Bengaluru is not one city when it comes to rain

Three-year study of the readings of 100 rain gauges spread across the city reveals interesting pattern

Skyscrapers and sprawling concrete buildings, leafy open spaces and tree-lined avenues, rejuvenated lakes and chock-a-block slums — the myriad landscape of Bengaluru seems to have a significant impact on rainfall.

A first of its kind study of rainfall variations in the city throws up some startling facts: Kengeri is among the most rain-prone areas while Yelahanka and surrounding regions receive the least amount of rain. The difference between these regions? More than 200mm.

To put this number in perspective, this is the difference in average rainfall received by Bengaluru and its drought-hit neighbour Kolar.

The Karnataka State Natural Disaster Management Centre (KSNDMC) analysing the readings of 100 rain gauges spread across the city over three years (2014-16).

The intensity of monsoons, which contribute nearly 60% of the city's rainfall, was higher in south Bengaluru. The reason, say meteorologists, could be urban heat.

North Bengaluru is peppered with public sector units and academic institutions, which have vast open spaces, and remains cooler. South and East Bengaluru are home to residential sprawls and IT hubs with little open spaces that increases the temperature.

Consequently, North and West Bengaluru see average rainfall of 900mm per annum while South and East receive in the range of 1,000mm to 1,100mm.

"Temperatures increase in isolated spots, causing a heat island effect. The increase in temperature leads to an localised depression, which attracts clouds from other areas," said Shubha Avinash, hydrologist with KSNDMC, who is leading the analysis.

However, the month of September serves a googly with North Bengaluru receiving more rains that the rest of the city.

As rainfall in August flooded parts of the city, in particular the southern reaches, September could see the action shift towards North Bengaluru.

While historically, the southern and eastern parts receive the most rain, for one month in a year northern Bengaluru bucks the trend.

The analysis of rainfall between 2014 and 2016, as recorded by nearly 100 rain gauges, shows that South and East Bengaluru receive most of the rain in the first three months of the monsoon, but the trend reverses in September.

In September, North Bengaluru, particularly Dasarahalli, Bagalakunte and Peenya, receives the highest rainfall, ranging between 170mm and 180mm while South Bengaluru gets a breather and records the least rainfall, shows data available with KSNDMC.

"A longer time frame of study will definitely help us in understanding this trend. It depends on where clouds are being formed. For instance, if it is formed in the Western Ghats and heads towards Bengaluru, it is likely to enter via the north," said G.S. Bhat, professor at the Centre for Atmospheric Sciences, Indian Institute of Science.

In addition, rainfall formed through rising temperatures — called convective clouds which are formed by rising thermals — reduces as the cooler months approach.

Trend can help disaster management agencies

The variability of rainfall within the urban sprawl of the city can give pointers to civic authorities and citizens.

"Since the network of gauges has increased, this gives a good picture of the rainfall patterns at the local level. It can help in preparing the city to cope with the variable rainfall and prioritising areas for flood preparation," says Shubha Avinash, hydrologist with KSNDMC, who is leading the project.

While rainfall has been mapped, the next step is analysing factors of temperatures, humidity and even land use patterns to buttress theories for micro climatic variations. For this, KSNDMC is roping in foreign experts and meteorologists to pin-point the exact reasons for varied rainfall.

Land use is an important factor, as disappearing open spaces tend to increase temperatures and create heat islands that attract clouds.

A recent report by T.V. Ramachandra from the Centre for Ecological Sciences at IISc. shows that built-up area has increased from 35.37% in 1999 to more than 78.65% now. Consequently, vegetation and water bodies reduced from 48% at the turn of the millennium to barely 5% now. "This would make the region GHG (Green House Gases) rich, water scarce, non-resilient and unlivable," states the report.

Anticipating danger?

Imagine a scenario where flood warnings are sent out the moment water levels in lakes reaches the danger point.

A year ago, KSNDMC and the Interdisciplinary Centre for Water Research at the Indian Institute of Science had installed six sensors in the first phase of a pilot project to measure lake water levels in and around the Gottigere micro-shed, which covers Gottigere, Hulimavu and Arakere lakes.

While the five-year study is intended to aid hydrological models, officials hope that this will eventually lead to fixing over 50 sensors in lakes, which can send alerts if flood-like situations are building up.