point in Figure 4 uses the standard Magnus approximation from annual mean temperature and RH. Specific humidity in Figure 5 uses $q = 0.622e/(p - 0.378e)$, with vapour pressure e derived from annual T/RH and representative local pressure. Because annual means are used as inputs, these are estimates rather than direct annual means of hourly/daily dew point or QV2M. The broad comparison and trend direction are the intended use.