

Heat waves in metros: The fault is in our lifestyles

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A man sleeps under the shade of a tree on a hot summer day at a public park. [Representational Image]Reuters

Come summer and heat waves have become a norm, with each year set on beating temperature records. This time around towns in Rajasthan have crossed 50 deg C and sent shock waves across the globe. Already 160 deaths from various associated reasons have resulted across southern and eastern India.

In the last four years, 4,204 people have died in India due to heat waves with 2014 alone seeing a dip. Last year around 2,135 lost their lives to intense heat, according to the Ministry of Earth Sciences.

While global warming caused by greenhouse gases emitted into the atmosphere is now accepted as the prime reason for recent heat waves, the unnatural warming seen in 2015 causing temperatures to rise by 0.9°C above the average for the 20th century is being laid at the door of El Nino, the Christ child or boy child in Spanish. This weather aberration brings heavy rains and droughts to different parts.

Scientists believe El Niño was responsible for 8 percent to 10 percent of the warming last year. The NASA Goddard Institute for Space Studies estimated that El Niño accounted for 0.07°C of the above average warming that occurred in 2015.

More than El Nino

The high temperatures in India this April and May (about 3 to 5 C above normal) are due to three reasons, according to Prof J Srinivasan, chairman, Divecha Centre for Climate Change, Bangalore. The El Nino, he says, causes a sinking motion over India which prevents rainfall and hence increases temperatures by about 2 C.

But there are two other reasons as well for many of the Indian metros experiencing extreme temperature rise, garden city Bangalore touching 40 deg C this summer for the first time. Even the lowest mean temperature here has seen a rise from 8.9 C in 1883 to 13.9°C in 2008 and around 17 C last year.

One reason for the rise in mercury is urbanization characterized by concretization, increase in vehicles and loss of green cover. This, says the professor, has increased the temperature of Bangalore by 2 C, while global warming has contributed another 1 C.

Urbanisation covers the whole gamut of energy use, energy emitted and absorbed by an area. This includes HVAC, transport and tree cover. Bangalore which did not require air-conditioning till about 10 years ago has rapidly changed. Not only commercial building, but many residential units have taken to air-conditioning.

Use of ACs

Air-conditioners work by cooling the interior and throwing out the heat along with the heat given by the compressor. The net effect is that the temperature of the city rises, causing more to opt for Acs.

A recent report by WHO and UN-Habitat has found that increasing use of air-conditioners is raising temperatures across cities by around 1 deg C. The heat island effects by the heat generated by the city can make cities hotter by one to three degrees Celsius during the day and one to two degrees Celsius warmer in the evening.

Sales of air-conditioners in Bangalore have risen by more than 30 percent in a year. Cooling units often utilize hydro-fluorocarbons (HFCs) that can leak into the environment and contribute to global warming. Many air conditioning systems are highly energy-intensive, drawing on fossil fuel power that exacerbates climate change.

A study by UN-Habitat in New York found that residential buildings with their energy intensive gadgets account for a major share of the city's greenhouse gas emissions.

Every one tonne of air-conditioner running for an hour adds to about 3000 kCal of heat in the atmosphere, calculates Sunil Sood, Bangalore-based energy expert and activist.

But he points how the bigger killer in a city like Bangalore are the vehicles, numbering around 6 million with 4 million two-wheelers and more than a million cars (Bangalore traffic policennumbers).

Exhaust fumes

The average calorific value of petrol and diesel may be assumed as 10,000 Kcal/Litre. Hence, if we burn a litre of petrol, an equivalent of about 11,000 kCal of heat would be dissipated into the atmosphere after adding the embodied energy, Sood calculates.

If this much heat is contained in a room of 10 M X 10 M X 10 M dimensions, it will increase its temperature by 35 Deg C assuming no losses. With a few million vehicles burning fuel during every hour of the day, it can be imagined how much heat is thrown into the surroundings from the exhaust.

On top of it all are the concrete structures that act as thermal mass and store heat in the day time to release it later in the day. Concretisation is also what Dr T V Ramachandra of Centre of Ecological Studies, IISc believes to be the prime reason for temperature rise in cities. This has increased by 925 percent in Bangalore from 1973 to 2014, while tree cover declined by 78 % in the period and water bodies dropped by 79%, as revealed in a study led by CES in 2014. This accompanied a 47 % rise in population from 2001 to 2011.

Loss of tree cover

An earlier study done in 2010 and published in 2012 had shown a 584% growth in built-in area of land during the last four decades accompanied by the decline of vegetation by 66% and water bodies by 74%. These figures have clearly worsened, as pointed by Ramachandra.

Keeping 2012 as base year, the study predicted that the urban area would cover close to 50 to 60 % of the total land in and surrounding Bangalore in 2020. Vegetation would comprise a 7 to 13 percent of the land.

Dr Ramachandra who led the study blames the tragic situation in Bangalore on irresponsible governance and lack of urban planning. "Vegetation and water body act as heat sink and help in moderating micro climate," he says pointing to the 2 deg lower temperature at Indian Institute of Science campus, Lalbagh, Cubbon Park, Hebbal lake, etc.

Solutions: Obvious first step would be to bring back the trees. Not only are we dependent on them for carbon sequestration, but also for providing shade and preventing the surfaces from getting heated. In the ideal scheme, around 32-55 trees are required per person to mitigate respiratory carbon. In Bangalore we have around one tree for 7 persons!

Studies have revealed that unshaded urban areas are approximately 2.5 C warmer when compared to the open rural areas and unshaded urban sites are warmer by 1 C when compared to the shaded areas. Trees have the potential to moderate air temperature through reduction of surface temperature and evaporative cooling.

Tree Acts in metros need to be empowered and violators dealt with strictly. In Bangalore the fine is a mere pittance of Rs 1000 as compared to over Rs 50,000 in Mumbai. While promises of replacing a tree with many saplings are frequent, we must remember that sustaining the sapling is often a neglected job. It takes between 10-15 years for a sapling to be a substantial contributor in terms of carbon sequestration and reducing local temperatures.

As Ramachandra notes, there is a crying need for pragmatic urban planning. A city like Bangalore has seen uncontrolled growth as was shown in the CES study. But the moot question is whether our policy makers will take any step to check the spread? With over 10,000 acres of lakes and lake beds already encroached in Bangalore, the National Green Tribunal ruling on buffer zones around lakes may not be able to do much beyond preventing further loss of shrunken urban water bodies. It extended the buffer zone from 30 metres to 75 metres around the lake.

A water body can lower temperature of the surrounding urban environment around 2 - 6 °C by evaporative cooling. The rise of evapotranspiration in cities aided by tree cover and water bodies can efficiently offset the influence of the urban heat island, as shown by many [studies](#).

Change lifestyles

To deal with heat, non-energy based methods should be adopted at homes. Applying limestone on the roof top has been shown to reduce inside temperatures by as much as 5 deg. A terrace garden would also help reduce temperature and procure fresh organic produce! As individuals each of us can reduce our carbon footprint that goes to add to global warming.

Begin by conserving energy at home, whether it be by reduce, reuse or recycle. Experts like Sunil Sood and others at IAEMP can help with an audit of power usage at home and suggest efficient ways of using energy. For instance, using T5 or T8 TFLs with electronic ballast in place of T12 TFLs can help bring down units used. A kilowatt of power saved is more than equal to one produced, believe the activists. It must be remembered that fossil fuel plants are the largest contributors to global warming.

It is also the reason why transport which is a major contributor to emissions has to be efficient. Car-pooling and public transport must be strengthened. Emission standards must be enforced for all vehicles. Regulating vehicles by means of odd-even numbers, etc alone can control traffic in cities choking under the huge numbers.

If all of these steps are taken, we can perhaps bring down the mercury a few degrees. Else, the urban heat islands will sizzle and scorch, thanks to our thoughtless lifestyles.