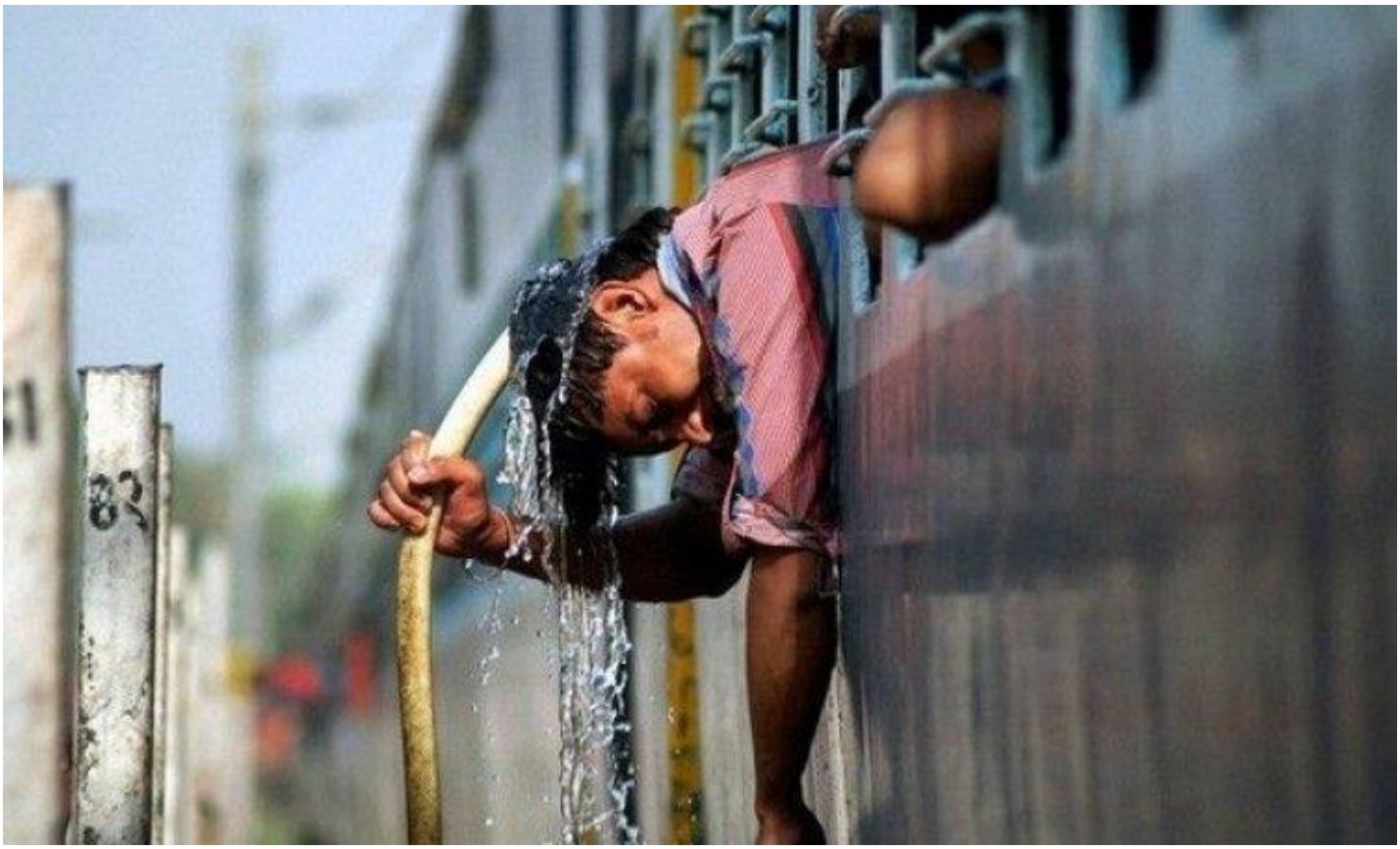
Are summers in Indian Cities Becoming Hotter and Monsoons Wetter?

Weather patterns across the country are changing. Urban areas are especially feeling the impact of a severe flux in conditions.

People wade through flood waters in rain-hit Chennai in 2015. Credit: PTI



A man washes his head with cold water for respite from the heat. Credit: PTI

The residents of Pune faced a wide range of temperatures on February 28 (Wednesday), according to the *Times of India*, as the maximum and minimum temperatures differed by 20º C. The Indian Meteorological Department (IMD) has forecast that such differences can be expected to continue in Pune for another week at least.

The Maharashtrian city is not alone experiencing such flux. Around the country as well as the world, cities have been increasingly reporting seesawing weather.

The IMD has also forecast an earlier onset of the Indian summer this year. According *Hindustan Times*, all states are predicted to experience temperatures above normal between March and May. Kerala is also likely to record its hottest year in 2018 since the IMD commenced record-keeping in 1900.

Similar trends have been reported in cities like Mumbai, where the maximum temperature on February 27 was 5.5º C above normal. One report also suggested that there are higher chances of heat wave occurrences this year. Heat-wave warnings have already been issued in some places in Maharashtra.

Together with water scarcity, these conditions can have an adverse impact on human health, livestock and agricultural produce. Talking about the effects of heatwaves, Dilip Mavalankar,

director of the Indian Institute of Public Health, Gandhinagar, said, "When people are exposed to very high temperatures, they start developing a [fever] and the body's heat-regulation mechanism and circulation fails. People can die if they are not cooled down immediately."

The number of people who succumbed to heatstroke in India has decreased from 2,081 in 2015 to 557 in 2016. The Ministry of Earth Sciences has attributed this to higher preparedness.

These deviations from normal are not restricted to summers. In 2017, the monsoon rains, though measuring up to 95% of the long-term average for the country, were well below average in many states, thus affecting agricultural output. State-specific data revealed that in 2016 there were major differences in the rainfall received among some states. The same report said that 40% of all districts in India were struck by drought in 2016 due to insufficient rainfall, while almost 25% of districts received surplus rainfall (in the order of over 100 mm in under 24 hours).

Researchers led by Vimal Mishra, an assistant professor in the civil engineering department at IIT Gandhinagar, have observed an increase in the intensity of rainfall received in less than 24 hours as well as a two-fold increase in the intensity of such rainfall in India's urban centres in the country, *The Hindu* reported. They warned that cities with larger impervious areas would also be more prone to flooding as a result.

Falling green cover makes things worse for cities because trees influence local temperature and help absorb rainfall. A study conducted by a team from Indian Institute of Science, Bengaluru, showed using a satellite drone that the number of trees in major cities like Kolkata, Ahmedabad, Bhopal and Hyderabad have all fallen significantly over a period of 20 years. According to the *Times of India*, dense forest cover in Delhi has decreased in the last three years. Similarly, Bengaluru lost 65% of its tree cover between 1999 and 2014, according to a different study.

The temperature difference between urban and rural areas are also stark. Another of Mishra's studies showed that urban areas are often 3-5º C warmer than the surrounding non-urban areas. This is attributed to the urban heat island effect, where urban areas are warmer thanks land modifications, heat retained by buildings and waste heat generated by energy use (not to mention lower green cover).

People living in slums in cities may also be affected disproportionately by the heat island effect because their houses "feel the urban heat island effect the most", causing "discomfort to dwellers in the day as well as in the night," Rajshree Kotharkar, an associate professor at Visvesvaraya National Institute of Technology, Nagpur, told *The Hindu*.

The urban poor and homeless are affected the worst because they lack access to protection. Ahmedabad recently implemented measures like keeping public parks open, distributing white paint for roofs and setting up free drinking water facilities to help the urban poor survive heat waves, which helped keep death tolls at under 20 during the historic heat wave of 2015, which took 2,081 lives across the country. But in Delhi, over 100 people died in the 2014 winter due to a lack of shelters.