THE AIR UP THERE

MILIND KANDLIKAR IS UNCOVERING HOW DELHI'S AIR QUALITY PROBLEM ISN'T NECESSARILY A TRAFFIC CONGESTION PROBLEM

In 2002, the City of Delhi and the Supreme Court of India tackled the capital's famously poor air quality in one legislative stroke. Over a multi-year grace period, thousands of diesel taxis, autorickshaws and transit buses were required to convert to cleaner fuels such as compressed natural gas (CNG).

This dramatic shift in policy provided a convenient exogenous experiment for Dr. Milind Kandlikar, an Assistant Professor jointly appointed to the Liu Institute of Global Studies and the Institute of Asian Research at UBC Vancouver. Fluent in the languages of climate science and public policy, Kandlikar and his team analyzed environmental data collected before and after the policy shift to determine whether air quality had actually improved. The study zeroed in on particulate matter – scientific shorthand for any number of tiny, airborne particles, which, unlike greenhouse gases, do not have a universally accepted chemical composition. Particulate matter is so heterogeneous that it is nearly impossible to quantify, let alone predict its behavior or impact.

"We found that it was difficult to detect changes in particulate matter concentrations that could be attributed to the CNG switch, suggesting that a portion of the air quality problem in Delhi was the result of particulate matter originating mostly from industry and biogenic sources," says Kandlikar. "Air pollution in Delhi is not necessarily just a traffic problem – its causes are much broader."

As evidence, Kandlikar points to the notorious Asian brown cloud, a vast pall of polluted air that periodically envelops parts of Asia and the Indian subcontinent. Its causes are a complex stew of airborne particles and pollutants, released across an entire continent by industry and by the burning of agricultural residues and other biomass.

"Our contribution was to look at the data and point out that focusing on transport alone is not going to solve Delhi's air quality problems, at least with respect to particulate matter," says Kandlikar. "This problem has regional and local characteristics with multiple sources."

Autorickshaw assessment

In collaboration with Dr. Madhav Badami of McGill University and Dr. Geetam Tiwari of IIT Delhi, Kandlikar and his team of graduate students are conducting a series of interconnected projects combining policy analysis and empirical data gathering, with a view to providing a comprehensive analysis of air quality issues in Indian cities.

A current study by doctoral student Conor Reynolds seeks to establish a baseline of emissions from autorickshaws, three-wheeled motorcycles that form a major component of India's public transport system, and which make a poorly understood contribution to pollution. The study will also survey the attitudes of autorickshaw drivers toward maintaining their vehicles and thus reducing air pollution.

Another element of Kandlikar's research addresses the intersection of air quality and global climate change. In a recent paper published in the journal *Environmental Science and Technology*, Kandlikar and Reynolds showed that conversion of Delhi's public transit fleet to compressed natural gas – which produces more carbon dioxide than diesel but less light-absorbing particulate matter – has had a net beneficial impact of reducing atmospheric warming.

"Within India, there are piecemeal research efforts on air quality but still very little comprehensive understanding of the problem or how to address it in a coordinated way," says Kandlikar. "We're seeking to combine analyses of air pollution and climate change, and so to inform policies that provide solutions to both issues."

The collaborative research project, Air Quality in Indian Cities is funded by the Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council of Canada (SSHRC) and AUTO21, a Network of Centres of Excellence.