



Technical Brief

A Strategic Research Initiative for Extended Research on Pollutant Exposure in India

Assessing Concentrations and Sources of Indoor Chemicals and Particulate Matter in Urban India and Comparing to Levels in China and the U.S.

Introduction

The World Health Organization (WHO) has estimated that roughly half of the cities with the worst air quality are in India, and Indian cities routinely comprise the majority of the top 10 cities worldwide with the worst air quality. High particulate matter (PM_{2.5}) concentrations in India are estimated to account for ~1.2 million deaths annually, eclipsing all other health risk factors including smoking, diet and high blood pressure.

However, pollutant composition and sources in India may differ from those in highly-polluted areas elsewhere in the world (e.g., China) due to different cultural practices, infrastructure, and policies. While the routine monitoring of particulate matter is gaining momentum in India, only a handful of studies have been done to examine speciated volatile organic compounds (VOCs), which may be just as relevant for human health and the environment.

Additionally, a few review papers published since 2016 have stressed the need for further work in India to better understand the air pollution problem, especially as the high population density means that poor air quality is affecting the lives of millions of people there.

The research will be conducted in an urban location in India that experiences poor air quality, Ahmedabad, a city of 7.3 million inhabitants in Gujarat Province in Northwest India. Ahmedabad is

also the location of IIT Gandhinagar, a leading research institution where both Duke University and UL have collaborators.

Study Objectives

- Apply the indoor/outdoor measurement strategies developed in the China research plan for UL and Duke University's pollution study that took place in Beijing and Shanghai.
- Characterize the concentrations and sources of VOCs and fine particulate matter (PM_{2.5}) in ambient air and within 20 typical residential homes in different seasons.
- Compare and contrast concentrations and sources of PM_{2.5} and VOCs in India with recent measurements made in the China research initiative and with available related measurements made in the U.S.

Science Outcomes

1. Make available the first comprehensive assessment of PM_{2.5} and VOC chemical characterization in indoor environments in India using an integrated measurement system.
2. Determine specific sources of indoor PM_{2.5} and VOCs in a typical urban household in India.
3. Provide detailed statistical comparison of the concentrations and sources of PM_{2.5} and VOCs in urban China, India, and the U.S.
4. Provide data of sources, levels, and associated factors that can lead to guidance, pollution control, and mitigative strategies.

Research Partners

- Duke University
- University of Wisconsin
- IIT Gandhinagar of India and the Physical Research Laboratory in Ahmedabad, India

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