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IIT-K study sheds light on air pollution sources & impact on health in North India

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Inside Delhi, ammonium chloride and organic aerosols from traffic, residential heating, and industrial activities are key contributors to air pollution



New research from Prof. Sachchida Nand Tripathi of the Department of Civil Engineering and the Department of Sustainable Energy Engineering, Indian Institute of Technology, Kanpur (IIT-K) has identified the major sources of harmful air pollutants along with their impact on human health in Northern India.

The study, published in Nature Communications, reveals that local emissions, particularly from incomplete combustion of various fuels, play a significant role in the poor air quality and associated health risks in the region.

While previous studies have highlighted the severity of air pollution in India, identifying the exact sources and their relative contributions has remained a challenge. Prof. Tripathi's team, in collaboration with national and international researchers, analysed air quality data from five locations across the Indo-Gangetic Plain, including sites in and around Delhi, to gain a comprehensive understanding of the issue.

The study found that local sources and processes are the main factors contributing to the widespread air pollution across the region. Inside Delhi, ammonium chloride and organic aerosols from traffic, residential heating, and industrial activities are key contributors. Outside Delhi, emissions from agricultural burning and secondary organic aerosols formed from these emissions are more prevalent. Contributing to the problem is the incomplete burning of fuels like wood, dung, coal, and petrol. This creates harmful particles that can damage our lungs and cause various health problems.

Regardless of location, the study identified organic aerosols from incomplete combustion of biomass and fossil fuels as the major factor driving air pollution's oxidative potential – a key indicator of its ability to cause adverse health effects.

According to Prof. Sachchida Nand Tripathi, “The oxidative potential refers to the free radicals that are generated when pollutants interact with certain substances in the environment or our bodies. These free radicals can cause damage by reacting with cells, proteins, and DNA. Oxidative potential measures how likely air pollution is to cause this reaction, which in turn can lead to health problems like respiratory diseases, heart disease, and accelerated ageing. There is an urgent need to address this issue and reduce emissions through targeted interventions to improve combustion efficiency in various sectors.”