PRESS RELEASE

Report Launch: Satellite-Based Mapping and the Quantification of $PM_{2.5}$ in India

For Immediate Release

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Particulate matter 2.5 ($PM_{2.5}$) is a tiny pollutant suspended in the air with a size of less than or equal to 2.5 microns. It causes several adverse effects to human health and climate, and is a major environmental issue in the Indian subcontinent as a large population lives in areas where the $PM_{2.5}$ pollution levels exceed the national safe limits. $PM_{2.5}$ varies significantly over short distances, and the sparse government regulatory measurements confined to urban areas fail to capture fine spatial variations. Methods to obtain high-resolution $PM_{2.5}$ pollution maps include satellite-based estimates, modelling, and dense measurement networks. Using satellite-based products to estimate $PM_{2.5}$ can help generate high-resolution gridded spatial maps at a significantly lower cost.

The Center for Study of Science, Technology and Policy (CSTEP) used satellite-based products to study the spatial patterns, hotspot areas, and rural–urban contrasts in $PM_{2.5}$ in the Delhi-NCR, Kanpur, and Bengaluru regions for the calendar year 2019. Titled '***Satellite-Based Mapping and the Quantification of $PM_{2.5}$ in India,***' the official report was launched during a virtual event held on 28 February 2022. Three policy briefs based on the satellite-based mapping of Delhi-NCR, Kanpur, and Bengaluru were also released along with the report.

The $PM_{2.5}$ maps and statistics obtained from the study regions can complement data from regulatory measurements and could be highly useful for policymakers, researchers, and citizen scientists. Dr Sreekanth Vakacherla, one of the authors of the report and a Senior Research Scientist at CSTEP, is of the opinion that 'Regulatory air pollution monitoring in India is mostly limited to urban areas. It is difficult to capture the intricate spatial variations of $PM_{2.5}$ without a dense network of monitors. Satellite-based products could bridge this gap. However, there are challenges and limitations in converting the satellite columnar aerosol optical depth into surface $PM_{2.5}$, such as the non-availability of satellite AOD during cloudy days and the lack of non-urban $PM_{2.5}$ measurements.'

The launch was followed by a panel discussion on the 'State of Non-conventional Air Pollution Monitoring in India.' Eminent panellists from the field discussed the merits and demerits of opting for non-conventional methods of monitoring air pollution. The general consensus was that while alternative ways to track air pollution are welcome, the accuracy of the data gathered is vital in finding sustainable solutions to mitigate air pollution.

Highlights from the study

- A key output of this study is high-resolution spatial maps of daily mean $PM_{2.5}$.
  - $PM_{2.5}$ in Delhi-NCR and Kanpur region was found to be three times higher than that of the Bengaluru region.
  - Within Delhi-NCR, high $PM_{2.5}$ levels were observed in eastern Delhi-NCT (East, Shahdara, South East, and North East) and other regions (Gurugram, Faridabad, Nuh, Palwal, and Bharatpur).

- In the Kanpur region, high $PM_{2.5}$ levels were observed in the Kanpur city.
- In Bengaluru, high levels were observed in the western part of urban Bengaluru and over a few areas in Greater Bengaluru.

- The spatial maps generated were used to identify pollution hotspots.
  - The most noticeable $PM_{2.5}$ hotspots were clustered in and around Delhi-NCT.
  - The Delhi-NCT region—including Shahdara, East, and North East districts—were most severely polluted and identified as hotspots across seasons except during the monsoon season.
  - In the Kanpur region, most of the urban zones were identified as $PM_{2.5}$ hotspot areas.
  - $PM_{2.5}$ hotspots were identified over a lesser spatial extent in the Bengaluru region compared to that of Delhi-NCR and Kanpur regions.
- Based on $PM_{2.5}$ spatial maps and GHMS-SMOD data, variations in $PM_{2.5}$ across several settlement classes (urban, peri-urban, rural, and uninhabited) were studied.
  - For Delhi-NCR and Kanpur regions, a marginal difference in annual $PM_{2.5}$ was observed between rural and urban areas. For the Bengaluru region, no difference was observed between urban, peri-urban, and rural areas, irrespective of seasons.

The full report is available **here**.

Please click on the respective regions for accessing the policy briefs: **Delhi-NCR**, **Kanpur**, and **Bengaluru**.

For more details and interviews with researchers, please write to us at cpe@cstep.in

About CSTEP: Headquartered in Bengaluru, the Center for Study of Science, Technology and Policy (CSTEP) is one of India's leading think tanks with a mission to enrich policymaking with innovative approaches using science and technology for a sustainable, secure, and inclusive society. CSTEP's areas of focus are Climate, Environment and Sustainability; Energy and Power; AI and Digital Platforms; and Strategic Studies.