

WINDS OF CHANGE IN URBAN INDIA THAT DEMAND CLOSE INVESTIGATION

Relevant for: Environment | Topic: Environmental Degradation - GHGs, Ozone Depletion and Climate Change

Wind speeds in Indian cities have been slowing dramatically over the decades and the country must probe this phenomenon

A quiet climatic change is taking place around us and no one seems to be talking about it. Perhaps like most unpleasant things, we may not recognize a creeping phenomenon until it's too late to address it.

The wind speed in major Indian cities has been slowing down consistently and significantly over several decades. When we mapped wind speeds during the years 1958 to 2015 in the country's fastest urbanizing cities (2011 census), we noticed an alarming and surprisingly consistent decline. The average wind speed has fallen by 47% in Hyderabad, 47% in Bengaluru, 46% in Kolkata, 34% in Ahmedabad and 25% in Pune.

We used agri-research institute ICRISAT's data on annual variations in wind speed for each month collected in situ district stations for near-surface wind speeds. For each city, we collected monthly data (for Delhi, we had fewer data points), removed a few outliers (that likely indicated storms), and estimated average annual wind speeds over 10 cities of India characterized by the fastest urbanization. The graph, which shows the best-fit line, emerged as a big revelation.

There are considerable variations in wind speed across months (May, June and July have suffered the biggest drop in wind speeds), but the annual average is a reasonable starting point. Surely, the measurement indices (including the height of the wind-speed measurement devices) simulated weather models, and more granular data on such patterns will reveal the exact nature of this phenomenon. At this stage, this simplest of metrics offers us findings that call for a larger investigation of this urban wind slowdown.

A decrease in wind speeds may have severe implications. Small changes in average wind speeds can have a large influence on atmospheric parameters. For instance, slow winds cannot carry moisture for long, resulting in altered rainfall patterns. Agriculture depends crucially on transpiration (a plant's exhalation of water vapour), which in turn needs evaporation that is a function of wind speed. Connectedly, wind-dispersed plant species also depend on wind speeds for survival. There are studies showing the impact of wind speed on natural disasters and ocean dynamics.

Lower urban wind speeds also mean that air pollution in our cities takes longer to get dispersed, making these places a toxic gas sink (Delhi comes to mind) and exacerbating public-health problems. Falling wind speed also has huge implications for the wind-energy sector. Typically, a 5% fall in wind speed can lead to an almost 17% fall in wind energy in an average turbine. Falling wind speeds can thus blow away the promise of cleaner energy.

Interestingly, scientists have found (not too long ago) that wind speeds have been declining globally since the 1960s. They call this "global terrestrial stilling". The average fall has been of 0.5km per hour every decade, studies note. This may not seem like much of a drop, but over long periods of time, it can have significant consequences. In Europe, for example, the decline has been as high as 15%. Another group of scientists, however, has claimed that this 'stilling' may have reversed. Regardless of this observation, the issue has become important globally.

Most of these studies focus on Europe and North America. Such investigations in India, unfortunately, have been scanty.

Our data shows a cause for concern in India. While the exact explanation of why wind speeds are falling is not clear, some scientists say it is happening (along with other atmospheric changes) as a result of an increase in surface roughness, attributed to land-use changes. This can be due to urbanization, or even forest growth.

Urbanization surely has an impact. Studies in Korea revealed that wind speeds are negatively correlated with population density. Wind speeds in Korea have decreased more in urban areas, and by more than they increased in rural regions, during 1993-2015. Studies in China indicate that urbanization is one of the major factors that can explain weakening winds in urban regions. Other studies show that increasing vegetation (due to agriculture and afforestation) could best explain the falling wind speeds, but these are outweighed by those studies where urbanization is put forth as the main culprit.

Urbanization affects the local climate through increased human intervention and the resultant complexity in airflow. Characterized by urban 'heat islands', altered rainfall patterns, increased fog, haze and reduced evaporative cooling, urbanization may well be the main driver of falling wind speeds. Given the dramatic reduction in wind speed in urban pockets of India, our hypothesis is the same. When we looked at the wind speed fall in some of the less-rapidly urbanizing districts, we noticed a relatively slower rate of change.

The reliability of studies on urbanization's effects on wind speed depend crucially on the methods adopted, but, by and large, it is likely that urbanization has a big effect. India is urbanizing at an unimaginable rate, and even though scholars have considered various implications arising from it, changing wind speed has not gained attention. Still, regardless of whether our falling wind speed is because of urbanization or not, it is an important atmospheric variable that deserves appropriate scrutiny in India. Although it may yet turn out not be the main factor behind reduced wind speeds, urbanization is certainly a compounding factor. Non-urban areas may have other reasons, such as differing climatic conditions, geographical vulnerabilities, etc, that could result in changing wind speeds.

Natural phenomena need to be scientifically investigated for their implications to broader socio-economic and cultural outcomes. India's meteorological data-gathering infrastructure is admirable. What we need is an interdisciplinary engagement of that data to distil an informed understanding of these winds of change so that we can formulate adaptation strategies.

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