Syllabus subtopic:

- Conservation, Environmental Pollution and Degradation, Environmental Impact Assessment.

Prelims and Mains focus: about the new device and its significance in forecasting air quality

News: A team of researchers, with \textit{funding from the Earth Sciences Ministry (MoES)}, has devised a \textit{system capable of almost accurately tracking variations in air quality in Delhi during events of biomass burning} and correspondingly issuing \textit{timely forecasts up to 72 hours in advance}.

Background

Every year between October and December, the air quality over Delhi drops to dangerous levels, triggering respiratory-related illnesses and hitting visibility.

About the new device

- The newly-devised \textit{air quality prediction system} is an \textit{upgrade over the one operated by MoES}, which mainly detects the presence of PM2.5 dust particles.

- A \textit{team of Pune-based scientists}, led by Indian Institute of Tropical Meteorology (IITM), along with those from Savitribai Phule Pune University (SPPU), Centre for Development of Advanced Computing (C-DAC), and researchers from Indian Institute of Science (IISc), Bangalore, and National Centre for Atmospheric Research, USA, have \textit{jointly worked on it}.

- Using the \textit{three-dimensional Variational Data Analysis (3DVAR)} devised by the group, the \textit{variations in PM2.5 level were tracked and validated during two winter seasons between 2017 and 2019}.

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Why is predicting air quality in advance difficult?

- Predicting air quality in advance over any region is difficult due to the direct link between local weather and the concentration of chemical gaseous matter that mix with the air.

- Still, large uncertainties are present in the prediction of atmospheric aerosols and locating the emission inventories, and limited understanding in the formation of secondary aerosols, among other factors.

- Chemical data is needed in model assimilation, which has been found to provide better outputs in terms of real-time forecasts. Chemical data assimilation can boost operational weather forecast as the variability of PM2.5 over Delhi was found to be very large. Local weather also plays a major role in accurate forecast of PM2.5, which has high levels of uncertainties due to wind speeds at surface and inventory chemicals.